

2019 Winter Wheat Annual Report

MONTANA AGRICULTURAL EXPERIMENT STATION
PLANT SCIENCES AND PLANT PATHOLOGY DEPT.
MONTANA STATE UNIVERSITY

2019 MONTANA WINTER WHEAT ANNUAL REPORT

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2019 Winter Wheat Crop

Montana's 2019 winter wheat crop production is projected at 95.0 million bushels, a 21% increase over the 2018 production of 78.5 million bushels. The 2019 average yield per acre, at 50 bu/ac, is unchanged from last year's record high yield. Harvested acres, at 1.90 million was an increase from the 1.57 million acres in 2018.

Montana 2016-2019 Wheat Production

Wheat Class	Acres harvested (X 1000)				Average Yield (bu/ac)				Total Production (millions of bushels)			
	2016	2017	2018	2019	16	17	18	19	2016	2017	2018	2019
Winter Wheat	2150	1590	1570	1900	49	42	50	50	105.4	66.8	78.5	95
Spring Wheat	2110	2290	2820	2860	36	21	34	37	76.0	48.1	95.9	105.8
Durum	765	785	775	535	41	16	30	42	31.4	12.6	23.3	22.5

2019 Winter Wheat Varieties

Warhorse remained the leading variety in 2019 at 28.0%, increasing from 24% in 2018.

Brawl CL Plus moved to the 2nd leading winter wheat variety in 2019 at 13.2%, up from 6.8% in 2018.

Yellowstone was the 3rd leading variety in 2019, with 13.0% of the acreage, a drop from 2nd place and 18.1% in 2018.

Keldin remained the 4th leading winter wheat variety in 2019 at 9.2%, up from 7.5% in 2018.

Judee was the 5th leading winter wheat variety in 2019 at 8.1%, a drop from 3rd place and 14.3% in 2018.

Loma moved to the 6th leading winter wheat variety in 2019 at 3.6%, up from the 'Other' category in 2018.

Montana public varieties {Warhorse, Yellowstone, Judee, Loma, Decade (3.4%), and Rampart (1.3%)} occupied 57% of the winter wheat acreage in 2019, down from 64% in 2018.

2019 Montana Wheat Variety Survey ^{1/}

Percentage of Acres Planted Statewide

Winter Wheat		Spring Wheat	
Warhorse	28.0%	Vida	23.8%
Brawl CL Plus	13.2%	SY Soren	11.5%
Yellowstone	13.0%	Reeder	10.4%
Keldin	9.2%	SY Ingmar	9.6%
Judee	8.1%	Corbin	6.8%
Loma	3.6%	WB Gunnison	5.5%
SY Monument	3.4%	Duclair	5.1%
Decade	3.4%	Brennan	3.9%
SY Wolf	2.8%	Mott	2.5%
CDC Falcon	1.8%	WB 9879	2.0%
Rampart	1.3%	Lanning	1.5%
Other	12.1%	Other	17.5%

Other planted varieties

Bearpaw
 WB 4623 CLP WB 4623 CLP
 Carter
 Colter
 Fusion LCS Fusion
 Genou
 LCS Jet
 WB Matlock WB Matlock
 Wesley Wesley
 Northern
 Overland
 Pintail
 Ray
 WB 4623 CLP WB 4623 CLP
 WB 4614
 Willow Creek
 Morgan

Other planted varieties

ONeal
 Elgin-ND
 Choteau
 SY Valda
 WB 9668
 Ambush
 Barlow
 Amidon
 Bolles
 MS Chevelle
 Conan
 Fortuna
 Hank
 SY Ingmar
 LCS Rebel
 McNeal
 NS Presser CLP
 SY Rockford
 SY Tyra
 Solana
 UI Stone
 WB 9483
 Breaker
 Newana
 SY 605

1/ Survey conducted by Dr. Anton Bekkerman, Department of Agricultural Economics and Economics, Montana State University

2019 Montana Wheat Variety Survey

Percentage of Acres Planted in the Top 5 Counties

Winter Wheat		Spring Wheat	
Warhorse	37.0%	Vida	23.0%
Yellowstone	12.5%	SY Soren	19.3%
Judee	11.8%	SY Ingmar	13.7%
Brawl CL Plus	9.0%	Reeder	12.8%
Keldin	7.1%	WB Gunnison	4.9%
SY Monument	4.1%	Duclair	4.5%
Decade	3.0%	Corbin	3.5%
Rampart	1.9%	Brennan	2.7%
CDC Falcon	1.9%	O'Neal	2.2%
Loma	1.3%	Mott	2.1%
Other	10.48%	Elgin-ND	2.1%
		Other	9.2%

2019 Montana Wheat Variety Survey - by Ag District

Winter Wheat								
	Northwest	North Central	Northeast	Central	Southwest	South Central	Southeast	State
Warhorse	—	38.4%	—	7.0%	—	12.9%	—	28.0%
Brawl CL Plus	—	3.9%	—	16.2%	—	67.9%	—	13.2%
Yellowstone	—	11.2%	22.3%	19.2%	58.1%	1.9%	—	13.0%
Keldin	—	13.1%	—	2.4%	—	.	—	9.2%
Judee	—	9.6%	—	6.6%	—	2.6%	—	8.1%
Loma	—	4.2%	—	3.0%	—	—	—	3.6%
SY Monument	—	3.0%	—	5.7%	—	—	—	3.4%
Decade	—	1.8%	34.3%	5.3%	—	—	—	3.4%
SY Wolf	—	1.0%	14.9%	0.5%	—	13.8%	—	2.8%
CDC Falcon	—	2.4%	—	—	—	—	—	1.8%
Rampart	—	1.6%	—	—	—	—	—	1.3%
SY Clearstone	—	0.2%	—	—	29.0%	.	—	0.7%
Other	—	9.6%	28.5%	18.9%	12.9%	1.0%	—	11.5%
Unknown/Unreported	100.0%	0.0%	0.0%	15.3%	0.0%	0.0%	100.0%	0.0%
Observations	1	254	24	54	6	13	2	354

Spring Wheat								
	Northwest	North Central	Northeast	Central	Southwest	South Central	Southeast	State
Vida	—	36.6%	14.9%	14.4%	—	—	—	23.8%
SY Soren	—	—	22.3%	—	—	—	—	11.5%
Reeder	—	—	19.4%	6.9%	—	—	—	10.4%
SY Ingmar	—	3.6%	13.7%	19.9%	—	—	—	9.6%
Corbin	—	13.9%	1.6%	—	—	—	—	6.8%
WB Gunnison	—	12.8%	0.0%	—	—	—	—	5.5%
Duclair	—	10.8%	0.9%	—	—	—	—	5.1%
Brennan	—	—	7.3%	—	—	—	—	3.9%
Mott	—	1.4%	3.5%	—	—	—	—	2.5%
WB 9879	—	2.7%	—	15.9%	—	—	—	2.0%
Lanning	—	2.9%	0.4%	—	—	—	—	1.5%
O'Neal	—	2.5%	—	—	—	—	—	1.2%
Elgin-ND	—	—	2.4%	—	—	—	—	1.2%
Choteau	—	2.8%	0.1%	—	—	—	—	1.0%
SY Valda	—	2.3%	—	—	—	—	—	0.9%
Other	5.0%	7.8%	11.1%	20.7%	80.9%	—	—	13.2%
Unknown/Unreported	95.0%	0.0%	2.4%	22.1%	19.1%	100.0%	100.0%	0.0%
Observations	2	235	156	49	6	11	0	459

Crop Science

Entomology

Horticulture

Plant Biology

Plant Genetics

Plant Pathology

DATE: January 22, 2019

TO: Variety Release and Recommendation Committee Members

FROM: Mike Giroux, Chair

RE: 2019 Variety Release Minutes and Committees

Chair: Mike Giroux, Interim Department Head PSPP

Secretary: Andy Hogg, Research Associate, PSPP

Present:

Mike Giroux, Andy Hogg, Dave Gettel, Phil Bruckner, Luther Talbert, Jamie Sherman, Liz Elmore, Hwa-young Heo, Nancy Blake, Anton Beckerman, Doug Holen, Heather Unverzagt, Daniel Juliano, Alan Dyer, Sreekala Bajwa, Craig Cook, Darin Oelkers, Andy Burkhardt, Kevin McPhee, Ron Ramsfield, David Weaver, Harvey TeSlaa, Perry Miller, Jason Cook, Robert Hoffman, Joe Jensen, Scott Christensen, Collin Watters, Trevor Schafer, Jessica Williams, Devon Miller, Jordan Skaley.

Called in:

Dale Clark, Ken Kephart, Peggy Lamb, Darrin Boss, Gadi Reddy, John Miller, Jed Eberly, Patrick Carr, Chengci Chen, Todd Hansen, Chris Westergard.

Absent: Deanna Nash, Jessica Torrion, Prashant Jha

Agenda for 2019 Variety Release Meeting

Following is the agenda for the 2019 Variety Release meeting held on **Tuesday, January 22, 2019 at 1:00 pm in 108 Plant BioScience Building.**

1. Approval of the 2018 meeting minutes.
2. Discuss and vote on the motions submitted to the Wheat and Barley Crop Committees.

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2019 Meeting Minutes

1. Approval of the Minutes of the 2018 meeting.

- Phil Bruckner motioned to approve the 2018 minutes.
- Alan Dyer seconded the motion.
- Motion passed unanimously, 13-0.
- Daniel Juliano from MSU tech transfer gave an update on revenue generation from new cultivar releases. Moving forward, a higher percentage of income generated from new cultivar releases will be reinvested into the breeding programs.

2. Wheat Committee

- **Phil Bruckner – Proposal to release MTS1588 hard red winter wheat as a public protected variety.**
- Phil Bruckner discussed the crossing pedigree and selection method used. The cross involved two solid stem experimental lines and a hollow stem experimental line.
- Phil Bruckner- Testing over multiple years in sawfly nurseries showed MTS1588 had the least cutting of solid stem lines and was more solid than Warhorse.
- Phil Bruckner- Compared to other solid stem lines in sawfly areas, MTS1588 was the highest yielding, with yields statistically comparable to Loma. MTS1588 performed best in Conrad and Havre, which are active sawfly areas. Under sawfly pressure, there was a 10% yield increase compared to Judee.
- Phil Bruckner- MTS1588 has acceptable protein and other quality traits comparable to current varieties.
- Phil Bruckner- MTS1588 has stripe rust resistance at seedling stage and likely the adult stage.
- Perry Miller wondered if the short height is beneficial or detrimental?
- Phil Bruckner thought under high drought stress/low rainfall it could maybe be an issue, but in general, he has been pushing his lines to be shorter.
- Dave Gettel commented that as a grower he thought it was beneficial to have shorter solid stemmed wheat in no till because it's easier to seed into.
- Phil Bruckner motioned to release MTS1588 hard red winter wheat as a public protected variety.
- Doug Holen seconded.
- Motion passed unanimously, 13-0.

- **Phil Bruckner – Proposal to release MT1564 hard red winter wheat as a public protected variety.**
- Phil Bruckner- MT1564 is an early maturing variety which is unique for Montana winter wheats. The cross involved a spring wheat that carries stripe rust resistant alleles YR5 and YR15 which was crossed to Yellowstone and Yellowstone derivatives (~75 % Yellowstone). Bulk selection through F₅. Winter hardiness was selected for in F₄ and stripe rust resistance was selected for in the F₆ and F₇. Multi location testing was carried out for 4 years.
- Phil Bruckner mentioned that Jason Cook confirmed that the two stripe rust resistant genes are present in MT1564 using molecular markers.
- Phil Bruckner- Data from NRPN indicated that MT1564 did not carry YR15 using molecular markers. However, stripe rust testing at Washington State by Xianming Chen showed it had resistance to all races at the seedling stage and several races in the adult stage. Field testing showed that MT1564 was highly resistant to stripe rust. MT1564 is moderately resistant to stem rust.
- Alan Dyer made a comment that an early heading variety is useful to help prevent wheat streak mosaic virus. Should help eliminate green bridge.
- Phil Bruckner- In advanced trials MT1564 had a high yield potential, similar to Yellowstone and SY-Wolf.
- Phil Bruckner- MT1564 has similar quality to Decade and Yellowstone in preliminary tests. Compared to the varieties Four-O-Six and Northern, MT1564 has improved mixing tolerance and higher flour yield.
- Jim Berg mentioned it has good mixing tolerance, which is preferred by bakers.
- Darin Oelkers asked if Phil knew why it did not perform well in 2018.
- Phil Bruckner said he did not observe anything last year that was unusual.
- Heather Unverzagt recommended that it have a white seed tolerance written into the PVP to avoid a problem if it is to be grown in Washington state.
- Phil Bruckner motioned to release MT1564 hard red winter wheat as a public protected variety.
- Motion was seconded by David Weaver.
- Motion passed unanimously, 13-0.
- **Phil Bruckner – Proposal to release MTCL1601 Clearfield hard red winter wheat as a licensed protected variety.**
- Phil Bruckner- MTCL1601 came from a cross between an experimental semi-solid hard white line and a Clearfield resistant experimental line. It carries 2 *als* resistance genes.
- Mike Giroux asked if the Clearfield trait will become publicly available soon.

- Daniel Juliano thought perhaps once its patent expires.
- Phil Bruckner- MTCL1601 was selected with herbicide tolerance 2x rate for several years. Currently waiting for approval from BASF confirming that it has acceptable herbicide resistance.
- Phil Bruckner- MTCL1601 has intermediate stem solidness and exhibited some cutting by sawfly similar to Loma and Judee. Lower yielding than other solid stem lines in sawfly areas due to higher cutting.
- Phil Bruckner- MTCL1601 has a better yield potential than Brawl CL Plus but comparable to SY Clearstone 2CL, both which are Clearfield resistant varieties.
- Phil Bruckner- MTCL1601 has adequate quality but lower mixing tolerance and bake water absorption compared to Yellowstone.
- Phil Bruckner- MTCL1601 has good stripe rust resistance and is moderately susceptible to stem rust.
- Phil Bruckner motioned to release MTCL1601 Clearfield hard red winter wheat as a licensed, protected variety.
- Alan Dyer seconded.
- Motion passed unanimously, 13-0.
- **Luther Talbert – Proposal to release MT1621 hard red spring wheat as a public, PVP, title V protected variety.**
- Luther Talbert- Rationale for release was improved protein and quality compared to Vida but have the stay green trait and more solid stems. Mentioned it has been difficult to separate the stay green trait and lower gluten strength. Was selected to have an earlier heading date so it might escape the hottest part of the summer/grain fill.
- Luther Talbert- Over 2 years, 2017-18, it had highest yield, statistically similar to Vida.
- Luther Talbert- MT1621 has increased protein content compared to Vida.
- Luther Talbert- MT1621 has a 3 day earlier heading date than Vida and senesced earlier. This means it has essentially the same grain fill period as Vida.
- Luther Talbert- MT1621 is an intermediate stem solid line. Has some sawfly resistance, not as good as Choteau or Duclair.
- Dave Gettel asked if early heading affects sawfly infestation?
- David Weaver commented that the heading date does not affect sawfly infestation.
- Mike Giroux asked about the increased protein content being site specific.
- Luther Talbert thought not given its performance across statewide yield trials.
- Luther Talbert- MT1621 has a much higher mixing tolerance than Vida and Reeder.

- Jim Berg mentioned the standard mix tolerance across the country is a 3.0 or higher.
- Luther Talbert- MT1621 was found to be moderately resistant to stripe rust, similar to Lanning and Duclair.
- Luther Talbert- MT1621 is susceptible to Fusarium head blight. Data was not consistent across trials.
- Luther Talbert motioned to release MT1621 hard red spring wheat as a public, PVP, Title V protected variety.
- David Weaver seconded.
- Motion passed unanimously, 13-0.

3. Barley and Oats Committee

- **Jamie Sherman – Proposal to release MT124112 spring malt barley as a public protected variety.**
- Jamie Sherman- This line was originally crossed by Tom Blake, parents included LK644, Hockett. The rationale was to replace Hockett which maltsters have an issue with because it is slow to germinate and requires the addition of an enzyme for quicker seed germination.
- Jamie Sherman- Parental material LK644 donated the low protein gene. This should be beneficial to growers as it will help prevent them from having too high of protein.
- Jamie Sherman- MT124112 has similar yield to Hockett but lower protein, about 91% of Hockett. MT124112 has comparable % plumps and test weight to Hockett.
- Jamie Sherman- MT124112 heads about 2 days earlier and matures a little later compared to Hockett.
- Jamie Sherman- MT124112 has lower lodging potential than Metcalfe and Hockett so could be grown under irrigation.
- Jamie Sherman- Under high fertility (nitrogen) MT124112 maintains a lower protein compared to Hockett and a high yield potential.
- Jamie Sherman- MT124112 seeds hydrate faster compared to Hockett which would be advantageous to maltsters. She was not sure how this relates to pre-harvest sprouting.
- Jamie Sherman- MT124112 has a higher malt extract than Hockett and lower beta glucans. The beta glucan content was similar or higher than Metcalfe.
- Jamie Sherman- Fusarium head blight disease severity is similar to Hockett.
- Jamie Sherman motioned to release MT124112 spring malt barley as a public protected variety.
- Alan Dyer seconded.

- Doug Holen mentioned there was a lot of seed on the ground in the breeder seed increase. Wondered if shattering would be an issue.
- Liz Elmore did not think the shattering was unique to this line, but perhaps due to the late rains knocking the seed out.
- Collin Watters asked if the lower diastatic power made MT124112 a target for all-malt brewing. Jamie thought it would be acceptable by both all-malt and adjunct brewers.
- Mike Giroux asked if the quality data was produced at MSU or another lab.
- Jamie said it was half and half. She said dryland was done at MSU, and the difference between the two labs is likely due to differences in the malting process.
- Motion passed unanimously, 13-0.
- David Weaver motioned to adjourn.
- Alan Dyer seconded the motion.
- Meeting was adjourned.

'Yellowstone' and 'Decade' Winter Wheats

Phil Bruckner and Jim Berg, Winter Wheat Breeding Program, Montana State University
Updated 1/2020

Yellowstone is a white-chaffed hard red winter wheat developed by the Montana Agricultural Experiment Station and released to seed growers in 2005. Yellowstone's pedigree is 'Judith' x 'Promontory'. Yellowstone is a very high yielding (Table 1) winter hardy variety with medium test weight, maturity, height, and grain protein (Table 2). Yellowstone has good milling and excellent baking quality (Table 3). It is resistant to stripe rust, but susceptible to stem rust. Yellowstone is recommended in Districts 1-5. Montana State University Research Fees due on seed sold. PVP, Title V has been issued (Certificate #200600284).

Decade is a white-chaffed hard red winter wheat developed by the Montana Agricultural Experiment Station and released to seed growers in 2010. Decade is a joint release with the North Dakota Agricultural Experiment Station. Decade was selected from a composite of three closely related F1 populations containing such varieties as a sib line of 'Wesley', 'CDC Clair', 'NuWest', 'Tiber', and 'Redwin'. Decade is a high yielding (Table 1) winter hardy variety well adapted to western North Dakota and eastern Montana with medium to high test weight, early maturity, reduced height, and medium to high grain protein (Table 2). Decade has excellent milling and baking quality (Table 3). It is resistant to stem rust, but susceptible to stripe rust. Relative to CDC Falcon, Decade is equivalent in yield potential and winter survival, with improved test weight, earlier maturity, higher grain protein content, superior milling characteristics and higher water absorption. Montana State University Research Fees due on seed sold. PVP, Title V has been issued (Certificate #201100096).

Table 1. Yield of Yellowstone and Decade, 2013-2019, compared to a set of winter wheat varieties.

Variety	Districts							All Locations
	1 Kalispell	2 Bozeman	3 Huntley ^{1/}	4 Moccasin ^{2/}	5 Conrad ^{3/}	5 Havre ^{4/}	6 - Sidney, Williston	
location-years	6	6	40	35	30	22	9	148
Yellowstone	118.6	110.4	73.5	61.0	73.7	57.8	61.7	70.9
Northern	126.3	108.1	73.8	61.3	72.3	57.9	59.5	70.9
SY Clearstone 2CL	123.8	108.0	72.2	61.5	72.0	55.7	54.1	69.7
Decade	67.8	89.7	70.9	59.1	68.3	53.4	54.9	64.6
Warhorse	119.0	94.4	68.8	56.6	64.1	51.8	48.6	64.2
Judee	119.5	94.0	65.9	54.8	67.2	54.3	48.7	64.1
LSD (0.05)	18.1	9.2	2.5	2.3	3.0	2.5	6.0	1.7

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

1/ includes data from Forsyth, Fort Smith, Hardin area, Hysham, Molt, Rapelje

2/ includes data from Denton, Geraldine, Highwood, Winifred, Belt

3/ includes data from The Knees, Shelby, Cut Bank, Choteau

4/ includes data from Loma, Turner, Fort Benton

Table 2. Agronomic characteristics of Yellowstone and Decade, 2013-2019, compared to a set of winter wheat varieties

Variety	Test weight	Winter survival	Heading date		Plant height	Lodging %	Protein %	Sawfly cutting %	Stripe rust %	Coleoptile length in
	lb/bu	%	Julian	Calendar	in					
location-years	148	6	58		145	26	145	24	7	2
Decade	59.8	54	160.0	9-Jun	31.3	20	12.8	32	67	3.3
Judee	60.9	36	161.1	10-Jun	30.9	22	12.9	29	12	3.9
Northern	60.1	47	163.2	12-Jun	31.1	20	12.8	34	15	2.7
SY Clearstone 2CL	59.4	44	162.1	11-Jun	33.5	25	12.5	46	29	3.0
Warhorse	60.0	45	162.1	11-Jun	30.4	13	13.1	7	12	3.3
Yellowstone	59.7	52	162.3	11-Jun	32.8	21	12.4	43	30	2.7
LSD (0.05)	0.2	11	0.4		0.3	7	0.1	7	15	0.3

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 3. Mill and bake characteristics of Yellowstone and Decade, 2013-2018, compared to a set of winter wheat varieties

Variety	PPO ^{1/}	Kernel hardness	Flour			Mixograph			Baking		
			yield %	protein %	ash %	tolerance (1-6)	mix time min	absorption %	mix time min	absorption %	volume cc
location-years	20	16	20	20	20	20	20	20	20	20	20
Decade	0.268	73.2	70.2	11.7	0.41	4.2	7.3	65.9	19.3	76.2	1043
Judee	0.261	79.1	70.1	12.0	0.42	3.8	5.2	63.5	9.7	73.5	1134
Northern	0.103	85.0	71.1	11.9	0.46	3.4	3.7	63.2	5.9	73.0	1077
SY Clearstone 2CL	0.283	75.9	69.3	11.2	0.43	3.7	5.7	63.3	9.7	73.6	1043
Warhorse	0.256	90.0	69.9	12.2	0.44	3.1	4.5	64.0	7.5	74.3	1077
Yellowstone	0.220	76.7	70.2	11.4	0.43	4.3	7.6	65.1	15.8	75.8	1053
LSD (0.05)	0.028	2.3	0.6	0.3	0.01	0.4	0.7	1.2	1.6	1.2	33

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

^{1/} low is best for noodles

Phil Bruckner and Jim Berg, Montana State University, Agricultural Experiment Station <<http://plantsciences.montana.edu/crops>>

'Judee' and 'Warhorse' Winter Wheats

Phil Bruckner and Jim Berg, Winter Wheat Breeding Program, Montana State University
Small Grain QuickFacts: <http://plantsciences.montana.edu/FoundationSeed> (Updated 1/2020)

Judee is a solid-stemmed hard red winter wheat with improved yield potential (Tables 1, 2) relative to Rampart. Judee was developed by the Montana Agricultural Experiment Station and released to seed growers in 2011. Judee's pedigree is 'Vanguard'/'Norstar'/'Judith' dwarf/3/ NuHorizon. Judee is a white-glumed, semi-dwarf (*Rht1*) wheat with medium maturity. Judee performs well in locations where sawfly cutting has occurred (Table 3). Stem solidness is good, intermediate between Rampart and Genou. Judee has average test weight and protein, and below average winter hardiness (Table 4). Judee is susceptible to prevalent races of leaf rust and stem rust, but resistant to stripe rust. Judee is a high PPO variety with average mill and above average bake properties (Table 5).). Montana State University Research Fees due on seed sold. PVP, Title V has been issued (Certificate #201200161).

Warhorse is a solid-stemmed hard red winter wheat with improved yield potential (Tables 1, 2) relative to Genou and Rampart. Warhorse was developed by the Montana Agricultural Experiment Station and released to seed growers in 2013. Warhorse was derived from a composite of three F₁ crosses with a common parent, 'Nuplains'/MTS9862 (an experimental sawfly line) crossed to three Montana unreleased hollow- and solid-stemmed experimental lines. Warhorse is an awned, white-glumed, semi-dwarf (*Rht1*) wheat with medium maturity. Warhorse performs well in locations where sawfly cutting has occurred (Table 3). Stem solidness is similar to Bearpaw and Rampart. Warhorse has average test weight and protein, and below average winter hardiness (Table 4). Warhorse is resistant to prevalent races of stripe and stem rust, but susceptible to leaf rust. Warhorse is a high PPO variety with average mill and bake properties (Table 5). To be sold by variety name only as a class of certified seed. Montana State University Research Fees due on seed sold. PVP, Title V has been issued (Certificate# 201400131).

Table 1. Yield of Judee and Warhorse vs. Decade, 2010-2019^{1/}

Variety	Districts							All Locations
	1 Kalispell	2 Bozeman ^{2/}	3 Huntley ^{3/}	4 Moccasin ^{4/}	5 Conrad ^{5/}	5 Havre ^{6/}	6- Sidney & Williston	
location-years	9	20	57	50	43	49	15	244
Warhorse	117.3	82.1	66.0	53.6	63.5	52.9	49.2	62.3
Judee	62.2	75.5	68.4	56.1	65.8	54.1	55.9	62.0
Decade	114.5	81.3	63.9	51.0	66.1	54.6	45.8	61.7
LSD (0.05)	19.3	ns	2.1	1.8	ns	ns	5.9	ns

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

1/ = includes 2012-19 Sawfly , 2010-19 Intrastate and 2011-19 Off Station tests

2/ includes data from Dry Creek, Willow Creek

3/ includes data from Billings, Forsyth, Fort Smith, Hardin area, Hysham, Lodge Grass, Molt, Rapelje

4/ includes data from Belt, Denton, Geraldine, Highwood, Winifred

5/ includes data from Choteau, Cut Bank, The Knees, Shelby

6/ includes data from Big Sandy, Carter, Gildford, Loma, Turner

Table 2. Judee and Warhorse Yield Performance under Sawfly Pressure and % Sawfly Cutting (test average cutting $\geq 10\%$) and % Sawfly Cutting (2010-2019)

Variety	Yield bu/a	Sawfly cutting %
location-years	36	36
Judee	57.2	30
Decade	55.9	38
Warhorse	54.5	8
LSD (0.05)	ns	6

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD ($p = 0.05$)

Table 3. Stem solidness ratings of Judee and Warhorse compared to other solid-stemmed varieties, (2015-2019)

	Stem Solidness Rating (scale 5-25, higher = more solid)						Stem Solidness by location, 2015-2019				
	2019	2018	2017	2016	2015	2015-18	Billings	Bozeman	Conrad	Havre ^{1/}	Moccasin
location-years	9	9	11	6	3	38	2	8	6	19	3
Bobcat	23.9	23.8	22.8	22.3	22.0	23.2	23.0	22.8	23.3	23.4	22.5
Warhorse	22.3	22.5	21.1	21.4	21.9	21.8	22.6	20.5	22.2	22.2	22.2
Judee	20.7	22.3	18.4	20.0	19.4	20.2	22.0	17.8	21.4	20.5	21.7
Loma	21.0	22.5	19.3	17.9	17.3	20.1	22.8	17.2	20.4	21.0	19.8
LSD (0.05)	0.9	ns	1.3	2.0	ns	0.7	ns	1.7	1.4	0.9	ns

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD ($p = 0.05$)

^{1/} includes Carter, Gildford, and Loma

Table 4. Agronomic characteristics of Judee and Warhorse vs. Decade, 2010-2019^{1/}

Variety	Test weight	Winter survival	Heading date		Plant height	Lodging	Protein	Sawfly cutting	Stripe rust	Coleoptile length
	lb/bu	%	Julian	Calendar	in	%	%	%	%	in
location-years	242	11	106		240	36	241	47	17	4
Decade	59.5	55	160.6	10-Jun	31.0	17	12.9	30	62	3.0
Judee	60.2	33	161.6	11-Jun	30.7	20	13.1	23	12	3.7
Warhorse	59.6	44	162.7	12-Jun	30.3	10	13.2	6	11	3.3
LSD (0.05)	0.26	10	0.24		0.23	5	0.1	5	8	0.2

^{1/} = includes 2012-19 Sawfly, 2010-19 Intrastate and 2011-19 Off Station tests

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD ($p = 0.05$)

Table 5. Mill and bake characteristics of Judee and Warhorse, compared to Decade, 2010-2018

Variety	PPO ^{1/}	Kernel hardness	Flour			Mixograph			Baking		
			yield	protein	ash	tolerance	mix time	absorption	mix time	absorption	volume
			%	%	%	(1-6)	min	%	min	%	cc
location-years	60	53	60	60	60	60	60	60	60	60	60
Decade	0.278	76.5	68.7	11.8	0.41	4.1	8.1	66.6	18.5	77.0	1058
Judee	0.262	79.3	68.4	12.1	0.41	3.8	5.5	63.4	9.1	73.4	1143
Warhorse	0.259	90.1	68.4	12.2	0.43	2.9	5.0	64.2	7.7	74.5	1083
LSD (0.05)	0.013	1.5	ns	0.2	0.01	0.3	0.5	0.7	1.1	0.7	17

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD ($p = 0.05$)

^{1/} low is best for noodles

'SY Clearstone 2CL' Winter Wheat

Phil Bruckner and Jim Berg, Winter Wheat Breeding Program, Montana State University
Updated 1/2020

SY Clearstone 2CL is a 2-gene CLEARFIELD hard red winter wheat developed by Montana Agricultural Experiment Station in 2012 and licensed exclusively to Syngenta Seeds. SY Clearstone 2CL wheat is very similar to Yellowstone. It is a medium maturing, medium tall, white chaffed wheat with average winter hardiness. It is a high yielding wheat (Tables 1,2) with average test weight and protein (Table 3). SY Clearstone 2CL is resistant to stripe rust and has moderate resistance to stem rust, the latter an improvement over Yellowstone. SY Clearstone 2CL is a medium PPO variety with average mill and above average bake properties (Table 4). PVP, Title V has been issued (Certificate# 201300357). Additionally, the CLEARFIELD genes are patented.

Table 1. Yield of SY Clearstone 2CL vs. a set of varieties, 2012-2019^{1/}

Variety	Districts							All Locations
	1 Kalispell	2 Bozeman	3 Huntley ^{2/}	4 Moccasin ^{3/}	5 Conrad ^{4/}	5 Havre ^{5/}	6- Sidney & Williston	
location-years	7	7	41	36	31	23	11	156
Yellowstone	113.7	105.9	73.4	60.3	74.5	57.6	60.3	70.1
Northern	116.8	103.9	73.5	60.6	73.1	57.9	58.2	69.9
SY Clearstone 2CL	117.0	104.4	72.1	60.7	72.4	56.3	53.5	68.9
Decade	59.4	88.1	70.7	58.3	68.7	53.4	53.9	63.6
LSD (0.05)	18.3	9.7	ns	ns	2.6	2.4	4.0	1.8

bold = indicates highest value within a column

ns = non-significant

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

1/ = 2012-2016, 2018-2019 Intrastate and 2013-2019 Off Station tests

2/ includes data from Forsyth, Fort Smith, Hardin area, Hysham, Lodge Grass, Molt, Rapelje

3/ includes data from Belt, Denton, Geraldine, Highwood, Winifred

4/ includes data from Choteau, The Knees, Shelby

5/ includes data from Ft. Benton, Loma, Turner

Table 2. Yield of SY Clearstone 2CL vs. a set of CLEARFIELD varieties: 2017-2019 Intrastate Tests

Variety	Districts							All Locations
	1 Kalispell	2 Bozeman	3 Huntley	4 Moccasin	5 Conrad	5 Havre ^{6/}	6- Sidney & Williston	
location-years	2	3	3	3	3	6	5	25
SY Clearstone 2CL	114.9	128.6	111.3	71.1	69.7	55.9	54.2	79.1
Byrd CL Plus	98.2	112.0	123.5	68.9	75.2	55.8	52.5	77.3
Brawl CL Plus	98.5	101.4	117.7	63.0	75.1	54.3	41.5	72.1
SY 517 CL2	73.4	103.3	117.0	65.2	69.8	51.8	39.2	68.8
LSD (0.05)	ns	19.6	ns	ns	ns	ns	11.7	5.1

6/ = includes Ft. Benton

Table 3. Agronomic characteristics of SY Clearstone 2CL vs. a set of recommended varieties, 2012-2019^{1/}

Variety	Test weight lb/bu	Winter survival %	Heading date		Plant height in	Lodging %	Protein %	Sawfly cutting %	Stripe rust %	Coleoptile length in
			Julian	Calendar						
location-years	156	8	66		153	25	153	25	8	2
Decade	59.4	47	157.8	7-Jun	31.1	20	12.8	30	71	3.2
Northern	59.6	38	161.0	10-Jun	31.0	20	12.7	32	22	2.5
SY Clearstone 2CL	58.9	35	159.9	9-Jun	33.3	25	12.4	43	34	3.0
Yellowstone	59.3	43	160.1	9-Jun	32.6	21	12.4	40	33	2.7
LSD (0.05)	0.28	8	0.349		0.27	ns	0.1	6	14	0.2

1/ = 2012-2016, 2018-2019 Intrastate and 2013-2019 Off Station tests

ns = non-significant

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 4. Mill and bake characteristics of SY Clearstone 2CL vs. a set of varieties, 2012-2018

Variety	PPO ^{1/}	Kernel hardness	Flour			Mixograph			Baking		
			yield %	protein %	ash %	tolerance (1-6)	mix time min	absorption %	mix time min	absorption %	volume cc
location-years	24	20	24	24	24	24	24	24	24	24	24
Decade	0.280	75.7	69.1	11.6	0.41	4.3	7.5	65.7	18.2	76.0	1049
Northern	0.105	86.2	69.9	11.8	0.45	3.4	3.9	62.9	6.0	72.7	1077
SY Clearstone 2CL	0.294	77.8	68.2	11.2	0.43	3.8	6.0	62.9	9.7	73.2	1042
Yellowstone	0.222	78.9	69.2	11.5	0.43	4.3	8.1	64.9	15.4	75.5	1059
LSD (0.05)	0.028	2.4	0.6	0.26	0.01	0.38	0.7	1.0	1.8	1.1	ns

bold = indicates highest value within a column

ns = non-significant

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

^{1/} low is best for noodles

Phil Bruckner and Jim Berg, Montana State University, Agricultural Experiment Station <<http://plantsciences.montana.edu/crops>>

'Northern' Winter Wheat

Phil Bruckner and Jim Berg, Winter Wheat Breeding Program, Montana State University
Updated 1/2020

Northern is a hard red winter wheat developed by the Montana Agricultural Experiment Station and released to growers in fall 2015. Northern was named to commemorate the 100th anniversary of the Northern Agricultural Research Center (NARC) in Havre, Montana. Northern is derived from a cross between a Yellowstone sib line (MT9982) and hard white winter Montana (MTW0072) and Nebraska (NW97S151) experimental lines. Northern is a medium-late maturing, medium-short statured wheat, with white chaff. Northern has average yield (similar to Yellowstone and Colter, see Table 1), average test weight, and average protein (Table 2). Northern is resistant to both stem and stripe rust. Northern has above average milling and average baking properties (Table 3.) Northern is a low PPO cultivar with favorable Asian noodle color stability and noodle score. To be sold by variety name only as a class of certified seed. Montana State University Research Fees due on seed sold. PVP, Title V is issued (Certificate# 20160092).

Table 1. Yield of Northern vs. a set of varieties, 2014-2019^{1/}

Variety	Districts							All Locations
	1	2	3	4	5	5	6- Sidney & Williston	
	Kalispell	Bozeman	Huntley ^{2/}	Moccasin ^{3/}	Conrad ^{4/}	Havre ^{5/}		
location-years	5	5	24	21	20	16	7	98
Keldin	120.8	116.2	85.4	66.6	80.6	57.8	59.8	77.4
Northern	126.5	111.6	78.3	64.7	75.5	58.6	61.2	74.5
Yellowstone	117.5	113.5	78.4	63.4	75.8	59.0	62.1	74.1
Decade	72.9	89.8	75.6	62.1	69.2	54.5	55.6	67.1
LSD (0.05)	24.1	10.8	4.0	ns	3.3	3.5	ns	2.5

bold = indicates highest value within a column

ns = non-significant

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

1/ = includes 2014-2016, 2018, and 2019 Intrastate and 2016-2019 Off Station tests

2/ includes data from Fort Smith, Hardin area, Hysham Molt, Rapelje

3/ includes data from Belt, Denton, Geraldine, Highwayood, Winifred

4/ includes data from Choteau, Cut Bank, The Knees, Shelby

5/ includes data from Ft. Benton, Loma, Turner

Table 2. Agronomic characteristics of Northern vs. a set of varieties, 2014-2019^{1/}

Variety	Test weight	Winter survival	Heading date		Plant height	Lodging %	Protein %	Saw fly cutting %	Stripe rust %	Coleoptile length in
	lb/bu	%	Julian	Calendar	in		%	%	%	
location-years	98	4	41		96	16	96	19	5	2
Decade	60.2	63	159.6	9-Jun	31.4	24	12.7	38	63	3.2
Keldin	61.1	45	161.0	10-Jun	31.0	26	12.1	49	28	2.8
Northern	60.4	57	162.7	12-Jun	31.3	24	12.6	41	15	2.5
Yellowstone	60.0	64	162.0	11-Jun	32.7	26	12.2	52	26	2.7
LSD (0.05)	0.3	ns	0.4		0.4	ns	0.2	8	17	0.2

1/ = includes 2014-2016, 2018, and 2019 Intrastate and 2016-2019 Off Station tests

ns = non-significant

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 3. Mill and bake characteristics of Northern vs. a set of varieties, 2014-2018											
Variety	PPO ^{1/}	Kernel hardness	Flour			Mixograph			Baking		
			yield	protein	Ash	tolerance	mix time	absorption	mix time	absorption	volume
			%	%	%	(1-6)	min	%	min	%	cc
location-years	16	12	16	16	16	16	16	16	16	16	16
Decade	0.246	72.1	70.1	11.4	0.41	4.1	7.2	65.1	18.8	75.5	1026
Keldin	0.298	65.4	70.0	11.0	0.43	3.4	4.6	62.7	9.0	73.0	979
Northern	0.097	84.5	71.0	11.7	0.46	3.3	3.7	63.0	5.9	72.8	1055
Yellowstone	0.218	76.3	69.9	11.2	0.43	4.1	7.6	64.7	15.5	75.6	1036
LSD (0.05)	0.029	3.2	0.9	0.4	0.01	0.5	0.9	1.4	2.3	1.5	36
bold = indicates highest value within a column											
bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)											
1/ polyphenol oxidase, low is best for noodles											

Phil Bruckner and Jim Berg, Montana State University, Agricultural Experiment Station <<http://plantsciences.montana.edu/crops>>

'Loma' Winter Wheat

Phil Bruckner and Jim Berg, Winter Wheat Breeding Program, Montana State University
Small Grain QuickFacts: <http://plantsciences.montana.edu/FoundationSeed> (Updated, 1/2020)

Loma is a semi-solid stemmed hard red winter wheat with improved yield potential (Tables 1, 2) relative to other solid stemmed varieties. Loma was developed by the Montana Agricultural Experiment Station and released to seed growers in 2016. Loma (Yellowstone//MTS0112/MTS0125) was a cross between Yellowstone and 2 unreleased solid-stemmed experimental lines. Loma is an awned, white-glumed, medium short wheat with medium to late maturity. Loma performs well in locations where sawfly cutting has occurred (Table 2). Stem solidness is similar to Judee (Table 3). Loma has average test weight and protein, and average winter hardiness (Table 4). Loma is resistant to prevalent races of stripe and stem rust, but susceptible to leaf rust. Loma is a medium low PPO variety with above average mill and bake properties (Table 5). To be sold by variety name only as a class of certified seed. Montana State University Research Fees due on seed sold. PVP, Title V is issued (Certificate# 201700021).

Table 1. Yield of Loma vs. a set of varieties, 2012-2019^{1/}

Variety	Districts							All Locations
	1 Kalispell	2 Bozeman	3 Huntley ^{2/}	4 Moccasin ^{3/}	5 Conrad ^{4/}	5 Havre ^{5/}	6- Sidney & Williston	
location-years	5	13	31	30	24	37	8	148
Yellowstone	117.5	104.6	72.7	61.2	74.0	57.9	60.6	70.6
Loma	126.1	101.4	69.3	59.4	73.7	55.8	54.9	68.6
Decade	72.9	86.8	69.9	59.3	67.8	55.0	54.7	64.5
Judee	122.0	91.5	64.2	54.5	67.9	55.4	50.1	64.2
Warhorse	119.8	92.0	68.4	56.5	63.6	53.6	47.9	64.2
LSD (0.05)	23.3	6.3	2.7	2.5	3.3	2.5	6.4	1.8

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

1/ = includes 2012-19 Sawfly; 2014-16, 2018-19 Intrastate and 2015-19 Off Station tests

2/ includes data from Billings, Fort Smith, Hardin area, Hysham, Molt, Rapelje

3/ includes data from Belt, Denton, Geraldine, Highwood, Winifred

4/ includes data from Choteau, Cut Bank, The Knees, Shelby

5/ includes data from Big Sandy, Carter, Gildford, Loma, Turner

**Table 2. Loma: Yield Performance under Sawfly Pressure
(test average cutting ≥10%) and % Sawfly Cutting (2012-2019)**

Variety	Yield bu/a	Sawfly Cutting (%)
location-years	27	27
Loma	60.4	30
Judee	58.0	36
Yellowstone	57.5	57
Decade	57.0	43
Warhorse	55.0	9
LSD (0.05)	3.0	7

Table 3. Stem solidness ratings of Loma compared to other solid-stemmed varieties, (2015-2019)

	Stem Solidness Rating (scale 5-25, higher = more solid)						Stem Solidness by location, 2015-2018				
	2019	2018	2017	2016	2015	2015-18	Billings	Bozeman	Conrad	Havre ^{1/}	Moccasin
location-years	9	9	11	6	3	38	2	8	6	19	3
Bobcat	23.9	23.8	22.8	22.3	22.0	23.2	23.0	22.8	23.3	23.4	22.5
Judee	20.7	22.3	18.4	20.0	19.4	20.2	22.0	17.8	21.4	20.5	21.7
Loma	21.0	22.5	19.3	17.9	17.3	20.1	22.8	17.2	20.4	21.0	19.8
Warhorse	22.3	22.5	21.1	21.4	21.9	21.8	22.6	20.5	22.2	22.2	22.2
LSD (0.05)	0.9	ns	1.3	2.0	ns	0.7	ns	1.7	1.4	0.9	ns

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

^{1/} includes Big Sandy, Carter, Gildford, and Loma

Table 4. Agronomic characteristics of Loma vs. a set of varieties, 2012-2019^{1/}

Variety	Test weight lb/bu	Winter survival %	Heading date		Plant height in	Lodging %	Protein %	Sawfly cutting %	Stripe rust %	Coleoptile length in
			Julian	Calendar						
location-years	146	5	68		144	19	146	34	8	1
Decade	59.8	69	160.4	9-Jun	31.2	22	12.7	35	53	2.9
Judee	60.8	47	161.1	10-Jun	30.8	25	12.9	29	9	3.7
Loma	59.8	64	163.7	13-Jun	29.5	25	12.6	25	10	2.8
Warhorse	60.0	61	162.3	11-Jun	30.5	14	13.1	8	8	3.2
Yellowstone	59.6	70	162.5	12-Jun	32.7	24	12.4	47	21	2.8
LSD (0.05)	0.23	ns	0.33		0.27	ns	0.1	7	12	0.2

^{1/} = includes 2012-19 Sawfly; 2014-16, 2018-19 Intrastate and 2015-19 Off Station tests

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

**Table 5. Mill and bake characteristics of Loma vs. commonly grown varieties, 2012-2018:
Combined Sawfly Tests (2012-2018) and 2014-2016, 2018 Intrastate Tests**

Variety	PPO ^{1/}	Kernel hardness	Flour			Mixograph			Baking		
			yield %	protein %	Ash %	tolerance (1-6)	mix time min	absorption %	mix time min	absorption %	volume cc
location-years	36	29	36	36	36	36	36	36	36	36	36
Decade	0.268	74.1	69.5	12.0	0.40	3.9	8.3	66.9	19.5	77.2	1072
Judee	0.254	78.8	69.4	12.3	0.40	3.8	5.7	64.4	9.9	74.4	1162
Loma	0.157	79.9	71.4	11.9	0.40	3.7	6.7	66.0	16.4	76.8	1131
Warhorse	0.255	88.9	69.2	12.5	0.43	2.8	4.9	65.1	8.1	75.4	1097
Yellowstone	0.226	78.0	69.8	11.8	0.42	4.2	8.1	65.3	15.4	75.9	1078
LSD (0.05)	0.017	1.8	0.4	0.3	0.01	0.3	0.7	0.9	1.5	0.9	24

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

^{1/} low is best for noodles

Phil Bruckner and Jim Berg, Montana State University, Agricultural Experiment Station <<http://plantsciences.montana.edu/crops>>

'FourOsix' Winter Wheat

Phil Bruckner and Jim Berg, Winter Wheat Breeding Program, Montana State University
Updated 1/2020

FourOsix - hard red winter wheat developed by the Montana Agricultural Experiment Station and available to certified seed growers in fall 2018. FourOsix is a medium maturing, short to medium statured wheat, with average winter-hardiness. FourOsix is a high yielding variety with above average test weight and average protein. FourOsix (50% Yellowstone, in pedigree) is similar in grain yield of Yellowstone (Table 1), but with significantly earlier heading, shorter plant height, and significantly higher test weight and protein (Table 2). FourOsix is resistant to stripe rust and this resistance is either similar or significantly higher than that of Yellowstone. FourOsix is moderately susceptible to stem rust. FourOsix has excellent milling and baking qualities, comparable to Decade and parental cultivar, Yellowstone (Table 3). To be sold by variety name only as a class of certified seed. Montana State University Research Fees due on seed sold. PVP, Title V is pending (Certificate# 201900053).

Table 1. Yield of FourOsix vs. a set of varieties, 2016-2019^{1/}

Variety	Districts							All Locations
	1 Kalispell	2 Bozeman	3 Huntley ^{2/}	4 Moccasin ^{3/}	5 Conrad ^{4/}	5 Havre ^{5/}	6- Sidney & Williston	
location-years	3	3	17	15	14	12	6	70
Keldin	112.6	127.6	91.5	64.5	72.5	58.4	65.1	76.4
Northern	117.0	125.7	85.3	63.8	69.5	58.9	63.0	74.2
SY Monument	110.7	120.1	83.7	66.7	69.4	59.2	57.6	73.5
Yellowstone	102.1	124.9	83.0	62.3	69.1	58.4	61.8	72.4
FourOsix	118.8	117.1	82.8	63.4	67.4	56.3	57.6	71.9
Decade	60.6	102.6	81.5	63.3	63.4	55.5	56.9	67.4
LSD (0.05)	ns	ns	5.7	ns	3.9	ns	ns	2.8

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

1/ = 2016, 2018-19 Intrastate and 2017-2019 Off Station tests

2/ includes data from Billings, Fort Smith, Hardin area, Hysham, Molt, Rapelje

3/ includes data from Belt, Denton, Geraldine, Highwood, Winifred

5/ includes data from Choteau, Cut Bank, The Knees, Shelby

6/ includes data from Carter, Loma, Turner

Table 2. Agronomic characteristics of FourOsix vs. a set of varieties, 2016-2019^{1/}

Variety	Test weight lb/bu	Winter survival %	Heading date		Plant height in	Lodging %	Protein %	Sawfly cutting %	Stripe rust %	Coleoptile length in
			Julian	Calendar						
location-years	70	3	26		68	10	69	17	2	1
Decade	60.6	58	160.2	9-Jun	30.8	21	12.7	38	75	2.9
FourOsix	60.9	46	160.9	10-Jun	29.4	21	12.3	53	22	2.8
Keldin	61.4	50	161.5	11-Jun	30.1	24	12.1	49	50	2.8
Northern	60.8	47	163.4	12-Jun	30.4	26	12.5	44	33	2.6
SY Monument	60.2	53	159.4	8-Jun	29.1	21	11.7	48	18	3.1
Yellowstone	60.2	54	162.5	12-Jun	31.9	23	12.2	53	51	2.7
LSD (0.05)	0.3	ns	0.6		0.4	ns	0.1	7	29	0.2

1/ = 2016, 2018-19 Intrastate and 2017-2019 Off Station tests

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 3. Mill and bake characteristics of FourOsix vs. a set of varieties, 2016 and 2018

Variety	PPO ^{1/}	Kernel hardness	Flour			Mixograph			Baking		
			yield %	protein %	Ash %	tolerance (1-6)	mix time min	absorption %	mix time min	absorption %	volume cc
location-years	8	4	8	8	8	8	8	8	8	8	8
FourOsix	0.235	64.4	72.1	11.7	0.42	2.8	5.3	66.8	11.9	76.5	1066
Northern	0.112	77.6	71.1	11.7	0.46	2.9	3.6	64.9	5.9	74.8	1041
Yellowstone	0.238	67.7	70.0	11.4	0.42	3.5	7.6	67.1	15.0	77.6	1041
Decade	0.239	69.9	70.9	11.2	0.40	3.3	5.9	66.9	16.8	76.7	1001
Keldin	0.314	61.2	70.6	10.9	0.43	2.8	4.7	64.8	8.8	75.1	960
SY Monument	0.179	68.4	72.2	10.4	0.39	3.8	8.0	65.5	16.4	75.7	957
LSD (0.05)	0.043	6.1	1.0	0.5	0.01	0.7	0.9	ns	2.7	ns	42

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

^{1/} low is best for noodles

Phil Bruckner and Jim Berg, Montana State University, Agricultural Experiment Station <<http://plantsciences.montana.edu/crops>>

'Ray' Forage Winter Wheat

Phil Bruckner and Jim Berg, Winter Wheat Breeding Program, Montana State University
Updated 1/2020

Ray – a hard red winter wheat developed by the Montana Agricultural Experiment Station and available to certified seed growers in fall 2018. Ray is a late maturing, tall, awnless line developed for **forage** production as a possible replacement (or supplement to) Willow Creek (MT, 2005). Compared to Willow Creek, Ray has similar forage yield and forage quality, but superior seed yield (Table 1). Compared to conventional bread wheats; Ray has average to above average yield, below average test weight, and average protein (tables 2 and 3). Ray is resistant to stripe rust and susceptible to stem rust. Ray has low PPO and average milling and baking characteristics (Table 4). To be sold by variety name only as a class of certified seed. Montana State University Research Fees due on seed sold. PVP, Title V is pending (Certificate# 201900058).

Table 1. Agronomic characteristics of Ray vs. a set of Winter Cereals Forage lines, 2014-2018.

Variety	Field Analysis					Forage Analysis (dry)				
	Yield	Test weight	Heading date		Plant height	Dry matter	Protein	ADF	NDF	TDN
	lb/a	lb/bu	Julian	Calendar	in	ton/a	%	%	%	%
location-years	12	12	18		21	25	6	6	6	5
MTF1435	3122	59.5	163.3	12-Jun	39.0	3.81	11.6	32.3	62.4	65.8
Ray	3867	59.1	165.0	14-Jun	35.4	3.60	11.2	31.5	60.7	66.7
Trical 102	3020	49.8	162.0	11-Jun	51.4	4.42	11.4	32.8	63.8	65.2
Willow Creek	2444	59.7	169.3	18-Jun	44.4	3.62	11.4	33.0	62.6	64.9
LSD (0.05)	316	0.9	1.1		2.0	0.36	ns	ns	ns	ns

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 2. Grain Yield of Ray vs. a set of varieties, 2017-2019^{1/}

Variety	Districts							All Locations
	1 Kalispell	2 Bozeman	3 Huntley ^{2/}	4 Moccasin ^{3/}	5 Conrad ^{4/}	5 Havre ^{5/}	6- Sidney & Williston	
location-years	2	2	16	14	13	10	4	61
Keldin	118.4	148.7	90.1	64.2	69.7	52.0	64.2	74.7
Northern	108.7	146.5	83.3	64.2	66.9	53.3	67.2	72.4
SY Monument	102.6	133.8	81.9	67.0	66.1	52.8	54.9	71.0
Yellowstone	105.8	139.9	81.3	62.2	66.5	52.3	62.1	70.5
FourOsix	110.8	131.5	81.0	62.8	64.6	50.7	59.0	69.6
Ray	114.3	138.7	77.6	59.4	64.5	50.1	57.7	68.0
Decade	81.7	128.4	80.5	63.9	61.0	51.2	58.5	67.9
LSD (0.05)	ns	9.3	5.6	3.9	4.0	ns	ns	2.4

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

1/ = 2018-19 Intrastate and 2017-19 Off Station tests

2/ includes data from Billings, Fort Smith, Hardin area, Hysham, Molt, Rapelje

3/ includes data from Belt, Denton, Geraldine, Highwood, Winifred

5/ includes data from Choteau, Cut Bank, The Knees, Shelby

6/ includes data from Carter, Loma, Turner

Table 3. Agronomic characteristics of Ray vs. a set of varieties, 2017-2019^{1/}

Variety	Test weight lb/bu	Winter survival %	Heading date		Plant height in	Lodging %	Protein %	Sawfly cutting %	Stripe rust %	Coleoptile length in
			Julian	Calendar						
location-years	61	3	19		59	9	61	16	2	1
Decade	60.9	58	162.0	11-Jun	30.2	21	12.9	40	74	2.9
FourOsix	60.9	46	162.7	12-Jun	28.7	23	12.5	56	6	2.8
Keldin	61.5	50	163.7	13-Jun	29.5	27	12.3	50	41	2.8
Northern	60.9	47	165.4	14-Jun	29.6	27	12.7	46	8	2.6
Ray	59.0	45	167.5	17-Jun	34.8	42	12.4	50	11	2.9
SY Monument	60.3	53	161.0	10-Jun	28.2	23	11.8	49	4	3.1
Yellowstone	60.3	54	164.9	14-Jun	31.1	25	12.4	55	-	2.7
LSD (0.05)	0.3	ns	0.6		0.5	12	0.1	8	23	0.2

^{1/} = 2018-19 Intrastate and 2017-19 Off Station tests

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 4. Mill and bake characteristics of Ray vs. a set of varieties, 2014-2016, 2018:

Variety	PPO ^{1/}	Kernel hardness	Flour			Mixograph			Baking		
			yield %	protein %	Ash %	tolerance (1-6)	mix time min	absorption %	mix time min	absorption %	volume cc
location-years	12	8	12	12	12	12	12	12	12	12	12
Decade	0.257	74.7	70.5	11.9	0.40	3.9	7.3	67.0	19.0	77.1	1052
Ray	0.136	81.6	72.3	11.8	0.42	3.8	9.4	65.6	20.4	76.3	1052
Yellowstone	0.215	79.6	70.5	11.7	0.41	3.8	7.5	65.5	13.7	76.0	1077
LSD (0.05)	0.032	2.7	0.6	ns	0.01	ns	1.7	1.1	3.9	ns	ns

^{1/} low is best for noodles

Phil Bruckner and Jim Berg, Montana State University, Agricultural Experiment Station <<http://plantsciences.montana.edu/crops>>

'Bobcat' Winter Wheat

Phil Bruckner and Jim Berg, Winter Wheat Breeding Program, Montana State University
Small Grain QuickFacts: <http://plantsciences.montana.edu/FoundationSeed> (Updated, Jan/2020)

Bobcat is a solid stemmed hard red winter wheat with improved yield potential (Tables 1, 2) relative to other solid stemmed varieties. Bobcat was developed by the Montana Agricultural Experiment Station and will be released to certified seed growers in fall 2019. Bobcat is a selection from a composite cross of 2 unreleased MT solid-stemmed experimental lines with an unreleased MT hollow-stemmed line. Bobcat is an awned, white-glumed, semi-dwarf wheat with medium to late maturity. Bobcat is the top performing line in locations where sawfly cutting has occurred (Table 2). Stem solidness is excellent, significantly higher than to Warhorse (Table 3). Bobcat has above average test weight and average protein, and average winter hardiness (Table 4). Bobcat is resistant to prevalent races of stripe and stem rust, but susceptible to leaf rust. Bobcat is a medium high PPO variety with above average mill and bake properties (Table 5). To be sold by variety name only as a class of certified seed. Montana State University Research Fees due on seed sold.

Table 1. Yield of Bobcat vs. a set of varieties, 2015-2019^{1/}

Variety	Districts							All Locations
	1 Kalispell	2 Bozeman	3 Huntley ^{2/}	4 Moccasin ^{3/}	5 Conrad ^{4/}	5 Have ^{5/}	6- Sidney & Williston	
location-years	2	8	19	16	16	25	5	91
Bobcat	105.9	104.5	74.0	59.1	70.6	62.1	54.4	69.8
Loma	109.0	108.4	74.1	61.4	68.8	55.9	57.0	68.8
Judee	114.8	100.4	71.3	59.5	62.1	55.0	50.9	65.5
Decade	81.7	90.2	75.9	63.1	61.1	54.2	57.0	65.4
Warhorse	105.2	99.5	75.5	58.7	60.2	53.5	50.2	65.2
LSD (0.05)	ns	10.3	ns	2.8	2.9	2.9	ns	1.9

bold = indicates highest value within a column

ns = non-significant

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

1/ = includes 2017-2019 Intrastate and 2017-2019 Off Station, and 2015-2019 Saw fly tests

2/ includes data from Fort Smith, Hardin area, Hysham Molt, Rapelje

3/ includes data from Belt, Denton, Geraldine, Highwood

4/ includes data from Choteau, Cut Bank, The Knees, Shelby

5/ includes data from Big Sandy, Fort Benton, Gildford, Loma, Turner

**Table 2. Bobcat: Yield Performance under Sawfly Pressure
(test average cutting ≥10%) and % Sawfly Cutting (2017-2019)**

Variety	Yield bu/a	Sawfly Cutting (%)
location-years	16	16
Bobcat	64.5	8
Loma	60.2	31
SY Monument	59.2	53
Northern	58.7	50
Keldin	58.3	53
Brawl CLP	57.9	39
Yellowstone	57.0	59
FourOsix	56.8	60
Decade	56.0	42
SY Clearstone 2CL	56.0	63
Judee	55.8	39
Ray	54.4	53
Warhorse	53.4	10
LSD (0.05)	3.6	9.3

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 3. Stem solidness ratings of Bobcat compared to other solid-stemmed varieties, (2015-2019)

	Stem Solidness Rating (scale 5-25, higher = more solid)						Stem Solidness by location, 2015-2019				
	2019	2018	2017	2016	2015	2015-18	Billings	Bozeman	Conrad	Havre ^{1/}	Moccasin
location-years	9	9	11	6	3	38	2	8	6	19	3
Bobcat	23.9	23.8	22.8	22.3	22.0	23.2	23.0	22.8	23.3	23.4	22.5
Judee	20.7	22.3	18.4	20.0	19.4	20.2	22.0	17.8	21.4	20.5	21.7
Loma	21.0	22.5	19.3	17.9	17.3	20.1	22.8	17.2	20.4	21.0	19.8
Warhorse	22.3	22.5	21.1	21.4	21.9	21.8	22.6	20.5	22.2	22.2	22.2
LSD (0.05)	0.9	ns	1.3	2.0	ns	0.7	ns	1.7	1.4	0.9	ns

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

1/ includes Carter, Gildford, and Loma

Table 4. Agronomic characteristics of Bobcat vs. a set of varieties, 2015-2019^{1/}

Variety	Test	Winter	Heading date		Plant	Lodging	Protein	Stem	Saw fly	Stripe	Coleoptile
	weight lb/bu	survival %	Julian	Calendar	height in	%	%	solidness 5-25	cutting %	rust %	length in
location-years	89	2	36		86	9	91	38	27	5	1
Bobcat	61.2	43	162.4	11-Jun	27.9	4	12.6	23.2	8	6	2.9
Decade	60.5	52	160.4	9-Jun	30.3	21	12.8	7.9	38	52	2.9
Judee	61.5	53	161.1	10-Jun	30.0	21	13.0	20.2	33	6	3.7
Loma	60.3	49	163.9	13-Jun	28.4	17	12.6	20.1	28	6	2.8
Warhorse	60.6	46	162.4	11-Jun	29.3	11	13.2	21.8	9	4	3.2
LSD (0.05)	0.2	ns	0.4		0.4	9	0.1	0.7	6	15	0.2

1/ = includes 2017-2019 Intrastate and 2017-2019 Off Station, and 2015-2019 Saw fly tests

bold = indicates highest (or most desirable) value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 5. Mill and bake characteristics of Bobcat vs. a set of varieties, 2015-2018

Variety	PPO ^{1/}	Kernel	Flour			Mixograph			Baking		
		hardness	yield	protein	Ash	tolerance	mix time	absorption	mix time	absorption	volume
			%	%	%	(1-6)	min	%	min	%	cc
location-years	19	12	19	19	19	19	19	19	19	19	19
Bobcat	0.285	69.2	72.0	12.5	0.39	3.2	6.5	68.1	14.9	78.3	1080
Decade	0.273	75.2	70.3	12.2	0.40	3.1	8.3	69.2	18.6	79.3	1077
Judee	0.250	78.4	70.4	12.6	0.40	3.4	5.7	66.0	9.0	75.9	1162
Loma	0.153	79.1	72.0	12.2	0.40	3.1	7.1	68.0	15.2	78.5	1131
Warhorse	0.258	87.5	69.7	12.8	0.42	2.3	4.9	67.2	7.9	77.2	1119
LSD (0.05)	0.027	3.1	0.5	0.31	0.01	0.4	1.1	1.4	2.2	1.4	32

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

^{1/} low is best for noodles

'Flathead' Winter Wheat

Phil Bruckner and Jim Berg, Winter Wheat Breeding Program, Montana State University
Updated January/2020

Flathead is a hard red winter wheat developed by the Montana Agricultural Experiment Station and available to certified seed growers in fall 2019. Flathead is derived from a composite of 2 crosses involving Yellowstone and a Washing State University line, PI 640431, that carries 2 stripe rust seedling resistance genes. Flathead is an early maturing (especially for a Montana line), hollow-stemmed, medium height wheat with white chaff (Table 2). Flathead has average yield, above average test weight, and average protein, with average winter survival. Flathead out-yields other early maturing varieties, such as Brawl CL Plus (Table 1). Flathead has excellent resistance to stripe rust and is moderately resistant to both stem rust and dwarf bunt. Flathead has medium PPO and above average milling and baking characteristics (Table 3). To be sold by variety name only as a class of certified seed. Montana State University Research Fees due on seed sold. PVP, Title V is pending.

Table 1. Yield of Flathead vs. a set of varieties, 2017-2019^{1/}

Variety	Districts							All Locations	Relative maturity
	1 Kalispell	2 Bozeman	3 Huntley ^{2/}	4 Moccasin ^{3/}	5 Conrad ^{4/}	5 Havre ^{5/}	6- Sidney & Williston		
location-years	2	3	12	10	10	10	5	52	
Brawl CL Plus	98.5	101.4	85.8	58.1	63.7	51.7	41.5	66.8	V. Early
Flathead	121.6	128.0	90.8	60.2	60.0	52.9	50.5	71.2	Early
SY Monument	102.6	122.2	92.6	<u>70.6</u>	63.0	56.7	52.9	74.0	Medium
Decade	81.7	99.8	91.7	66.1	59.9	55.2	57.0	70.4	Medium
FourOsix	110.8	122.5	88.0	64.2	62.2	54.8	55.4	71.8	M-L
Keldin	118.4	131.7	<u>103.7</u>	65.4	<u>67.5</u>	57.4	57.3	<u>78.2</u>	M-L
LCS Jet	<u>134.0</u>	<u>138.7</u>	102.2	67.1	66.0	52.7	48.3	77.1	Late
Northern	108.7	127.8	94.5	67.2	66.0	56.2	61.1	75.7	Late
LSD (0.05)	27.1	24.6	7.1	4.7	5.0	ns	ns	3.4	

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

1/ = 2017-2019 Intrastate and 2018-2019 Off Station tests

2/ includes data from Billings, Fort Smith, Hardin area, Hysham, Molt, Rapelje

3/ includes data from Belt, Denton, Geraldine, Highwood, Winifred

5/ includes data from Choteau, Cut Bank, The Knees, Shelby

6/ includes data from Carter, Loma, Turner

Table 2. Agronomic characteristics of Flathead vs. a set of varieties, 2017-2018^{1/}

Variety	Test weight lb/bu	Winter survival %	Heading date		Plant height in	Lodging %	Protein %	Sawfly cutting %	Stripe rust %	Coleoptile length in
			Julian	Calendar						
location-years	52	4	23		50	5	52	15	2	1
Brawl CL Plus	62.4	42	155.5	5-Jun	28.3	11	13.4	35	70	3.5
Flathead	61.6	50	157.7	7-Jun	29.6	11	12.7	50	3	2.6
SY Monument	60.4	52	159.8	9-Jun	28.5	7	12.0	51	4	3.1
Decade	60.9	59	160.6	10-Jun	31.0	8	13.0	39	74	2.9
FourOsix	61.0	46	161.4	10-Jun	29.2	6	12.6	58	6	2.8
Keldin	61.5	45	162.2	11-Jun	30.0	7	12.5	49	41	2.8
LCS Jet	58.6	19	162.5	12-Jun	26.9	4	12.3	51	2	3.6
Northern	61.0	45	164.0	13-Jun	30.1	11	12.8	49	8	2.6
LSD (0.05)	0.3	13	0.6		0.5	ns	0.2	9	23	0.2

^{1/} = 2017-2019 Intrastate and 2018-2019 Off Station tests

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

**Table 3. Mill and bake characteristics of Flathead vs. a set of varieties, 2017-2018:
Intrastate Tests only**

Variety	PPO ^{1/}	Kernel hardness	Flour			Mixograph			Baking		
			yield %	protein %	Ash %	tolerance (1-6)	mix time min	absorption %	mix time min	absorption %	volume cc
location-years	8	4	8	8	8	8	8	8	8	8	8
FourOsix	0.246	77.7	72.4	12.3	0.42	2.6	5.2	67.8	10.3	77.8	1111
Northern	0.126	85.6	70.4	12.1	0.45	2.8	3.4	64.9	4.6	74.3	1075
Flathead	0.247	74.2	73.1	12.0	0.41	3.9	9.1	68.1	17.1	78.6	1068
Decade	0.265	78.4	71.0	12.1	0.40	3.0	6.8	69.0	15.9	79.2	1066
Brawl CL Plus	0.275	75.5	70.8	12.0	0.39	2.9	4.0	65.5	6.4	75.4	1050
SY Monument	0.181	80.1	72.2	11.1	0.40	3.5	7.9	66.0	14.4	76.1	1018
Keldin	0.311	68.0	70.4	11.7	0.44	2.8	5.1	65.2	7.8	75.2	1014
LCS Jet	0.278	69.8	72.5	11.5	0.39	3.1	5.3	66.0	8.5	76.5	973
LSD (0.05)	0.044	5.2	0.8	0.5	0.02	0.7	1.4	1.8	2.8	2.0	32

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

^{1/} low is best for noodles

Phil Bruckner and Jim Berg, Montana State University, Agricultural Experiment Station <<http://plantsciences.montana.edu/crops>>

MSU/MAES Hollow-Stemmed Winter Wheat Varieties

Phil Bruckner and Jim Berg, Winter Wheat Breeding Program, Montana State University
Updated 1/2020

Description of selected varieties developed by MSU/MAES Winter Wheat Breeding Program:

Decade – hard red winter wheat developed by the Montana Agricultural Experiment Station and released jointly with North Dakota (pending at publication) in 2010. Decade is an early to medium maturing reduced height wheat with white chaff. Decade is a high yielding wheat with good winter hardiness and medium to high test weight and protein. Decade is resistant to prevalent races of stem and stripe rust. Decade has excellent milling and baking quality. PVP, Title V has been issued (Certificate #201100096).

Flathead - a hard red winter wheat developed by the Montana Agricultural Experiment Station and available to certified seed growers in fall 2019. Flathead is derived from a composite of 2 crosses involving Yellowstone and a Washing State University line, PI 640431, that carries 2 stripe rust seedling resistance genes. Flathead is an early maturing (especially for a Montana line), hollow-stemmed, medium height wheat with white chaff (Table 2). Flathead has average yield, above average test weight, and average protein, with average winter survival. Flathead out-yields other early maturing varieties, such as Brawl CI Plus (Table 1). Flathead has excellent resistance to stripe rust and is moderately resistant to both stem rust and dwarf bunt. Flathead has medium PPO and above average milling and baking characteristics (Table 3). To be sold by variety name only as a class of certified seed. Montana State University Research Fees due on seed sold. PVP, Title V is pending.

FourOsix - hard red winter wheat developed by the Montana Agricultural Experiment Station and available to seed growers in fall 2018. FourOsix is a medium maturing, short to medium statured wheat, with average winter-hardiness. FourOsix is a high yielding variety with above average test weight and average protein. FourOsix (50% Yellowstone, in pedigree) is similar in grain yield of Yellowstone, but with significantly earlier heading, shorter plant height, and significantly higher test weight and protein. FourOsix is resistant to stripe rust and this resistance is either similar or significantly higher than that of Yellowstone. FourOsix is moderately susceptible to stem rust. FourOsix has excellent milling and baking qualities, comparable to Decade and parental cultivar, Yellowstone. PVP, Title V is pending (Certificate# 201900053).

Northern is a hard red winter wheat developed by the Montana Agricultural Experiment Station and released to growers in 2015. Northern was named to commemorate the 100th anniversary of the Northern Agricultural Research Center (NARC) in Havre, Montana. Northern is a medium-late maturing, medium-short statured wheat, with white chaff. Northern has average yield (similar to Yellowstone and Colter), average test weight, and average protein. Northern is resistant to both stem and stripe rust. Northern has above average milling and average baking properties (Table 3.) Northern is a low PPO cultivar with favorable Asian noodle color stability and noodle score. PVP, Title V has been issued (Certificate# 201600092).

SY Clearstone 2CL – a 2-gene CLEARFIELD hard red winter wheat developed by Montana Agricultural Experiment Station in 2012 and licensed exclusively to Syngenta Seeds. SY Clearstone wheat 2CL is very similar to Yellowstone. It is a medium maturing, medium tall, white chaffed wheat with average winter hardiness. It is a high yielding wheat with average test weight and protein. SY Clearstone 2CL is resistant to stripe rust and has moderate resistance to stem rust, the latter an improvement over Yellowstone. SY Clearstone 2CL is a medium PPO variety with average mill and above average bake properties. PVP, Title V has been issued (Certificate# 201300357). Additionally, the CLEARFIELD genes are patented.

Yellowstone – hard red winter wheat developed by the Montana Agricultural Experiment Station and released to seed growers in 2005. Yellowstone is a very high yielding winter hardy variety with medium test weight, maturity, height, and grain protein. Yellowstone has excellent baking and good Asian noodle quality. It is moderately resistant to TCK smut and resistant to stripe rust, but susceptible to stem rust. Yellowstone has been the leading winter wheat variety planted in Montana since 2012. PVP, Title V has been issued (Certificate #200600284).

Table 1. Yield of Hollow-Stemmed Winter Wheat varieties, 2018-2019^{1/}

Shaded entries, in all tables, are MSU/MAES developed varieties								
Variety	Districts							All Locations
	1 Kalispell	2 Bozeman	3 Huntley ^{2/}	4 Moccasin ^{3/}	5 Conrad ^{4/}	5 Havre ^{5/}	6- Sidney & Williston	
location-years	2	2	11	9	9	8	4	45
Keldin	118.4	148.7	100.8	65.0	66.1	57.5	64.2	78.7
Northern	108.7	146.5	92.8	67.9	65.1	58.5	67.2	77.0
LCS Jet	134.0	145.7	98.8	67.3	63.9	52.9	52.4	76.9
SY Clearstone 2CL	114.9	143.5	88.8	68.2	62.7	56.8	57.5	74.6
SY Monument	102.6	133.8	89.2	70.7	61.2	58.7	54.9	74.0
Yellowstone	105.8	139.9	86.9	64.4	64.2	57.7	62.1	73.7
FourOsix	110.8	131.5	85.5	64.7	61.2	55.6	59.0	72.0
Decade	81.7	128.4	90.9	66.8	59.1	56.3	58.5	71.9
Flathead	121.6	132.7	87.1	59.2	58.6	52.2	53.3	70.2
Brawl CL Plus	98.5	120.8	83.1	57.2	61.8	53.1	44.7	67.3
LSD (0.05)	23.7	9.2	7.1	4.5	ns	ns	ns	3.2

bold = indicates highest value within a column

ns = non-significant

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

1/ = 2018-2019 Intrastate and 2018-2019 Off Station tests

2/ includes data from Fort Smith, Hardin area, Hysham Molt, Rapelje

3/ includes data from Belt, Denton, Geraldine, Highwood, Winifred

4/ includes data from Choteau, Cut Bank, The Knees, Shelby

5/ includes data from Ft. Benton, Loma, Turner

Table 2. Agronomic characteristics of Hollow-Stemmed Varieties, 2018-2019^{1/}

Variety	Test weight lb/bu	Winter survival %	Heading date		Plant height in	Lodging %	Protein %	Sawfly cutting %	Stripe rust %	Coleoptile length in
			Julian	Calendar						
location-years	45	3	17		44	5	45	14	2	1
Brawl CL Plus	62.5	47	157.4	6-Jun	27.9	11	13.5	33	70	2.8
Decade	61.0	58	162.6	12-Jun	31.1	8	13.1	39	74	2.9
Flathead	61.6	51	159.8	9-Jun	29.3	11	12.7	50	3	2.6
FourOsix	61.0	46	163.5	13-Jun	29.1	6	12.6	57	6	2.8
Keldin	61.6	50	164.4	13-Jun	29.9	7	12.5	49	41	2.8
LCS Jet	58.6	22	164.7	14-Jun	26.8	4	12.2	51	2	3.6
Northern	61.2	47	166.2	15-Jun	30.2	11	12.7	48	8	2.6
SY Clearstone 2CL	60.2	50	165.3	14-Jun	32.8	22	12.5	61	16	2.9
SY Monument	60.6	53	161.9	11-Jun	28.3	7	12.0	49	4	3.1
Yellowstone	60.4	54	165.8	15-Jun	31.9	15	12.5	58	-	2.7
LSD (0.05)	0.3	15	0.7		0.5	ns	0.2	9	18	0.2

1/ = 2018-2019 Intrastate and 2018-2019 Off Station tests

ns = non-significant

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 3. Mill and bake characteristics of Hollow-stemmed Varieties, 2017-2018

Variety	PPO ^{1/}	Kernel hardness	Flour			Mixograph			Baking		
			yield %	protein %	Ash %	tolerance (1-6)	mix time min	absorption %	mix time min	absorption %	volume cc
location-years	8	4	8	8	8	8	8	8	8	8	8
Brawl CL Plus	0.275	75.5	70.8	12.0	0.39	2.9	4.0	65.5	6.4	75.4	1050
Decade	0.265	78.4	71.0	12.1	0.40	3.0	6.8	69.0	15.9	79.2	1066
Flathead	0.247	74.2	73.1	12.0	0.41	3.9	9.1	68.1	17.1	78.6	1068
FourOsix	0.246	77.7	72.4	12.3	0.42	2.6	5.2	67.8	10.3	77.8	1111
Keldin	0.311	68.0	70.4	11.7	0.44	2.8	5.1	65.2	7.8	75.2	1014
LCS Jet	0.278	69.8	72.5	11.5	0.39	3.1	5.3	66.0	8.5	76.5	973
Northern	0.100	85.6	70.4	12.1	0.45	2.8	3.4	64.9	4.6	74.3	1075
SY Clearstone 2CL	0.273	75.5	69.7	11.8	0.41	3.5	5.7	65.7	8.0	75.5	1061
SY Monument	0.207	80.1	72.2	11.1	0.40	3.5	7.9	66.0	14.4	76.1	1018
Yellowstone ^{2/}	0.247	-	71.2	12.2	0.42	3.8	7.2	68.2	12.0	78.4	1093
LSD (0.05)	0.037	6.0	0.8	0.5	0.02	0.7	1.3	1.8	2.7	2.2	32

bold = indicates highest value within a column

2/ Yellowstone data is for 2018 only, means not in statistical analysis

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

1/ polyphenol oxidase, low is best for noodles

MSU/MAES Solid-Stemmed Winter Wheat Varieties

Phil Bruckner and Jim Berg, Winter Wheat Breeding Program, Montana State University
Small Grain QuickFacts: <http://plantsciences.montana.edu/FoundationSeed> (Updated 1/2020)

Description of selected varieties developed by MSU/MAES Winter Wheat Breeding Program:

Bobcat is a solid stemmed hard red winter wheat with improved yield potential (Tables 1, 2) relative to other solid stemmed varieties. Bobcat was developed by the Montana Agricultural Experiment Station and will be released to certified seed growers in fall 2019. Bobcat is a selection from a composite cross of 2 unreleased MT solid-stemmed experimental lines with an unreleased MT hollow-stemmed line. Bobcat is an awned, white-glumed, semi-dwarf wheat with medium to late maturity. Bobcat is the top performing line in locations where sawfly cutting has occurred (Table 2). Stem solidness is excellent, significantly higher than to Warhorse (Table 3). Bobcat has above average test weight and average protein, and average winter hardiness (Table 4). Bobcat is resistant to prevalent races of stripe and stem rust, but susceptible to leaf rust. Bobcat is a medium high PPO variety with above average mill and bake properties (Table 5). PVP, Title V will be applied for.

Judee – hard red winter wheat developed by the Montana Agricultural Experiment Station in 2011. Judee is a white-glumed, solid-stem, semi-dwarf (*Rht1*) wheat with medium maturity. Judee has average yield, test weight, and protein, and below average winter hardiness. Judee is susceptible to prevalent races of stem and leaf rust but resistant to stripe rust. Stem-solidness of Judee is most similar to Genou. Judee is a high PPO variety with average mill and above average bake properties. PVP, Title V has been issued (Certificate #201200161).

Table 1. Yield of Solid-Stemmed Winter Wheat varieties, 2015-2019^{1/}

Variety	Districts							All Locations
	1 Kalispell	2 Bozeman	3 Huntley ^{2/}	4 Moccasin ^{3/}	5 Conrad ^{4/}	5 Havre ^{5/}	6- Sidney & Williston	
location-years	2	8	19	16	16	25	5	91
Bobcat	105.9	104.5	74.0	59.1	70.6	62.1	54.4	69.8
Loma	109.0	108.4	74.1	61.4	68.8	55.9	57.0	68.8
Judee	114.8	100.4	71.3	59.5	62.1	55.0	50.9	65.5
Warhorse	105.2	99.5	75.5	58.7	60.2	53.5	50.2	65.2
LSD (0.05)	ns	5.3	ns	ns	2.9	2.9	ns	1.6

bold = indicates highest value within a column

ns = non-significant

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

1/ = includes 2017-2019 Intrastate and 2017-2019 Off Station, and 2015-2019 Saw fly tests

2/ includes data from Fort Smith, Hardin area, Hysham, Molt, Rapelje

3/ includes data from Belt, Denton, Geraldine, Highwood

4/ includes data from Choteau, Cut Bank, The Knees, Shelby

5/ includes data from Big Sandy, Carter, Loma, Turner

Table 2. 'Solid' Varieties: Yield Performance under Sawfly Pressure (test average cutting >10%) and % Sawfly Cutting (2017-2019)

Variety	Yield bu/a	Sawfly Cutting (%)
location-years	24	24
Bobcat	63.4	9
Loma	59.4	31
Judee	56.0	37
Warhorse	54.6	10
LSD (0.05)	2.9	7

Loma is a semi-solid stemmed hard red winter wheat with improved yield potential relative to other solid stemmed varieties. Loma was developed by the Montana Agricultural Experiment Station and released to seed growers in 2016. Loma (Yellowstone//MTS0112/MTS0125) was a cross between Yellowstone and 2 unreleased solid-stemmed experimental lines. Loma is an awned, white-glumed, medium short wheat with

medium to late maturity. Loma performs well in locations where sawfly cutting has occurred. Stem solidness is less than to Judee and WB Quake. Loma has average test weight and protein, and average winter hardiness (Table 4). Loma is resistant to prevalent races of stripe and stem rust, but susceptible to leaf rust. Loma is a medium low PPO variety with above average mill and bake properties. PVP, Title V is issued (Certificate# 201700021).

Table 3. Stem solidness ratings of solid-stemmed varieties, (2015-2019)

	Stem Solidness Rating (scale 5-25, higher = more solid)						Stem Solidness by location, 2015-2018				
	2019	2018	2017	2016	2015	2015-18	Billings	Bozeman	Conrad	Havre ^{1/}	Moccasin
location-years	9	9	11	6	3	38	2	8	6	19	3
Bobcat	23.9	23.8	22.8	22.3	22.0	23.2	23.0	22.8	23.3	23.4	22.5
Warhorse	22.3	22.5	21.1	21.4	21.9	21.8	22.6	20.5	22.2	22.2	22.2
Judee	20.7	22.3	18.4	20.0	19.4	20.2	22.0	17.8	21.4	20.5	21.7
Loma	21.0	22.5	19.3	17.9	17.3	20.1	22.8	17.2	20.4	21.0	19.8
LSD (0.05)	0.9	ns	1.3	2.0	ns	0.7	ns	1.7	1.4	0.9	ns

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

^{1/} includes Big Sandy, Carter, Gildford and Loma

Table 4. Agronomic characteristics of Solid-Stemmed Varieties, 2015-2019^{1/}

Variety	Test	Winter	Heading date		Plant	Lodging	Protein	Saw fly	Stripe	Coleoptile
	weight	survival			height	%		cutting	rust	length
	lb/bu	%	Julian	Calendar	in		%	%	%	in
location-years	89	2	36		86	9	91	27	5	1
Bobcat	61.2	43	162.4	11-Jun	27.9	4	12.6	8	6	2.9
Judee	61.5	53	161.1	10-Jun	30.0	21	13.0	33	6	3.7
Loma	60.3	49	163.9	13-Jun	28.4	17	12.6	28	6	2.8
Warhorse	60.6	46	162.4	11-Jun	29.3	11	13.2	9	4	3.2
LSD (0.05)	0.2	ns	0.4		0.3	9	0.1	6	ns	0.2

^{1/} = includes 2017-2019 Intrastate and 2017-2019 Off Station, and 2015-2019 Saw fly test; ns = non-significant

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 5. Mill and bake characteristics of Solid-Stemmed Varieties, 2015-2018

Variety	PPO ^{1/}	Kernel hardness	Flour			Mixograph			Baking		
			yield	protein	ash	tolerance	mix time	absorption	mix time	absorption	volume
			%	%	%	(1-6)	min	%	min	%	cc
location-years	19	12	19	19	19	19	19	19	19	19	19
Bobcat	0.285	69.2	72.0	12.5	0.39	3.2	6.5	68.1	14.9	78.3	1080
Judee	0.250	78.4	70.4	12.6	0.40	3.4	5.7	66.0	9.0	75.9	1162
Loma	0.153	79.1	72.0	12.2	0.40	3.1	7.1	68.0	15.2	78.5	1131
Warhorse	0.258	87.5	69.7	12.8	0.42	2.3	4.9	67.2	7.9	77.2	1119
LSD (0.05)	0.023	3.0	0.5	0.3	0.01	0.5	0.7	1.4	1.8	1.4	33

bold = indicates highest value within a column

ns = non-significant

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

^{1/} low is best for noodles

Warhorse - is an awned, white glumed, solid-stemmed hard red winter wheat released in 2013 by the Montana Agricultural Experiment Station. Warhorse has medium maturity and has medium short, semi-dwarf height. Warhorse's winter hardiness, rated at 4 on 0-5 scale, is an improvement over other solid stem varieties. Stem solidness is similar to that of Bearpaw and Rampart, while sawfly cutting of stems is very low (similar to Rampart). Warhorse yield is similar to Judee, while test weight and protein are above average. Warhorse is resistant to both stem and stripe rust. Warhorse has acceptable mill and bake qualities. PVP, Title V has been issued (Certificate# 201400131).

MSU/MAES Winter Wheat Varieties

Phil Bruckner and Jim Berg, Winter Wheat Breeding Program, Montana State University
Updated 1/2020

Montana Tested Hard Winter Wheat Varieties:					
Shaded entries are MSU/MAES developed varieties					
Variety	Origin	Release year	Solid-stem	Forage	Clearfield
Bobcat	Montana	2019	X		
Brawl CL Plus	Colorado	2011			X
Decade	Montana/North Dakota (2010)	2010			
Flathead	Montana	2019			
FourOsix	Montana	2018			
Judee	Montana	2011	X		
Keldin	WestBred/Monsanto	2011			
LCS Jet	Limagrain	2015			
Loma	Montana	2016	X		
Northern	Montana	2015			
Ray	Montana	2018		X	
SY Clearstone 2CL	Montana/Syngenta	2012			X
SY Monument	Syngenta	2014			
Warhorse	Montana	2015	X		
Yellowstone	Montana	2010			

Table 1. Yield of Winter Wheat varieties, 2018-2019^{1/}

Variety	Districts							All Locations
	1 Kalispell	2 Bozeman	3 Huntley ^{2/}	4 Moccasin ^{3/}	5 Conrad ^{4/}	5 Havre ^{5/}	6- Sidney & Williston	
location-years	2	2	11	9	9	8	4	45
Keldin	118.4	148.7	100.8	65.0	66.1	57.5	64.2	78.7
Northern	108.7	146.5	92.8	67.9	65.1	58.5	67.2	77.0
LCS Jet	134.0	145.7	98.8	67.3	63.9	52.9	52.4	76.9
Loma	109.0	134.2	85.3	67.2	68.3	57.8	62.1	74.6
SY Clearstone 2CL	114.9	143.5	88.8	68.2	62.7	56.8	57.5	74.6
Bobcat	105.9	127.0	84.4	63.9	70.8	63.0	58.5	74.3
SY Monument	102.6	133.8	89.2	70.7	61.2	58.7	54.9	74.0
Yellowstone	105.8	139.9	86.9	64.4	64.2	57.7	62.1	73.7
FourOsix	110.8	131.5	85.5	64.7	61.2	55.6	59.0	72.0
Decade	81.7	128.4	90.9	66.8	59.1	56.3	58.5	71.9
Ray	114.3	138.7	86.1	59.1	61.9	55.2	57.7	71.4
Judee	114.8	125.4	81.6	64.0	60.0	55.3	60.3	70.6
Flathead	121.6	132.7	87.1	59.2	58.6	52.2	53.3	70.2
Warhorse	105.2	119.8	88.7	62.4	58.6	50.6	54.6	69.7
Brawl CL Plus	98.5	120.8	83.1	57.2	61.8	53.1	44.7	67.3
LSD (0.05)	20	10.6	6.7	4.8	5.4	5.1	ns	3.1

bold = indicates highest value within a column

ns = non-significant

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

1/ = 2018-2019 Intrastate and 2018-2019 Off-Station tests

2/ includes data from Fort Smith, Hardin area, Hysham, Molt, Rapelje

3/ includes data from Belt, Denton, Geraldine, Highwood

4/ includes data from Choteau, Cut Bank, The Knees, Shelby

5/ includes data from Carter, Loma, Turner

Table 2. Agronomic characteristics of Winter Wheat Varieties, 2018-2019^{1/}

Variety	Test weight lb/bu	Winter survival %	Heading date		Plant height in	Lodging %	Protein %	Sawfly cutting %	Stripe rust %	Coleoptile length in
			Julian	Calendar						
location-years	45	3	17		44	5	45	14	2	1
Bobcat	61.6	46	165.1	14-Jun	28.2	3	12.7	7	5	2.9
Brawl CL Plus	62.5	47	157.4	6-Jun	27.9	11	13.5	33	70	3.5
Decade	61.0	58	162.6	12-Jun	31.1	8	13.1	39	74	2.9
Flathead	61.6	51	159.8	9-Jun	29.3	11	12.7	50	3	2.6
FourOsix	61.0	46	163.5	13-Jun	29.1	6	12.6	57	6	2.8
Judee	62.0	51	163.7	13-Jun	30.4	8	13.1	40	5	3.7
Keldin	61.6	50	164.4	13-Jun	29.9	7	12.5	49	41	2.8
LCS Jet	58.6	22	164.7	14-Jun	26.8	4	12.2	51	2	3.6
Loma	60.7	48	166.5	16-Jun	28.6	8	12.8	29	4	2.8
Northern	61.2	47	166.2	15-Jun	30.2	11	12.7	48	8	2.6
Ray	59.2	45	168.3	17-Jun	35.6	36	12.6	51	11	2.9
SY Clearstone 2CL	60.2	50	165.3	14-Jun	32.8	22	12.5	61	16	2.9
SY Monument	60.6	53	161.9	11-Jun	28.3	7	12.0	49	4	3.1
Warhorse	61.1	48	164.9	14-Jun	29.6	2	13.3	10	5	3.2
Yellowstone	60.4	54	165.8	15-Jun	31.9	15	12.5	58	20	2.7
LSD (0.05)	0.3	13	0.7		0.5	13	0.2	10	18	0.2

^{1/} = 2018-2019 Intrastate and 2018-2019 Off-Station tests

ns = non-significant

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 3. Mill and bake characteristics of Winter Wheat Varieties, 2017-18

Variety	PPO ^{1/}	Kernel hardness	Flour			Mixograph			Baking		
			yield %	protein %	Ash %	tolerance (1-6)	mix time min	absorption %	mix time min	absorption %	volume cc
location-years	8	4	8	8	8	8	8	8	8	8	8
Bobcat	0.234	71.8	72.3	12.5	0.40	3.1	6.1	68.3	13.1	78.6	1070
Brawl CL Plus	0.275	75.5	70.8	12.0	0.39	2.9	4.0	65.5	6.4	75.4	1050
Decade	0.265	78.4	71.0	12.1	0.40	3.0	6.8	69.0	15.9	79.2	1066
Flathead	0.247	74.2	73.1	12.0	0.41	3.9	9.1	68.1	17.1	78.6	1068
FourOsix	0.246	77.7	72.4	12.3	0.42	2.6	5.2	67.8	10.3	77.8	1111
Judee	0.239	78.5	71.1	12.6	0.41	3.3	5.0	65.9	7.7	75.8	1129
Keldin	0.311	68.0	70.4	11.7	0.44	2.8	5.1	65.2	7.8	75.2	1014
LCS Jet	0.278	69.8	72.5	11.5	0.39	3.1	5.3	66.0	8.5	76.5	973
Loma	0.154	79.5	72.0	11.9	0.40	3.1	6.4	66.7	12.3	77.2	1137
Northern	0.100	85.6	70.4	12.1	0.45	2.8	3.4	64.9	4.6	74.3	1075
Ray	0.114	77.6	72.5	12.3	0.42	3.1	9.9	67.5	18.4	78.1	1059
SY Clearstone 2CL	0.273	75.5	69.7	11.8	0.41	3.5	5.7	65.7	8.0	75.5	1061
SY Monument	0.207	80.1	72.2	11.1	0.40	3.5	7.9	66.0	14.4	76.1	1018
Warhorse	0.264	89.0	70.0	12.7	0.42	2.4	4.3	66.0	6.1	76.1	1095
Yellowstone^{2/}	0.247		71.2	12.2	0.42	3.8	7.2	68.2	12.0	78.4	1093
LSD (0.05)	0.039	5.7	0.8	0.5	0.02	0.7	1.4	1.9	3.2	1.9	33

bold = indicates highest value within a column

ns = non-significant

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

^{1/} polyphenol oxidase, low is best for noodles

^{2/} Yellowstone misplanted in 2017 Intrastate tests, data not in statistics

Summary of climatic data by months for the 2018-2019 crop year (September to August) and averages for the period 1958-2018 at the Post Agronomy Research Farm in Bozeman, Montana.

Month Year	Sep 2018	Oct 2018	Nov 2018	Dec 2018	Jan 2019	Feb 2019	Mar 2019	Apr 2019	May 2019	Jun 2019	Jul 2019	Aug 2019	Year
<u>Precipitation (inches)</u>													
Current Year	0.58	1.51	0.98	0.37	0.60	1.31	0.59	3.32	1.72	2.06	2.69	0.74	16.47
Average (1958-2019)	1.46	1.36	0.93	0.60	0.52	0.52	1.02	1.69	2.62	2.68	1.29	1.22	15.92
difference	-0.88	0.15	0.05	-0.23	0.08	0.79	-0.43	1.63	-0.90	-0.62	1.40	-0.48	0.55
<u>Mean Temperature (°F)</u>													
Current Year	55.7	43.8	31.6	24.8	25.5	11.4	22.1	43.0	49.1	59.1	64.8	65.8	41.4
Average (1958-2019)	55.8	45.4	31.7	23.5	22.8	26.9	34.0	42.4	51.3	58.9	65.9	65.0	43.6
difference	-0.1	-1.6	-0.1	1.3	2.7	-15.5	-11.9	0.6	-2.2	0.2	-1.1	0.8	-2.2

Last killing frost in spring*

2019 _____ May 19 (32°F)
Ave. 1958-2019 _____ May 31

First killing frost in fall*

2019 _____ September 28 (32°F)
Ave. 1958-2019 _____ September 13

Frost free period

2019 _____ 132 days
Ave. 1958-2018 _____ 106 days

Maximum summer temperature _____ 90°F on July 24, 2019
Minimum winter temperature _____ -26°F on March 4, 2019

*In this summary 32° is considered a killing frost.

Summary of climatic data by months for the 2018-2019 crop year (September to August) and averages for the period 1916-2019 at the Northern Agricultural Research Center. Havre, Montana.

Month Year	Sep 2018	Oct 2018	Nov 2018	Dec 2018	Jan 2019	Feb 2019	Mar 2019	Apr 2019	May 2019	Jun 2019	Jul 2019	Aug 2019	Crop Year
<u>Precipitation (inches)</u>													
Current Year	2.08	0.29	0.35	0.02	0.40	0.86	0.23	0.92	1.53	3.24	0.64	0.73	11.29
Average (1916-2019)	1.17	0.69	0.44	0.45	0.43	0.35	0.54	1.00	1.84	2.55	1.43	1.18	12.07
Difference	0.91	-0.40	-0.09	-0.43	-0.03	0.51	-0.31	-0.08	-0.31	0.69	-0.79	-0.45	-0.78
<u>Mean Temperature (°F)</u>													
Current Year	54.1	42.8	31.9	27.0	24.1	-6.1	21.0	44.6	49.4	61.4	67.4	67.3	40.4
Average (1916-2019)	56.3	45.6	30.2	19.6	15.7	19.7	30.0	43.6	53.9	61.8	69.3	67.3	42.8
Difference	-2.2	-2.8	1.7	7.4	8.4	-25.8	-9.0	1.0	-4.5	-0.4	-1.9	0.0	-2.4

Last killing frost in spring*

2019 _____ May 20th (29.3°)
Ave. 1916-2019 _____ May 14th

First killing frost in fall*

2019 _____ September 28th (29.0°)
Ave. 1916-2019 _____ September 20th

Frost free period

2019 _____ 131 days
Ave. 1916-2019 _____ 129 days

Growing degree days (base 50)

May 20-Sept. 28, 2019 _____ 1851.6
May 1-Sept. 30, 2019 _____ 1955.9
Ave. 1951-2019 (May 1-Sept. 30) _____ 2177.1

Maximum summer temperature _____ 98.1° F on August 3, 2019

Minimum winter temperature _____ -38.4° F on February 7, 2019

*In this summary 32° is considered a killing frost.

Summary of climatic data by months for the 2018-2019 crop year (October thru September) and averages for the period 1949-2019 at the Eastern Agricultural Research Center, Sidney, Montana, irrigated and dryland site.

Month Year	Oct 2018	Nov 2018	Dec 2018	Jan 2019	Feb 2019	Mar 2019	Apr 2019	May 2019	June 2019	July 2019	Aug 2019	Sept 2019
<u>Precipitation (inches)</u>												Total
Current Year-Irrigated	0.41	1.06	0.41	0.38	0.87	0.00	1.12	1.78	2.39	3.28	1.52	9.28
Avg. 1949 to 2019	0.92	0.49	0.44	0.40	0.36	0.54	1.15	2.16	2.73	2.07	1.46	1.39
Current Year-Dryland	0.45	1.06	0.41	0.38	0.87	0.00	1.26	1.56	2.98	2.50	1.85	8.19
												21.51
<u>Temperature (F °)</u>												Average
Ave. Maximum Temp	54.5	34.9	33.9	28.0	6.0	35.5	57.1	62.9	76.8	81.6	80.8	69.6
Ave. Minimum Temp	28.8	19.7	15.9	10.3	-14.0	15.6	31.9	37.7	49.9	54.9	53.3	46.8
Current Year Mean Temp	41.7	27.3	24.9	19.2	- 4.0	25.6	44.5	50.3	63.4	68.3	67.1	58.2
Avg. 1949 to 2019	45.9	30.2	18.1	13.2	19.3	30.5	44.5	56.0	64.6	70.2	68.7	58.0
												43.3

Last killing frost in spring *

2019 May 17, 2019 (31.8°F)
 Avg. 1949 to 2019 May 15

First killing frost in fall *

2019 October 2, 2019 (31.9°F)
 Avg. 1949 to 2019 September 21

Frost-free period

2019 138
 Avg. 1949 to 2019 129

Growing degree days (base 50) **

May 1 - First killing frost 2352.7
 Avg. 1949 to 2019 2250.6

Maximum summer temperature August 3, 2019 (96.2°F)

Minimum winter temperature February 8, 2019 (-42.4°F)

* 32° is considered a killing frost.

** In calculating growing degree days, 29° is considered a killing frost.

Summary of climatic data for the 2019 crop year: September, 2018 – August 31, 2019
Northwestern Agricultural Research Center, Creston, Montana

Month Year	SEPT 2018	OCT 2018	NOV. 2018	DEC. 2018	JAN. 2019	FEB. 2019	MAR. 2019	APR. 2019	MAY 2019	JUNE 2019	JULY 2019	AUG. 2019	
<u>Precipitation (in.)</u>													<u>Total</u>
Current Year	0.59	1.17	1.52	0.46	1.37	1.79	0.98	1.19	1.63	1.96	1.12	0.65	14.43
Average (1980-2019)	1.54	1.42	1.59	1.56	1.38	1.24	1.31	1.75	2.30	3.27	1.47	1.04	19.84
Difference	-0.95	-0.25	-0.07	-1.10	-0.01	0.55	-0.33	-0.56	-0.67	-1.31	-0.35	-0.39	-5.41
<u>Mean Temperature (°F)</u>													<u>Average</u>
Current Year	55.5	44.7	37.3	28.95	25.6	11.3	25.5	43.9	53.5	59.4	63.4	64.8	42.8
Average (1980-2019)	53.9	42.5	32.7	24.4	24.6	26.7	34.9	43.1	51.6	57.8	64.5	63.6	43.3
Difference	1.6	2.2	4.6	4.6	1.0	-15.4	-9.4	0.8	1.9	1.6	-1.1	1.2	-0.5

Last killing frost in spring*

Spring, 2019: May 8

Average (1980-2018): May 19 (31°F)

First killing frost in fall*

Fall, 2019: September 27 (32°F)

Average (1980-2018): September 19

Frost-free period

2019: 141 days

Average (1980-2019): 124 days

Maximum summer temperature: 93°F (August 22nd, 2019)

Minimum winter temperature: -22°F (March 3rd, 2019)

Growing degree days (base 50)

May 1st – September 30th, 2019: 1795 GDD

Average (2016-2018): 1849.2 GDD

*32 °F is considered a killing frost

Summary of climatic data by months for the 2018-2019 crop year (September to August) and averages for the periods 1910-2018 (precipitation) and 1912-2018 (temperature) at the Central Agricultural Research Station, Moccasin, MT.

Year	2018	2018	2018	2018	2019	2019	2019	2019	2019	2019	2019
Precipitation (inches)											
Average (1910 - 2019)	1.44	0.92	0.57	0.54	0.54	0.71	1.22	2.64	3.07	1.65	15.35
Current Year	1.55	1.15	1.22	0.16	0.41	0.6	1.87	3.71	2.71	1.91	18.45
Difference	0.11	0.23	0.65	-0.38	-0.13	-0.11	0.65	1.07	-0.36	0.26	3.10
Temperature (°F)											
Average (1910 - 2019)	54.9	44.9	32.9	24.9	21.9	30.6	40.8	50.1	57.9	66.0	42.9
Current Year	55.1	43.0	33.2	29.6	28.7	25.0	41.7	46.5	57.7	64.2	41.0
Difference	0.2	-1.9	0.3	4.7	6.8	-5.6	0.9	-3.6	-0.2	-1.8	-1.8

Maximum summer temperature

Minimum winter temperature -33°F on March 2

Summary of climatic data by months for the 2018-2019 cropping year (September-August) compared to averages for the period of record from 1911 to 2018 at the Southern Agricultural Research Center near Huntley, Montana.

	2018					2019								Year
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug		
<u>Precipitation (inches)</u>													<u>Total</u>	
Current Year (2018-2019)	0.36	0.66	0.48	0.40	0.61	1.44	0.28	1.53	3.48	2.32	1.71	1.70	14.97	
Average (1911-2018)	1.31	1.10	0.63	0.61	0.55	0.47	0.80	1.38	2.22	2.32	1.13	0.97	13.49	
Difference	-0.95	-0.44	-0.15	-0.21	0.06	0.97	-0.52	0.15	1.26	0.00	0.58	0.73	1.48	
<u>Mean Temperature (°F)</u>													<u>Average</u>	
Current Year (2018-2019)	57.3	44.0	34.7	28.9	25.4	6.3	24.8	46.2	50.4	63.0	69.6	70.6	43.43	
Average (1911-2018)	58.2	46.9	33.7	23.8	21.1	25.8	34.4	45.5	55.0	63.4	70.9	68.8	45.63	
Difference	-0.9	-2.9	1.0	5.1	4.3	-19.5	-9.6	0.7	-4.6	-0.4	-1.3	1.8	-2.20	

Last Killing Frost in Spring^{1/}

2019 32 °F on May 10
Average (1911-2018) May 17

First Killing Frost in the Fall^{1/}

2019 30°F on September 21
Average (1911-2018) September 19

Frost-free Period

2019 134 days
Average (1911-2018) 125 days

Growing Degree Days (Base 50)^{2/}

2019 2,079 GDD (°F)
Average (1911-2018) 2,220 GDD (°F)

Growing Degree Days (Base Corn)^{2/}

2019 2,508 GDD (°F)
Average (1911-2018) 2,760 GDD (°F)

Maximum Summer Temperature

97°F on August 3, 4, and 5, 2019

Minimum Winter Temperature

-33 °F on March 3, 2019

1/ 32 °F is considered a killing frost. Average last and first killing frost dates are calculated on a 50% probability of a minimum temperature occurring below the threshold temperature of 32.5 °F based on observations from 1911 to 2018.

2/ Growing degree days calculated from temperatures observed during the frost free period from May 10th through September 21st, 2019, and for the same 145-day interval from the period of record of 1911 to 2018.

Summary of climatic data by months for the 2018-2019 crop year (September to August) and averages for the period 1987-2019 at the Western Triangle Agricultural Research Center near Conrad, Montana.

Month Year	Sep 2018	Oct 2018	Nov 2018	Dec 2018	Jan 2019	Feb 2019	Mar 2019	Apr 2019	May 2019	Jun 2019	Jul 2019	Aug 2019	Year
<u>Precipitation (inches)</u>													
Current Year	1.23	0.44	0.15	0.14	0.24	0.12	0.11	2.12	2.50	0.81	0.56	0.89	9.31
33-year Average	1.23	0.67	0.31	0.22	0.29	0.23	0.41	1.08	1.86	2.81	1.34	1.21	11.65
difference	0.00	-0.23	-0.16	-0.08	-0.05	-0.11	-0.30	1.04	0.64	-2.00	-0.78	-0.32	-2.34
<u>Mean Temperature (°F)</u>													
Current Year	51.2	40.8	31.6	27.6	26.0	-1.6	23.7	41.1	47.0	58.6	64.2	64.0	42.4
33-year Average	56.6	44.5	32.0	23.6	23.1	23.4	32.4	42.5	51.6	59.4	66.8	65.8	43.7
difference	-5.4	-3.7	-0.4	4.0	2.9	-25.0	-8.7	-1.4	-4.6	-0.8	-2.6	-1.8	-1.3

Last killing frost in spring*

2019 _____ 20-May
Ave. 1986-2019 _____ May 17

First killing frost in fall*^{1/}

2019 _____ September 29
Ave. 1986-2019 _____ September 25

Frost free period^{1/}

2019 _____ 132 days
Ave. 1990-2019 _____ 136 days

Maximum summer temperature _____ 93°F on Aug 4, 2019

Minimum winter temperature _____ -28°F on March 4, 2019

*In this summary 32° is considered a killing frost.

Summary of climatic data by months for the 2018-2019 crop year (September to August) and averages for the period 1990-2019 at the Williston Research and Extension Center near Williston, North Dakota.

Month Year	Sep 2018	Oct 2018	Nov 2018	Dec 2018	Jan 2019	Feb 2019	Mar 2019	Apr 2019	May 2019	Jun 2019	Jul 2019	Aug 2019	Year
<u>Precipitation (inches)</u>													
Current Year	1.30	0.65	0.94	0.51	0.11	1.39	0.00	0.18	0.50	1.10	0.26	0.89	7.83
Average (1990-2019)	1.28	0.94	0.52	0.38	0.38	0.35	0.47	1.09	2.16	2.75	2.57	1.66	14.55
difference	0.02	-0.29	0.42	0.13	-0.27	1.04	-0.47	-0.91	-1.66	-1.65	-2.31	-0.77	-6.72
<u>Mean Temperature (°F)</u>													
Current Year	55.5	42.3	26.5	24.8	18.5	-2.0	25.0	42.9	52.8	64.5	69.4	67.0	40.6
Average (1990-2019)	61.0	46.7	30.5	18.4	14.8	19.0	31.6	45.0	56.2	65.1	71.6	70.8	44.2
difference	-5.5	-4.4	-4.0	6.4	3.7	-21.0	-6.6	-2.1	-3.4	-0.6	-2.2	-3.8	-3.6

Last killing frost in spring*

2018 ^{1/} _____ April 24 (29°F)
 2019 _____ June 3 (32°F)
 Ave. 1990-2019 _____ May 12

First killing frost in fall*^{1/}

2018 _____ September 21 (31°F)
 Ave. 1990-2018 _____ September 25

Frost free period

2018 _____ 150 days
 Ave. 1990-2018 _____ 136 days

Maximum summer temperature _____ 95°F on Aug 3, 2019

Minimum winter temperature _____ -34°F on February 9, 2019

*In this summary 32° is considered a killing frost.

1/ = no data in NDAWN or NOAA for September of 2019

Summary of climatic data by months for the 2018-2019 crop year (September to August) and averages for the period 2008-2019 at Fort Benton, representing the Northern Seeds plot site at Carter, MT.

Month Year	Sep 2018	Oct 2018	Nov 2018	Dec 2018	Jan 2019	Feb 2019	Mar 2019	Apr 2019	May 2019	Jun 2019	Jul 2019	Aug 2019	Year
<u>Precipitation (inches)</u>													
Current Year	1.69	0.46	0.81	0.13	0.61	1.61	0.27	1.30	1.74	2.76	0.59	0.78	12.75
Average (2008-2019)	1.30	0.89	0.59	0.86	0.72	0.44	0.49	1.62	2.14	2.03	1.24	1.20	13.46
difference	0.39	-0.43	0.22	-0.73	-0.11	1.17	-0.22	-0.32	-0.40	0.73	-0.65	-0.42	-0.71
<u>Mean Temperature (°F)</u>													
Current Year	56.0	44.1	33.5	30.3	27.0	-1.7	24.1	45.8	50.8	62.4	68.5	69.3	42.5
Average (2008-2019)	58.5	45.7	34.0	21.7	22.8	21.8	33.7	44.5	53.5	62.3	70.4	68.7	44.8
difference	-2.5	-1.6	-0.5	8.6	4.2	-23.5	-9.6	1.3	-2.7	0.1	-1.9	0.6	-2.3

Maximum summer temperature _____ 99°F on August 3, 2019
Minimum winter temperature _____ -31°F on both February 19 and March 3, 2019

2018-2019 Intrastate Winter Wheat Nurseries: Crop Information

	Bozeman	Havre	Sidney (2)	Williston	Kalispell	Moccasin	Huntley	Conrad	Ft. Benton/ Carter (3)
Location:									
Latitude, N.	45° 41'	48° 29'	47° 40'	48° 08'	48° 40'	47° 03'	45° 55'	48° 18.4'	47° 47'
Longitude, W.	111° 00'	109° 48'	104° 08'	103° 44'	114° 15'	109° 57'	108° 15'	111° 55.5'	110° 58'
Elevation (ft)	4772	2689	2200	2105	2890	4300	3200	3700	3000
Precipitation (in)									
Average moisture (1)	15.92	12.07	14.11	14.55	19.84	15.35	13.49	11.65	13.46
This year's moisture (1)	16.47	11.29	21.51	7.83	14.43	18.45	14.97	9.31	12.75
October '18 - July '19	15.15	8.48	11.47	5.64	13.19	15.42	12.91	7.19	10.28
Previous Crop:									
2016	fallow	fallow	fallow	na	forage mix (pea/oaat/barley)	fallow	barley	ch. fallow	
2017	barley	spr. wheat	spr. wheat		w. wheat	'lentil cover	ch. fallow	barley	
2018	fallow	fallow	fallow		Canola	'lentil cover	ch. fallow	ch. fallow	ch. fallow
Soil Type:									
Series	Amsterdam	Telstad	Williams	Williams- Bowbells	Creston	Judith	Ft.Collins/ Thurlow	Scobey	Scobey
Texture (1)	SiL	CL	CL	L	SiL	CL	CL	CL	CL
Fertilization (lb/ac)									
Available N/P/K									
Nitrogen (lb)	45	85	34	na	58 (NO3-)	32	85.3	na	na
Phosphorus (mg/kg, ppm)	14	13	23		14	27	12		
Potassium (mg/kg, ppm)	251	247			90	NA	429		
Applied N/P/K/S - at seeding	220/50/20/35	125/20/10/10	73/21/0/0		10/40/90/20S	50 lb/ac 20- 30-20-10	161/39/0/0		
- spring					82/0/0/0S	140 lb/ac 44:0:0			
Planting Date	2-Oct-18	10-Oct-18	27-Sep-18	26-Sep-18	27-Sep-18	27-Sep-18	26-Sep-18	26-Sep-18	10-Oct-18
Harvest Date	25-Aug-19	8-Aug-19	6-Aug-19	na	20-Aug-19 & 21-Aug-19	14-Aug-19	7-Aug-19	9-Aug-19	5-Aug-19

(1) September - August moisture
(2) October - September moisture

(2) C = clay, L = loam, Sa = Sand, Si = silt

(3) site at Carter, precipitation from Ft Benton
na = information not available

2019 Montana Intrastate Winter Wheat Test: List of Varieties and Lines

Variety	Experimental Designation	Origin	Release Year	Pedigree
Public Varieties				
AAC Wildfire	W512	Alberta/ SECAN	2015	((Norstar*5/PGR16635, AMN4LV) /6/ (RWA53, PI294994/3/ I3C//Norwin/ Blizzard/4/2*AC Readymade /5/ Norstar*5/PGR16635// 2*Redwin/3/ AC Readymade) /7/ (A7257W-71-2-1/ A77695W, ID337-R1)// CDC Kestrel, <u>L99-1236</u>)/8/ <u>AC Bellatrix</u>
Bobcat	MTS1588	Montana	2019	selection from a composite of 2 crosses: 07X291, ((SMN82164/ SMN82140//Rocky/Tiber, MT9659)/3/S87-101/4/Pronghorn, <u>MT0598</u>)/5/(98X366E29-1, Heyne/Rampart//((MT9513, BigSky sib)) and 07X295, (((Lew/Tiber//Redwin ,MTS92021)/3/Judith/Arapahoe, MTS0023)/4/Pryor/ Genou, <u>01X258C1</u>)/5/ <u>MT0598</u>
Brawl CL Plus	CO06052	Colorado: Plainsgold/ Colorado Research Foundation	2011	Teal 11A/Above//((CO99314, TX91V4931/ Halt)
Byrd CL Plus	CO13003C	Colorado: Plainsgold/ Colorado Research Foundation	2018	CO06072/4*Byrd (Als1, Als2)
Canvas	CO12D1770	Colorado: Plainsgold/ Colorado Research Foundation	2018	Denali/Antero//Byrd
Decade	MT0552	Montana; North Dakota	2010	selection from composite of 3 crosses:((Sumner sib, KS831936-3, (Plainsman V/Odesskaya 51)///((NE86501, Colt/Cody), N95L159, Wesley sib)/3/ CDC Clair, N95L159//((MT9602, NuWest/Tiber) and N95L159/4/ (MT9609, Froid/SD1287// Redwin/3/NuWest)
Flathead	MT1564	Montana	2019	selection from a composite of 2 crosses: 07X76, <u>Yellowstone</u> *2/5/ (<u>PI640431</u> , BC4F4 line derived from WA007900*5/4/WA007900// Yr5/6*Avocet/3/ WA007900/Yr15/ 6*Avocet) and 07X77, <u>Yellowstone/PI640431/4/(Yellowstone(340,233), Yellowstone*5/3/ (Yellowstone sib, MT9982)///((MTS0222, Rampart*2/Judith))</u>
FourOsix	MT1465	Montana	2018	selection from a composite of 5 crosses: 06X272, Yellowstone/ (MT0684, a composite - see pedigree); 06X276, Yellowstone/ (MT06102, , a composite - see pedigree); 06X278, Yellowstone/7/ (MT06110, (Arapahoe/3/Brule//Hiplains/ Newton, SD93528)/6/ (MT9409, Tiber/5/ (TAM W-103/Froid/4/Yogo//Turkey Red/ Oro/3/Centurk, MT8030)); 06X282, Yellowstone/3/(MT06123, '2174'/(MT9440, BigSky sib)/BigSky); and 06X285, Yellowstone/7/ (98X168E1, (Nuwest/4/ (MT88001, Sawmont/Tendoy /3/Yogo// Norin 10/Brevor) /5/(MT7863, Froid/Winoka/ Centurk), MTS9720)/6/(PI 191303, Alba = Belgian variety)/Elkhorn);
Incline AX	CO14A065	Colorado: Plainsgold/ Colorado Research Foundation	2017	(AF28/Byrd)//(AF10/2*Byrd)
Judee	MTS0713	Montana	2011	(Vanguard/Norstar//Judith dwf, 93X312E14)/3/ NuHorizon
Loma	MTS1224	Montana	2016	<u>Yellowstone</u> 5/((Lew/Tiber//Redwin, MTS92045)/3/2*Erhardt, <u>MTS0112</u>)/4/((<u>MTS0125</u> , selection from a composite of 4 crosses)
Northern	MT0978	Montana	2015	selection from a composite of 2 crosses: 00X248, (Yellowstone sib, MT9982)/4/((MT8709, Erhardt sib)/NuWest//Erhardt, MTW0072)/3/ (NW97S151, KSSB0192-3/NE89529) and 00X249, (Judith/(PI262605, Karagach, RWA resis.)/3/(S86-740, Norstar/Plainsman V //Ulianovka) ,MTW0047)/4/MTW0072/NW97S151
Oahe	SD10257-2	South Dakota	2016	Ransom//3/(SD96240-3-1, (Colt*2/Chisholm, NE87513)//USSR#67)
Ray (forage)	MTF1432	Montana	2018	<u>Yellowstone</u> *2/7/((98X168E1, (Nuwest/4/(MT88001, Sawmont/ Tendoy /3/Yogo//Norin 10/Brevor) /5/(MT7863, Froid/Winoka/ Centurk), MTS9720)/6/(PI 191303, Alba = Belgian variety)/Elkhorn)

2019 Montana Intrastate Winter Wheat Test: List of Varieties and Lines

Variety	Experimental Designation	Origin	Release Year	Pedigree
Warhorse	MTS0808	Montana	2013	selection from a composite of 3 crosses: 00X182, ((Froid/Winoka/7/ ((Sinvaloch/Wichita// Hope/Cheyenne /3/Wichita/4/Seu Seun 27, TX55-391-56-D8)/5/Westmont, MT6928)/6/ Trader, MT85200)/8/ Redwin, MT9908)/9/ Nuplains/6/(MTS9862, (NuWest/ Lovrin 24 /4/((Rego/Cheyenne, Sel. 39-18-7)// Winalta, MT7431)/3/(MT7115, Yogo/T. polonicum-70-5), MT91366)/5/ (MTS92137, Lew/Tiber//Redwin)); 00X183, Nuplains/MTS9862/4/ (MTW0047, Judith/(PI262605, Karagach, RWA resis.)/3/(S86-740, Norstar/ Plainsman V //Ulianovka)); and 00X184, Nuplains/MTS9862/5/(MTS0028, Vanguard/4/(Lew/Tiber//Redwin, MTSF1570)/3/ Norstar)
Yellowstone	MT00159	Montana	2005	F ₂ composite of Promontory/Judith and Judith-dwarf/Promontory

Private Varieties

Keldin	ACS55017	Peter Franck: Seed-Link Inc.; Ontario, Canada, Westbred LLC	2011	Barenburg 235/Carlisle//TRX-A16-3-2
LCS Chrome	LCH13DH-20-87	Limagrain LLC	2016	N94L027 / Thunderbolt // KS891808 /3/ KS920946-B-16-1-1 / Overley // Jagger
LCS Jet	NSA10-7208	Limagrain Europe s.a.	2015	Apache/Autan
LCS Zoom	LWW14-73915	Limagrain LLC	2018	na
Long Branch	LCH12-012, HRX1652	Limagrain; Dyna-Gro Wheat	2015	T154 / T158
SY 517 CL2	07CL039-7	Syngenta	2017	(BC950811-2-6 / BC98343-09-7, <u>03B212#4</u>) // (CL03040-6-1, iW98-362A1 (imiJagalene, Als3) / AP502CL (Als1) /3/ <u>Art</u>
SY Clearstone 2CL	MTCL1077	Syngenta, Montana	2012	Yellowstone*4/3/MTCL01158/CDC Teal 11A//Jagalene
SY Legend CL2	07CL046-2	Syngenta	2018	(BC950811-2-6 / BC98343-09-7 /3/ (CL03040-24-1, iW98-362A1 (imiJagalene, Als3) / AP502CL (Als1)), 06CL028) /4/ Jagalene
SY Monument	04BC574-2	Syngenta	2014	(KS89180B-2-1-1/CM75113, F1//X920750-A-11-2, <u>BC991149-11</u>)/3/((00x0090-4, W95091/W98-183
SY Wolverine	08BC379-40-1	Syngenta	2019	na
WB4269	H4N12-0038	WestBred-Monsanto:	2017	na
WB4311	XA4104	WestBred-Monsanto:	2017	ACS 51016 / Harvard
WB4418	XA4402	WestBred-Monsanto:	2018	na

Public Elite Lines

	MTW1491		2018	(Yellowstone (Low PPO) plant seln, MT08184)/(Yellowstone (Low PPO) plant seln, MT08188/(MT08175, Colter sib)
	MTCS1601		2019	((L'Govskaya 167/Rampart/6/(MT9409, Tiber/5/ (MT8030, TAM W-103/Froid /4/Yogo//Turkey Red /Oro/3/Centurk)) , <u>MTS0531</u>) /13/ (<u>MTS0532</u> , same pedigree as MTS0531) /12/ (Morgan/5/ (88X24D247-?, (Wasatch/Yogo//Rescue/3/Tendoy, Sel. 251, MT88006)/4/Judith)), <u>96X17E69</u>) /9/((Tiber/5/(MT8030, TAM W-103/Froid /4/Yogo//Turkey Red /Oro/3/Centurk), MT9409)*2/6/IMI Fidel, <u>MTCL0309</u>)/7/ <u>CDC Teal 11A</u> /8/(<u>MTW01143</u> , Promontory/5/ (MT91366, NuWest/ Lovrin 24 /4/((Rego/ Cheyenne, Sel. 39-18-7)//Winalta, MT7431)/3/NuWest)) /10/(MTCL0510, Rampart*3/Fidel/6/ (MTS9720, Nuwest/4/(MT88001, Sawmont/Tendoy /3/Yogo//Norin 10/Brevor)/5/(MT7863, Froid/Winoka/Centurk))) /11/ (<u>MTS0531</u> , see above)
	MT1642			Yellowstone/Madsen//Yellowstone
	MT1683			selection from a composite of 2 crosses: 08X243, Yellowstone(L)*2/CDC Buteo and 08X245, same pedigree

2019 Montana Intrastate Winter Wheat Test: List of Varieties and Lines

Variety	Experimental Designation	Origin	Release Year	Pedigree
	MTS1731			(L'Govskaya 167/Rampart/6/(MT9409, Tiber/5/ (MT8030, TAM W-103/Froid /4/Yogo//Turkey Red /Oro/3/Centurk)), MTS0531)*2/7/ (BC4F4 line derived from WA007900*5/4/WA007900// Yr5/6*Avocet /3/ WA007900//Yr15/ 6*Avocet, PI640431)/5/(MTS04114, same pedigree as MTS0531)
	MTCL1732			(NuFrontier-2CL line, AP035-8-1)/11/ ((Yellowstone sib, MT9982)*2/9/(MT9904, (Froid/Winoka/7/((Sinvalocho/Wichita//Hope/ Cheyenne/3/ Wichita/4/Seu Seun 27, TX55-391-56-D8)/5/Westmont, MT6928) /6/Trader, MT85200)/8/Tiber), MT08134) /10/Yellowstone*4 /4/ (IMI-Fidel/ Tiber, MTCL01158)//CDC Teal 11A/3/ Jagalene
	MTCL1737			Yellowstone-2CL /3/ Yellowstone*2 /Pelsart// Promontory/ 3*Yellowstone
	MT1745			Decade*2/3/(NI06732, HKB0630-4-5// (NE98632, Niobrara/NE91525)
	MT1746			selection from a composite of 2 crosses: 09X135, (selection from a composite of 2 crosses, see pedigree, MT06103)/3/ (selection from a composite of 2 crosses, see pedigree, MTW0881)//(SD06W166, Wendy*2/CDC Falcon) and 09X136, (same pedigree as MTW0881, MTW0880)// MTW0881/SD06W166
	MT1747			selection from a composite of 2 crosses: 09X135, (selection from a composite of 2 crosses, see pedigree, MT06103)/3/ (selection from a composite of 2 crosses, see pedigree, MTW0881)//(SD06W166, Wendy*2/CDC Falcon) and 09X136, (same pedigree as MTW0881, MTW0880)// MTW0881/SD06W166
	MT1750			(Yellowstone (Low PPO) plant seln, MT08185)/5/YLL(L)/4/ (NX05M4391, Cimarron/Rio Blanco//Bai Hou 4/N91L0097 /3/ Lakin)
	MT1764			Yellowstone*3/3/(NE01533, HBC059E/HBK0935W-24//2137) /4/Promontory/3*Yellowstone/3/Yellowstone*2/ Pelsart// Promontory/3*Yellowstone
	MT1773			(L'Govskaya 167/Rampart/6/(MT9409, Tiber/5/ (MT8030, TAM W-103/Froid /4/Yogo//Turkey Red /Oro/3/Centurk)), MTS04114)*2/7/(PI640431, BC4F4 line derived from WA007900*5/4/ WA007900// Yr5/6*Avocet/3/ WA007900//Yr15/ 6*Avocet)
	MT1782			selection from a composite of 2 crosses: 09X87, ((MT8709, Erhardt sib)/NuWest// Erhardt, MT0071)/10/(Wesley sib, N95L1229)/9/(MT9834, (Froid/Winoka/7/ ((Sinvalocho/Wichita// Hope/Cheyenne/3/ Wichita/4/Seu Seun 27, TX55-391-56-D8) /5/Westmont, MT6928)/6/Trader, MT85200) /8/Tiber), MT0859)/11/(same pedigree as MT0859, MT0860)/(MT0885, selection from a composite of 4 crosses, see pedigree) and 09X89, (selection from a composite of 2 crosses, see pedigree, MT0938)// MT0860/MT0885
	MT1787			selection from a composite of 2 crosses: 09X257, MT08185/YLL*2/PI640431 /3/PROM/ 3*YLL/YLL*2/Pelsart and 09X258, MT08185/YLL*2/PI640431/3/ YLL*2/ Pelsart//PROM/3*YLL
	MT1793			Decade/WesleyFHB1-106BC2F4-10
	MT1796			Decade/WesleyFHB1-106BC2F4-15

Private Elite Lines

	ASC107	Europe; All Star Seeds		na
	ASC116	Europe; All Star Seeds		na
	ASC122	Europe; All Star Seeds		na

Table 1. 2019 Intrastate Winter Wheat Test : Statewide Summary

Cultivar/Line		Pedigree	Yield bu/ac	Test weight lb/bu	Winter survival %	Heading date Julian	Plant height in	Stem solidness (5-25)	Sawfly cutting %	Protein %
d = cultivars/lines dropped for 2020 test + = new for 2019, # = paid entry										
Locations			9	9	2	8	8	4	3	9
#	AAC Wildfire	Alberta: SECAN, 2015	80.9	61.2	53	173.0	32.6		46	12.9
#+ d	ASC107	Europe/All Star Seeds experiment	62.8	60.8	28	165.9	26.5		55	13.6
#+ d	ASC116	Europe/All Star Seeds experiment	68.5	59.8	42	160.4	27.5		42	14.8
#+ d	ASC122	Europe/All Star Seeds experiment	64.0	61.4	21	167.2	26.0		13	13.9
	Brawl CL Plus	Plainsgold/Colorado Wheat Res F	77.2	62.2	49	160.6	29.3		45	13.4
#	Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2	80.3	60.2	41	164.5	31.3		38	11.9
#+ d	Canvas	Plainsgold/Colorado Wheat Res F	77.5	62.6	40	165.5	27.9		48	12.4
d	Decade	Montana/North Dakota, 2010	79.4	60.9	52	166.2	31.8		47	13.3
	FourOsix	Montana, 2018	82.1	60.8	45	167.0	29.7		60	12.7
#	Incline AX	Plainsgold/Colorado Wheat Res F	78.5	59.7	41	167.4	30.4		31	11.6
	Judee	Montana, 2011	79.5	62.0	53	167.4	31.1	19.6	36	13.4
	Keldin	WestBred, 2011	88.2	61.3	47	168.5	30.2		63	12.5
# d	LCS Chrome	Limagrain Cereal Seeds, 2016	78.1	61.3	46	164.9	31.0		69	13.4
#	LCS Jet	Limagrain Cereal Seeds, 2015	90.6	58.6	26	168.1	27.8		41	12.2
# d	LCS Zoom	Limagrain Cereal Seeds, 2018 (LV	81.9	57.6	44	166.2	28.5		73	12.4
	Loma	Montana, 2016	80.9	60.9	49	170.0	29.4	20.4	32	12.8
#	Long Branch	Dyna-Gro Wheat	81.0	61.5	51	160.9	28.5		40	12.1
	MT1564 (Flathead)	Montana, 2019	82.2	61.3	54	163.3	30.2		54	12.8
	MT1642	Yellowstone/Madsen//Yellowstone	87.6	60.8	42	170.5	32.2		51	12.8
	MT1683	Yellowstone(L)*2/CDC Buteo	84.7	60.5	52	168.5	32.7		62	12.7
+	MT1745	Decade*2/NI06732	86.8	61.2	55	169.1	30.9		35	12.2
+	MT1746	MT06103//MTW0881/SD06W166	83.1	62.5	50	167.5	28.7		32	12.7
+	d MT1747	MT06103//MTW0881/SD06W166	81.8	62.5	46	166.7	28.9		33	12.7
+	d MT1750	MT08185//YLL(L)/NX05M4391	78.0	62.3	44	169.4	27.6		27	12.9
+	d MT1764	YLL*3/NE01533//PROM/3*YLL/3/Y	78.6	60.8	49	164.7	28.1		52	13.2
+	d MT1773	MTS04114*2/PI640431	82.2	60.9	50	167.6	30.1		53	12.8
+	d MT1782	MT0859//MT0860/MT0885	82.8	62.4	50	165.9	30.1		39	13.0
+	MT1787	MT08185//YLL*2/PI640431/3/PRO	82.9	61.4	47	169.2	27.5		44	12.9
+	MT1793	Decade-Fhb1	79.2	60.9	63	164.4	29.9		56	13.6
+	d MT1796	Decade-Fhb1	76.2	61.5	51	164.8	30.7		53	13.8
+	MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/I	78.4	60.1	46	168.1	29.0		14	12.6
+	MTCL1737	YLL-2CL/3/YLL*2/Pelsart//PROM/3	84.3	60.3	48	170.9	29.0		39	12.8
	MTCs1601R	MTS0531/7/MTS0532/6/96X17E69	82.5	61.8	51	167.9	30.7	18.8	43	13.2
	MTS1588 (Bobcat)	Montana, 2019	80.4	61.7	43	168.8	28.9	24.1	13	12.9
+	d MTS1731(w)	MTS0531*2//PI640431/MTS04114	82.4	61.5	47	165.5	28.3	22.6	24	13.2
d	MTW1491	MT08189//MT08187/(MTW08166,	90.7	60.9	50	169.1	33.0		47	12.3
	Northern	Montana, 2015	88.6	61.3	46	169.8	31.4		43	12.8
d	Oahe	South Dakota, 2016	77.6	61.8	50	164.6	33.1		50	12.9
d	Ray	Montana, 2018	78.7	59.4	45	172.3	35.9		51	12.7
#	SY 517 CL2	Syngenta (AgriPro), 2017	72.3	62.4	43	161.7	27.9		43	13.3
	SY Clearstone 2CL	Montana/Syngenta, 2012	85.8	60.2	51	168.3	32.6		62	12.8
#	SY Legend CL2	Syngenta, 2018 (07CL046-2)	71.9	61.1	44	165.3	29.2		70	12.9
#	SY Monument	Syngenta (AgriPro), 2014	81.2	60.3	49	165.9	28.7		59	12.2
#+ d	SY Wolverine	Syngenta 2019 (08BC379-40-1)	74.2	61.6	36	163.0	26.8		42	13.4
	Warhorse	Montana, 2013	74.3	61.1	46	168.3	30.2	21.5	14	13.6
#+	WB4269	WestBred, 2017	73.9	61.6	38	163.5	26.9		38	12.4
#+	WB4311	WestBred, 2017 (solid stem, form	79.9	61.8	44	165.3	27.3		48	13.3
#+	WB4418	WestBred, 2017 (formerly exp 207	73.6	60.2	45	162.9	27.3	7.8	32	12.6
	Yellowstone	Montana 2005	82.3	60.4	50	169.0	32.7	6.8	56	12.6
Average			79.8	61.0	45.9	166.6	29.7	17.7	44.0	12.9
LSD (0.05)			8.5	0.7	12.3	1.0	1.3	1.5	18.0	0.5
C. V. (%)			11.5	1.3	13.3	0.6	4.5	5.7	25.3	4.3

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 2. 2019 Intrastate Winter Wheat Test (Exp. 3501): Bozeman

Entry	Cultivar/Line	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Green Leaf Duration		Plant height in	Protein %
						Senescence Date	Days after heading		
			LAT	LAT	RCB	LAT		LAT	Bulk
		lattice efficiency relative to RCB	129%	113%		122%	120%	107%	
9	Keldin	WestBred, 2011	152.8	63.6	175.7	213.6	37.9	33.6	11.5
13	d MTW1491	MT08189//MT08187/(MTW08166,	149.6	63.6	178.0	215.8	37.6	38.8	11.3
23	# LCS Jet	Limagrain Cereal Seeds, 2015	146.0	61.4	176.0	215.9	39.8	31.8	11.4
7	Northern	Montana, 2015	145.1	63.0	177.3	215.1	38.0	37.0	11.5
6	SY Clearstone 2CL	Montana/Syngenta, 2012	144.5	61.6	178.0	214.0	36.0	38.6	12.4
36	MT1642	Yellowstone/Madsen//Yellowstone	144.0	62.7	179.7	216.0	36.3	35.8	11.8
1	Yellowstone	Montana 2005	142.4	62.2	178.0	213.9	35.9	38.6	11.7
37	MT1683	Yellowstone(L)*2/CDC Buteo	139.2	62.3	178.3	212.5	34.1	38.4	12.2
11	d Ray	Montana, 2018	138.8	61.7	180.7	216.9	36.2	40.0	12.4
44	+ d MT1773	MTS04114*2/PI640431	138.6	62.9	176.0	213.5	37.3	35.2	11.5
28	# Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2l	138.1	62.9	171.0	207.7	36.7	35.6	11.0
12	d Oahe	South Dakota, 2016	138.0	64.0	171.0	207.6	36.7	38.6	11.9
40	+ MT1745	Decade*2/NI06732	137.2	63.4	176.7	212.7	36.1	34.7	11.4
33	MT1564 (Flathead)	Montana, 2019	134.9	64.1	170.7	207.5	36.7	35.2	11.6
42	+ d MT1747	MT06103//MTW0881/SD06W166	134.8	64.7	174.7	210.2	35.5	32.6	11.8
24	# d LCS Zoom	Limagrain Cereal Seeds, 2018 (LV	133.0	59.4	172.0	213.6	41.5	32.6	12.0
49	+ d MTS1731(w)	MTS0531*2//PI640431/MTS04114	131.7	63.3	174.0	210.5	36.4	31.5	12.2
14	# SY Monument	Syngenta (AgriPro), 2014	130.8	62.4	175.0	211.0	35.9	33.0	11.1
45	+ d MT1782	MT0859//MT0860/MT0885	130.1	64.3	174.3	209.2	34.9	32.9	11.8
21	+ d MT1764	YLL*3/NE01533//PROM/3*YLL/3/Y	130.1	63.0	171.0	210.2	39.1	31.9	11.6
43	+ d MT1750	MT08185//YLL(L)/NX05M4391	130.0	64.5	177.0	214.0	37.3	31.9	11.8
22	# d LCS Chrome	Limagrain Cereal Seeds, 2016	129.9	63.4	172.3	215.1	42.9	34.4	12.5
41	+ MT1746	MT06103//MTW0881/SD06W166	129.7	64.6	175.3	209.8	34.6	32.4	11.9
8	Loma	Montana, 2016	128.7	63.0	179.3	209.9	30.6	34.0	11.6
10	FourOsix	Montana, 2018	128.6	63.1	175.0	212.6	37.6	34.1	12.0
35	MTCS1601R	MTS0531/7/MTS0532/6/96X17E6	127.7	63.8	176.0	209.5	33.4	35.1	12.4
48	+ d MT1796	Decade-Fhb1	127.6	62.9	171.0	209.2	38.2	34.1	12.3
5	d Decade	Montana/North Dakota, 2010	127.4	62.6	174.0	214.0	39.9	35.8	12.3
19	#+ WB4311	WestBred, 2017	126.6	64.2	170.3	210.7	40.4	29.6	12.0
4	Brawl CL Plus	Plainsgold/Colorado Wheat Res F	126.3	64.5	167.7	206.6	39.1	33.0	12.3
46	+ MT1787	MT08185//YLL*2/PI640431/3/PRO	125.6	63.0	178.3	213.8	35.5	30.7	12.2
29	# AAC Wildfire	Alberta/SECAN, 2015	125.3	63.0	181.7	216.9	35.3	37.9	12.5
39	+ MTCL1737	YLL-2CL/3/YLL*2/Pelsart//PROM/	125.0	62.3	179.7	214.3	34.5	31.5	12.4
47	+ MT1793	Decade-Fhb1	124.6	62.5	170.7	209.2	38.8	32.8	12.4
2	Judee	Montana, 2011	122.5	63.5	175.0	209.1	34.1	36.1	12.4
26	# Incline AX	Plainsgold/Colorado Wheat Res F	122.0	61.6	175.0	209.0	34.0	33.8	10.7
31	#+ d ASC116	Europe/All Star Seeds experiment	120.9	61.8	166.3	204.5	38.1	31.0	13.8
25	# Long Branch	Limagrain; Dyna-Gro Wheat, 2016	120.7	63.6	167.0	205.9	38.9	33.3	11.2
34	MTS1588 (Bobcat)	Montana, 2019	119.5	63.2	177.0	210.3	33.1	32.2	11.9
3	Warhorse	Montana, 2013	118.9	62.8	176.7	212.0	35.3	34.0	12.6
38	+ MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/I	118.5	61.1	176.0	212.2	36.4	31.9	11.7
15	# SY 517 CL2	Syngenta (AgriPro), 2017	117.3	64.6	168.3	207.0	38.8	31.2	12.5
18	#+ WB4269	WestBred, 2017	113.7	63.2	169.7	209.8	40.2	30.2	11.6
16	# SY Legend CL2	Syngenta, 2018 (07CL046-2)	113.7	64.0	172.3	209.3	36.9	31.9	11.2
27	#+ d Canvas	Plainsgold/Colorado Wheat Res F	113.1	64.5	173.7	209.7	35.9	31.9	11.5
17	#+ SY Wolverine	Syngenta 2019 (08BC379-40-1)	112.6	63.2	170.3	209.8	39.4	29.1	12.6
20	#+ WB4418	WestBred, 2018	112.0	61.8	169.3	206.4	37.0	31.2	11.6
30	#+ d ASC107	Europe/All Star Seeds experiment	107.3	63.0	171.3	209.6	38.2	29.4	12.5
32	#+ d ASC122	Europe/All Star Seeds experiment	103.0	63.5	175.0	213.0	38.0	28.5	13.1
Average			128.5	63.0	174.3	211.2	37.0	33.7	12.0
LSD (0.05)			12.7	0.6	1.1	2.5	2.7	1.2	
C. V. (%)			5.7	0.6	0.4	0.7	4.3	2.1	
P-value (Varieties)			<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD ($p=0.05$)

Table 3. 2019 Intrastate Winter Wheat Test (Exp. 3502): Havre

Entry	Cultivar/Line		Pedigree	Yield bu/ac	Test weight lb/bu	Stand %	Heading date Julian	Plant height in RCB	Sawfly cutting % 30-Jul harvest		Protein %
d = cultivars/lines dropped for 2020 test + = new for 2019, # = paid entry				LAT	LAT	LAT	LAT	RCB	LAT	LAT	LAT
			lattice efficiency relative to RCB	128%	143%	115%	119%		112%	106%	115%
26 #	Incline AX	Plainsgold/Colorado Wheat Res F	63.1	59.8	97	166.7	27.3		19	15	13.7
34	MTS1588 (Bobcat)	Montana, 2019	62.6	60.6	98	168.1	25.6		1	1	14.9
35	MTCS1601R	MTS0531/7/MTS0532/6/96X17E6	61.6	60.7	100	168.0	25.8		11	12	15.1
25 #	Long Branch	Limagrain; Dyna-Gro Wheat, 2016	61.5	60.9	97	160.8	23.4		24	12	13.9
23 #	LCS Jet	Limagrain Cereal Seeds, 2015	58.9	57.5	98	167.6	20.7		40	35	14.6
11 d	Ray	Montana, 2018	58.9	58.7	91	173.8	31.4		31	39	14.5
47 +	MT1793	Decade-Fhb1	58.5	59.7	91	164.4	26.2		19	22	16.1
7	Northern	Montana, 2015	57.7	60.3	96	170.0	24.4		24	38	14.8
10	FourOsix	Montana, 2018	57.5	60.0	92	166.8	25.4		38	39	14.9
40 +	MT1745	Decade*2/NI06732	57.5	60.9	97	169.7	26.2		27	18	14.4
13 d	MTW1491	MT08189//MT08187/(MTW08166,	57.5	59.6	99	169.6	27.5		19	30	14.7
14 #	SY Monument	Syngenta (AgriPro), 2014	57.4	59.5	93	165.7	25.3		36	32	14.0
6	SY Clearstone 2CL	Montana/Syngenta, 2012	56.8	59.5	89	168.8	28.1		43	44	15.3
39 +	MTCL1737	YLL-2CL/3/YLL*2/Pelsart//PROM/	56.4	58.6	95	173.5	29.0		20	23	14.8
27 #+ d	Canvas	Plainsgold/Colorado Wheat Res F	55.5	62.4	96	165.8	21.5		22	24	14.2
5 d	Decade	Montana/North Dakota, 2010	55.5	60.1	99	167.2	29.2		21	22	15.5
1	Yellowstone	Montana 2005	54.8	59.5	90	169.7	30.0		36	30	15.1
41 +	MT1746	MT06103//MTW0881/SD06W166	54.8	61.5	100	169.4	22.6		11	13	14.7
49 + d	MTS1731(w)	MTS0531*2//PI640431/MTS04114	54.0	59.8	94	166.0	27.6		4	8	15.6
29 #	AAC Wildfire	Alberta/SECAN, 2015	54.0	58.8	99	174.3	25.4		24	32	14.6
16 #	SY Legend CL2	Syngenta, 2018 (07CL046-2)	53.6	60.6	90	165.9	26.0		27	27	14.8
45 + d	MT1782	MT0859//MT0860/MT0885	53.5	60.9	99	165.4	25.9		17	20	15.5
18 #+	WB4269	WestBred, 2017	53.5	60.8	90	162.7	25.3		14	12	13.7
20 #+	WB4418	WestBred, 2018	53.5	59.9	84	163.1	22.6		16	15	14.4
38 +	MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/	53.0	59.6	99	168.7	27.4		15	14	14.4
2	Judee	Montana, 2011	52.6	61.3	94	168.9	27.0		11	11	15.8
42 + d	MT1747	MT06103//MTW0881/SD06W166	52.6	61.6	95	168.3	23.9		23	24	14.8
9	Keldin	WestBred, 2011	52.4	59.9	95	169.2	25.4		38	46	15.1
46 +	MT1787	MT08185//YLL*2/PI640431/3/PRC	52.3	60.3	97	169.1	25.5		26	30	15.0
4	Brawl CL Plus	Plainsgold/Colorado Wheat Res F	52.2	62.0	91	160.5	25.3		25	14	15.3
37	MT1683	Yellowstone(L)*2/CDC Buteo	51.6	59.8	99	170.2	27.4		30	46	15.1
21 + d	MT1764	YLL*3/NE01533//PROM/3*YLL/3/	51.6	59.9	95	163.9	24.9		31	21	15.5
36	MT1642	Yellowstone/Madsen//Yellowstone	51.3	58.8	99	173.2	28.0		24	34	15.7
8	Loma	Montana, 2016	51.1	59.7	96	172.2	23.7		13	15	15.2
19 #+	WB4311	WestBred, 2017	51.1	60.4	98	164.4	22.6		24	30	15.0
28 #	Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2	51.0	60.6	96	163.7	24.3		20	21	13.9
43 + d	MT1750	MT08185//YLL(L)/NX05M4391	49.8	61.4	94	171.7	22.4		11	10	15.3
33	MT1564 (Flathead)	Montana, 2019	49.1	60.4	99	163.8	24.6		38	27	15.1
44 + d	MT1773	MTS04114*2/PI640431	49.1	60.2	98	169.3	26.3		17	21	14.9
17 #+	SY Wolverine	Syngenta 2019 (08BC379-40-1)	48.9	60.3	87	163.6	23.0		26	29	15.7
24 # d	LCS Zoom	Limagrain Cereal Seeds, 2018 (LV	48.7	57.6	98	167.3	24.5		56	48	14.2
22 # d	LCS Chrome	Limagrain Cereal Seeds, 2016	48.2	59.6	100	166.8	26.2		51	51	15.1
48 + d	MT1796	Decade-Fhb1	47.8	60.0	88	164.9	23.7		18	18	16.5
12 d	Oahe	South Dakota, 2016	46.7	60.2	100	165.0	28.6		36	36	15.1
3	Warhorse	Montana, 2013	46.5	60.2	94	170.4	26.2		5	3	16.2
15 #	SY 517 CL2	Syngenta (AgriPro), 2017	46.4	61.3	90	162.9	22.4		20	16	16.0
31 #+ d	ASC116	Europe/All Star Seeds experiment	41.3	60.1	95	161.8	22.7		35	18	15.9
32 #+ d	ASC122	Europe/All Star Seeds experiment	39.5	59.9	88	166.1	24.3		25	13	16.0
30 #+ d	ASC107	Europe/All Star Seeds experiment	38.0	59.7	98	166.1	23.0		37	23	15.6
Average				52.9	60.1	95.0	167.3	25.4	24.5	24.2	15.0
LSD (0.05)				7.4	0.6	ns	1.7	2.0	16.0	14.1	0.5
C. V. (%)				8.0	0.6	6.4	0.6	4.8	38.3	34.6	1.8
P-value (Varieties)				<.0001	<.0001	0.1672	<.0001	<.0001	<.0001	<.0001	<.0001

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 4. 2019 Intrastate Winter Wheat Test (Exp. 3503): Sidney

Entry	Cultivar/Line	Pedigree	Yield bu/ac	Test weight lb/bu	Winter survival % 3-Jun			Heading date Julian	Plant height in	Grain moisture %	Protein %
					Sheet	Map	Avg.				
d = cultivars/lines dropped for 2020 test + = new for 2019, # = paid entry			RCB	RCB	RCB	RCB		RCB	RCB	RCB	LAT
lattice efficiency relative to RCB											105%
29 #	AAC Wildfire	Alberta/SECAN, 2015	88.8	64.5	18	20	19	168.3	30.1	12.0	13.1
40 +	MT1745	Decade*2/NI06732	87.8	64.0	28	32	30	164.3	28.7	12.2	12.9
13 d	MTW1491	MT08189//MT08187/(MTW08166,	87.3	63.7	22	20	21	164.3	31.1	12.1	12.7
7	Northern	Montana, 2015	86.6	63.6	21	22	22	165.7	28.2	12.4	13.6
2	Judee	Montana, 2011	81.1	65.1	17	23	20	162.3	28.9	11.8	14.0
35	MTCS1601R	MTS0531/7/MTS0532/6/96X17E6	79.3	64.4	22	23	23	164.7	28.7	11.8	14.1
37	MT1683	Yellowstone(L)*2/CDC Buteo	79.0	62.7	18	22	20	164.0	29.8	12.4	13.3
39 +	MTCL1737	YLL-2CL/3/YLL*2/Pelsart//PROM/	76.2	62.9	15	17	16	165.0	25.9	12.3	13.4
23 #	LCS Jet	Limagrain Cereal Seeds, 2015	75.6	60.2	12	13	13	164.3	23.6	13.1	13.1
6	SY Clearstone 2CL	Montana/Syngenta, 2012	73.7	63.1	18	17	18	164.0	28.2	12.1	13.3
1	Yellowstone	Montana 2005	73.3	62.8	18	22	20	165.0	29.1	12.7	13.5
8	Loma	Montana, 2016	71.8	62.5	14	12	13	167.3	26.2	12.5	13.7
44 + d	MT1773	MTS04114*2/PI640431	70.7	63.6	17	17	17	163.0	26.2	11.9	13.2
41 +	MT1746	MT06103//MTW0881/SD06W166	70.1	64.1	20	23	22	163.0	25.3	12.0	13.5
5 d	Decade	Montana/North Dakota, 2010	68.8	63.6	27	22	24	162.0	30.4	12.3	14.5
46 +	MT1787	MT08185//YLL*2/PI640431/3/PRC	68.6	63.1	13	14	14	165.0	24.3	12.2	14.3
36	MT1642	Yellowstone/Madsen//Yellowstone	68.4	62.1	12	11	11	165.0	29.7	12.8	13.5
49 + d	MTS1731(w)	MTS0531*2//PI640431/MTS04114	68.1	63.5	17	18	18	161.7	26.1	11.7	14.2
9	Keldin	WestBred, 2011	66.8	63.8	15	20	18	164.3	29.3	11.8	14.1
33	MT1564 (Flathead)	Montana, 2019	66.6	64.0	25	27	26	159.0	27.0	11.9	13.7
34	MTS1588 (Bobcat)	Montana, 2019	65.2	64.2	12	13	13	165.0	26.2	11.9	13.4
47 +	MT1793	Decade-Fhb1	65.1	63.4	42	37	39	161.0	28.7	12.0	15.2
38 +	MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/	65.0	62.8	12	17	15	164.3	26.2	11.9	12.8
10	FourOsix	Montana, 2018	64.6	62.9	10	13	12	162.7	27.0	12.1	14.1
11 d	Ray	Montana, 2018	64.6	60.8	12	14	13	169.0	31.1	13.0	14.1
48 + d	MT1796	Decade-Fhb1	63.5	63.5	22	22	22	161.0	28.3	12.1	16.3
45 + d	MT1782	MT0859//MT0860/MT0885	59.7	64.0	15	25	20	163.0	28.3	12.0	15.1
3	Warhorse	Montana, 2013	53.4	63.0	11	15	13	165.0	28.7	12.5	15.8
42 + d	MT1747	MT06103//MTW0881/SD06W166	52.8	63.4	11	13	12	161.7	25.7	12.2	13.7
28 #	Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2	51.2	63.0	13	13	13	161.0	28.9	12.1	12.8
25 #	Long Branch	Limagrain; Dyna-Gro Wheat, 2016	50.8	63.4	19	17	18	157.3	25.9	11.7	13.3
24 # d	LCS Zoom	Limagrain Cereal Seeds, 2018 (LV	50.7	58.1	12	10	11	163.0	24.7	12.2	13.8
22 # d	LCS Chrome	Limagrain Cereal Seeds, 2016	50.7	63.3	10	10	10	162.3	29.0	12.1	15.0
26 #	Incline AX	Plainsgold/Colorado Wheat Res F	48.3	61.4	9	9	9	163.7	27.2	12.7	12.9
27 #+ d	Canvas	Plainsgold/Colorado Wheat Res F	46.8	64.7	9	10	10	161.0	26.5	11.7	14.0
43 + d	MT1750	MT08185//YLL(L)/NX05M4391	46.2	62.9	7	8	8	163.7	25.6	12.3	13.8
21 + d	MT1764	YLL*3/NE01533//PROM/3*YLL/3/	45.8	62.2	13	17	15	161.0	24.9	11.9	15.4
19 #+	WB4311	WestBred, 2017	45.4	63.2	12	15	14	161.0	24.0	12.2	15.6
20 #+	WB4418	WestBred, 2018	40.7	62.8	10	10	10	158.3	25.6	12.3	13.2
16 #	SY Legend CL2	Syngenta, 2018 (07CL046-2)	38.7	63.2	7	10	9	162.3	26.0	12.2	14.2
14 #	SY Monument	Syngenta (AgriPro), 2014	38.7	60.8	12	14	13	161.0	24.0	11.9	14.0
12 d	Oahe	South Dakota, 2016	38.6	63.0	19	25	22	161.0	30.1	11.9	14.8
4	Brawl CL Plus	Plainsgold/Colorado Wheat Res F	35.8	63.3	11	18	15	157.0	26.1	11.8	15.7
18 #+	WB4269	WestBred, 2017	33.9	62.9	10	8	9	160.0	22.7	11.7	14.2
15 #	SY 517 CL2	Syngenta (AgriPro), 2017	26.3	63.4	12	12	12	157.0	24.3	12.0	16.0
17 #+	SY Wolverine	Syngenta 2019 (08BC379-40-1)	25.5	61.9	7	6	6	160.0	24.3	12.3	15.2
31 #+ d	ASC116	Europe/All Star Seeds experiment	20.6	59.1	10	11	11	157.0	23.9	11.8	17.9
32 #+ d	ASC122	Europe/All Star Seeds experiment	15.5	61.5	2	3	2	163.7	22.0	12.1	15.4
30 #+ d	ASC107	Europe/All Star Seeds experiment	5.5	1/	2	1	2	162.0	21.0	11.9	14.9
Average			57.5	62.9	14.7	16.1	15.4	162.6	26.8	12.1	14.2
LSD (0.05)			15.9	1.3	9.4	10.7		1.6	2.5	0.6	0.8
C. V. (%)			17.1	1.2	39.2	40.8		0.6	5.7	3.1	3.1
P-value (Varieties)			<.0001	<.0001	<.0001	<.0001		<.0001	<.0001	0.0018	<.0001

bold = indicates highest value within a column

1/ = not enough sample to do test weight

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 5. 2019 Intrastate Winter Wheat Test (Exp. 3504): Williston, ND

Entry #	Cultivar/Line	Pedigree	Yield bu/ac	Test weight lb/bu	Winter Survival %		Heading date Julian	Plant height in	Protein %
					PLB 3-Jun	WREC			
	d = cultivars/lines dropped for 2020 test + = new for 2019, # = paid entry		LAT	LAT	LAT	LAT	LAT	LAT	LAT
		lattice efficiency relative to RCB	154%	111%	114%	131%	155%	126%	187%
13	d MTW1491	MT08189//MT08187/(MTW08166,	63.9	59.9	99	79	162.7	20.2	16.8
36	MT1642	Yellowstone/Madsen//Yellowstone	63.2	60.1	88	72	164.1	25.4	16.5
46	+ MT1787	MT08185//YLL*2/PI640431/3/PRC	60.3	60.9	97	81	162.6	17.3	16.7
14	# SY Monument	Syngenta (AgriPro), 2014	58.5	60.4	99	85	160.8	17.6	16.3
8	Loma	Montana, 2016	57.9	60.7	91	85	163.2	19.1	17.2
34	MTS1588 (Bobcat)	Montana, 2019	57.5	60.7	81	74	162.8	20.4	17.1
26	# Incline AX	Plainsgold/Colorado Wheat Res F	57.0	60.0	76	73	163.0	20.8	14.7
37	MT1683	Yellowstone(L)*2/CDC Buteo	56.8	60.7	99	84	162.7	22.3	16.5
10	FourOsix	Montana, 2018	56.7	60.8	94	79	161.3	20.1	16.9
22	# d LCS Chrome	Limagrain Cereal Seeds, 2016	56.5	61.0	96	82	160.3	20.1	18.1
24	# d LCS Zoom	Limagrain Cereal Seeds, 2018 (LV	56.4	57.9	83	77	162.7	18.3	15.1
43	+ d MT1750	MT08185//YLL(L)/NX05M4391	56.2	61.7	94	80	163.3	18.1	17.3
39	+ MTCL1737	YLL-2CL/3/YLL*2/Pelsart//PROM/	56.1	59.7	99	79	164.0	18.8	17.6
1	Yellowstone	Montana 2005	55.6	60.3	100	80	162.3	20.5	16.9
27	#+ d Canvas	Plainsgold/Colorado Wheat Res F	55.3	62.5	89	71	160.2	18.5	17.3
29	# AAC Wildfire	Alberta/SECAN, 2015	54.1	60.5	100	87	167.4	21.3	16.7
7	Northern	Montana, 2015	53.1	61.0	96	71	163.7	18.7	17.7
49	+ d MTS1731(w)	MTS0531*2//PI640431/MTS04114	53.0	60.3	99	77	160.8	19.1	18.9
11	d Ray	Montana, 2018	52.8	59.5	97	76	165.0	24.2	16.2
21	+ d MT1764	YLL*3/NE01533//PROM/3*YLL/3/\	52.7	59.2	100	82	160.1	18.0	18.8
9	Keldin	WestBred, 2011	52.4	61.2	90	75	163.9	18.6	16.6
41	+ MT1746	MT06103//MTW0881/SD06W166	52.3	61.2	96	79	162.3	18.6	17.3
40	+ MT1745	Decade*2/NI06732	52.3	60.9	98	81	162.4	18.7	16.3
25	# Long Branch	Limagrain; Dyna-Gro Wheat, 2016	52.2	60.9	99	84	156.8	18.0	15.8
38	+ MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/	51.3	59.5	95	77	161.1	17.3	17.8
3	Warhorse	Montana, 2013	50.8	61.4	88	80	162.7	19.1	18.2
35	MTCS1601R	MTS0531/7/MTS0532/6/96X17E6/	50.8	60.2	91	80	163.7	20.4	18.2
19	#+ WB4311	WestBred, 2017	49.4	60.3	79	74	161.8	18.7	17.8
2	Judee	Montana, 2011	49.3	61.9	98	85	161.6	19.3	18.4
45	+ d MT1782	MT0859//MT0860/MT0885	48.9	60.7	98	81	161.0	17.9	18.5
23	# LCS Jet	Limagrain Cereal Seeds, 2015	48.8	57.3	36	39	163.5	19.8	15.6
28	# Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2/	48.6	61.1	81	70	159.5	19.3	16.1
5	d Decade	Montana/North Dakota, 2010	47.6	60.5	100	80	160.3	17.4	19.3
17	#+ SY Wolverine	Syngenta 2019 (08BC379-40-1)	47.6	60.6	89	66	157.6	18.4	18.3
42	+ d MT1747	MT06103//MTW0881/SD06W166	47.1	60.8	94	80	161.1	19.1	17.7
12	d Oahe	South Dakota, 2016	45.5	60.8	97	77	159.2	18.9	17.6
6	SY Clearstone 2CL	Montana/Syngenta, 2012	45.5	60.1	99	85	161.8	20.2	18.0
16	# SY Legend CL2	Syngenta, 2018 (07CL046-2)	45.4	61.4	93	78	159.3	18.1	17.9
33	MT1564 (Flathead)	Montana, 2019	44.7	60.6	91	82	157.4	19.0	18.2
48	+ d MT1796	Decade-Fhb1	44.2	60.5	98	80	159.8	19.4	20.2
15	# SY 517 CL2	Syngenta (AgriPro), 2017	44.1	61.7	87	74	156.6	19.2	17.6
44	+ d MT1773	MTS04114*2/PI640431	43.8	59.7	99	84	161.7	18.1	18.6
4	Brawl CL Plus	Plainsgold/Colorado Wheat Res F	43.8	60.8	98	82	156.3	21.0	18.7
47	+ MT1793	Decade-Fhb1	43.2	60.1	99	87	159.4	17.3	19.5
20	#+ WB4418	WestBred, 2018	38.7	57.8	99	81	157.6	18.7	18.0
18	#+ WB4269	WestBred, 2017	37.4	59.4	81	67	157.8	16.8	17.0
30	#+ d ASC107	Europe/All Star Seeds experiment	34.4	59.9	25	54	162.7	20.0	18.3
32	#+ d ASC122	Europe/All Star Seeds experiment	27.4	60.3	15	40	164.1	18.8	17.5
31	#+ d ASC116	Europe/All Star Seeds experiment	22.5	56.8	65	72	157.1	17.7	21.2
	Average		49.9	60.3	87.2	76.4	161.3	19.2	17.5
	LSD (0.05)		12.5	0.9	14.2	12.5	1.8	3.0	1.3
	C. V. (%)		14.3	0.8	9.5	9.5	0.6	9.2	4.4
	P-value (Varieties)		<.0001	<.0001	<.0001	<.0001	<.0001	0.0009	<.0001

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 6. 2019 Intrastate Winter Wheat Test (Exp. 3505): Kalispell

Entry	Cultivar/Line	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Stripe rust % 3 rep avg 9-Jul	Grain moisture %	TKW g	Falling number	Protein %
	d = cultivars/lines dropped for 2020 test + = new for 2019, # = paid entry		RCB	RCB	LAT	LAT		RCB	RCB	LAT	LAT
		lattice efficiency relative to RCB	103%	104%	110%	115%		100%	100%	115%	112%
23 #	LCS Jet	Limagrain Cereal Seeds, 2015	145.7	58.8	166.4	33.2		11.5	40.2	315	7.5
13 d	MTW1491	MT08189//MT08187/(MTW08166,	145.2	60.6	167.8	41.0		12.6	43.2	360	8.1
44 + d	MT1773	MTS04114*2/PI640431	142.2	61.1	164.9	36.9		12.4	43.0	369	8.3
6	SY Clearstone 2CL	Montana/Syngenta, 2012	140.2	60.5	166.9	39.5		12.2	45.4	389	7.9
7	Northern	Montana, 2015	139.1	61.2	168.9	38.9		12.0	40.8	340	8.5
37	MT1683	Yellowstone(L)*2/CDC Buteo	138.7	60.9	165.5	38.1	7	12.1	43.4	384	8.5
33	MT1564 (Flathead)	Montana, 2019	136.9	61.3	161.9	36.2		12.0	42.6	373	8.3
36	MT1642	Yellowstone/Madsen//Yellowstone	135.7	62.0	168.1	36.6	tr	12.0	43.5	342	8.3
9	Keldin	WestBred, 2011	135.4	60.8	166.1	35.0		11.4	44.9	358	8.1
2	Judee	Montana, 2011	135.1	62.4	166.6	37.5		11.6	40.8	327	8.5
43 + d	MT1750	MT08185//YLL(L)/NX05M4391	134.8	62.7	166.6	32.8		11.6	38.4	361	8.5
29 #	AAC Wildfire	Alberta/SECAN, 2015	134.4	62.3	170.7	40.1	10	11.3	41.7	337	8.4
45 + d	MT1782	MT0859//MT0860/MT0885	132.9	62.1	164.8	35.0		11.9	40.8	372	8.6
39 +	MTCL1737	YLL-2CL/3/YLL*2/Pelsart//PROM/	132.5	60.5	169.1	33.1		11.9	35.8	334	8.3
11 d	Ray	Montana, 2018	131.4	60.4	171.0	42.9		12.6	43.0	410	8.4
8	Loma	Montana, 2016	130.3	61.6	168.0	35.5		12.6	39.4	257	8.7
10	FourOsix	Montana, 2018	129.1	60.2	165.1	33.6		11.6	40.9	361	8.0
24 # d	LCS Zoom	Limagrain Cereal Seeds, 2018 (LV	128.5	58.0	164.2	32.9		11.5	37.7	362	8.2
41 +	MT1746	MT06103//MTW0881/SD06W166	128.3	62.3	165.1	35.1		11.4	36.5	401	8.6
21 + d	MT1764	YLL*3/NE01533//PROM/3*YLL/3/	128.2	60.6	164.3	32.4		11.8	39.2	406	8.8
1	Yellowstone	Montana 2005	127.9	60.7	167.6	37.2		12.1	42.9	395	8.1
27 #+ d	Canvas	Plainsgold/Colorado Wheat Res F	127.7	61.6	164.8	32.1		11.9	35.5	370	8.3
28 #	Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2	126.2	59.5	164.0	37.5		12.2	41.8	344	7.8
12 d	Oahe	South Dakota, 2016	125.4	60.7	164.2	40.4		12.2	42.8	375	8.6
40 +	MT1745	Decade*2/NI06732	124.4	60.9	166.9	36.9		11.8	43.7	402	7.8
42 + d	MT1747	MT06103//MTW0881/SD06W166	123.7	61.9	165.0	33.3		11.8	37.4	385	8.3
38 +	MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/	123.3	60.7	168.0	33.8		11.5	41.1	346	8.0
35	MTCS1601R	MTS0531/7/MTS0532/6/96X17E6	122.6	62.4	166.0	36.6		11.8	39.7	413	8.8
26 #	Incline AX	Plainsgold/Colorado Wheat Res F	122.5	59.1	167.4	34.7	5	12.0	39.7	330	7.4
20 #+	WB4418	WestBred, 2018	122.2	59.5	162.7	31.0		11.4	33.9	339	8.4
19 #+	WB4311	WestBred, 2017	121.8	61.8	165.9	30.8		11.9	44.2	381	9.6
47 +	MT1793	Decade-Fhb1	121.7	60.0	163.1	35.4	17	11.7	36.7	384	8.8
25 #	Long Branch	Limagrain; Dyna-Gro Wheat, 2016	121.1	61.6	158.2	32.0	5	11.5	40.0	326	8.6
14 #	SY Monument	Syngenta (AgriPro), 2014	121.0	59.8	165.2	34.0	3	11.8	41.3	362	8.4
46 +	MT1787	MT08185//YLL*2/PI640431/3/PRC	120.7	61.4	168.1	31.8		12.1	39.4	361	8.6
49 + d	MTS1731(w)	MTS0531*2//PI640431/MTS04114	119.5	61.4	163.9	32.1	tr	11.6	36.3	356	8.5
16 #	SY Legend CL2	Syngenta, 2018 (07CL046-2)	119.0	61.2	164.8	32.9		11.9	41.6	402	8.5
30 #+ d	ASC107	Europe/All Star Seeds experiment	118.9	62.5	164.8	29.6		11.9	38.4	365	9.6
3	Warhorse	Montana, 2013	118.4	60.6	165.6	35.6		12.1	38.1	399	8.6
34	MTS1588 (Bobcat)	Montana, 2019	117.6	62.1	168.1	32.7		11.7	38.8	384	8.7
5 d	Decade	Montana/North Dakota, 2010	115.0	59.8	164.9	38.3	33	11.9	36.3	362	8.4
22 # d	LCS Chrome	Limagrain Cereal Seeds, 2016	113.3	61.0	162.8	35.9	tr	11.9	36.6	402	9.5
18 #+	WB4269	WestBred, 2017	112.8	61.4	164.9	29.5		11.6	35.5	379	8.8
17 #+	SY Wolverine	Syngenta 2019 (08BC379-40-1)	111.3	61.2	160.6	29.8		11.8	37.6	340	8.3
4	Brawl CL Plus	Plainsgold/Colorado Wheat Res F	110.0	61.2	159.4	32.9	18	11.7	38.5	385	9.3
32 #+ d	ASC122	Europe/All Star Seeds experiment	110.0	62.0	165.2	29.9		11.3	35.9	356	8.9
48 + d	MT1796	Decade-Fhb1	103.3	60.5	163.5	36.6	38	12.0	36.2	378	8.8
31 #+ d	ASC116	Europe/All Star Seeds experiment	100.4	59.6	157.7	33.0		11.7	48.3	472	10.0
15 #	SY 517 CL2	Syngenta (AgriPro), 2017	93.6	63.3	158.4	31.2		11.8	36.8	435	9.7
	Average		124.9	61.0	165.2	34.8		11.6	39.9	369.1	8.5
	LSD (0.05)		13.0	0.4	1.5	2.2		0.3	1.8	32.2	0.5
	C. V. (%)		6.4	0.4	0.5	3.6		1.8	2.7	5.1	3.6
	P-value (Varieties)		<.0001	<.0001	<.0001	<.0001		<.0001	<.0001	<.0001	<.0001

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 7. 2019 Intrastate Winter Wheat Test (Exp. 3507): Moccasin

Entry	Cultivar/Line	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Grain moisture %	Protein %
	d = cultivars/lines dropped for 2020 test + = new for 2019, # = paid entry		LAT	RCB	RCB	LAT	RCB	LAT
		lattice efficiency relative to RCB	147%	101%	97%	112%	102%	108%
23 #	LCS Jet	Limagrain Cereal Seeds, 2015	86.0	59.9	170.3	29.0	9.6	8.8
36	MT1642	Yellowstone/Madsen//Yellowstone	83.6	62.8	172.3	31.6	10.1	10.0
6	SY Clearstone 2CL	Montana/Syngenta, 2012	80.6	62.6	171.3	34.7	9.0	9.3
7	Northern	Montana, 2015	79.4	63.1	173.7	31.9	9.8	9.8
26 #	Incline AX	Plainsgold/Colorado Wheat Res F	78.1	62.1	171.7	31.3	8.4	9.3
29 #	AAC Wildfire	Alberta/SECAN, 2015	77.9	61.3	177.0	34.7	10.4	9.7
40 +	MT1745	Decade*2/NI06732	77.9	62.9	176.0	32.1	8.7	9.9
14 #	SY Monument	Syngenta (AgriPro), 2014	77.6	63.4	169.0	29.6	10.0	9.6
19 #+	WB4311	WestBred, 2017	77.2	62.5	169.3	28.7	8.7	10.8
13 d	MTW1491	MT08189//MT08187/(MTW08166,	76.4	63.3	172.7	33.5	11.4	9.2
10	FourOsix	Montana, 2018	76.3	63.1	171.0	30.5	9.5	9.5
28 #	Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2	76.2	61.0	168.7	32.2	9.7	9.0
25 #	Long Branch	Limagrain; Dyna-Gro Wheat, 2016	75.0	63.8	164.0	27.9	9.7	9.8
37	MT1683	Yellowstone(L)*2/CDC Buteo	74.7	62.7	172.0	33.2	8.1	9.6
24 # d	LCS Zoom	Limagrain Cereal Seeds, 2018 (Lv	73.9	60.5	170.3	29.2	9.5	9.4
17 #+	SY Wolverine	Syngenta 2019 (08BC379-40-1)	73.5	63.3	166.3	27.0	8.6	10.6
41 +	MT1746	MT06103//MTW0881/SD06W166	73.3	64.6	170.3	30.2	9.6	10.1
15 #	SY 517 CL2	Syngenta (AgriPro), 2017	73.1	63.0	168.7	31.0	10.0	10.4
9	Keldin	WestBred, 2011	73.0	63.5	174.0	31.6	9.2	9.6
45 + d	MT1782	MT0859//MT0860/MT0885	72.9	64.1	168.7	31.2	8.9	10.6
46 +	MT1787	MT08185//YLL*2/PI640431/3/PRC	72.7	63.6	174.0	28.6	10.4	9.8
42 + d	MT1747	MT06103//MTW0881/SD06W166	72.1	64.9	169.7	29.4	10.2	9.8
5 d	Decade	Montana/North Dakota, 2010	72.0	63.8	169.3	33.0	10.0	10.4
1	Yellowstone	Montana 2005	71.9	62.9	170.7	33.9	9.6	9.6
8	Loma	Montana, 2016	71.6	63.0	171.3	30.5	9.6	9.6
39 +	MTCL1737	YLL-2CL/3/YLL*2/Pelsart//PROM/	71.6	61.2	175.3	29.0	11.4	9.8
34	MTS1588 (Bobcat)	Montana, 2019	71.4	63.7	171.3	29.9	10.1	9.8
38 +	MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/	71.3	62.4	172.0	29.6	8.4	9.6
20 #+	WB4418	WestBred, 2018	71.0	62.9	167.0	27.9	8.9	10.4
2	Judee	Montana, 2011	69.6	64.5	170.3	31.3	9.8	10.1
44 + d	MT1773	MTS04114*2/PI640431	69.6	63.7	169.3	31.0	9.8	10.1
48 + d	MT1796	Decade-Fhb1	68.6	63.9	168.0	32.3	9.5	11.6
18 #+	WB4269	WestBred, 2017	68.3	64.0	167.7	27.9	10.0	10.9
35	MTCS1601R	MTS0531/7/MTS0532/6/96X17E6	68.0	63.8	169.7	31.8	9.0	10.4
12 d	Oahe	South Dakota, 2016	67.6	64.6	167.7	33.6	10.2	10.4
22 # d	LCS Chrome	Limagrain Cereal Seeds, 2016	67.2	63.0	165.7	30.6	8.4	11.3
32 #+ d	ASC122	Europe/All Star Seeds experiment	66.9	64.2	170.3	27.4	10.3	11.0
3	Warhorse	Montana, 2013	66.0	63.6	170.0	30.4	10.0	10.3
27 #+ d	Canvas	Plainsgold/Colorado Wheat Res F	65.8	64.0	168.7	27.9	8.4	10.4
21 + d	MT1764	YLL*3/NE01533//PROM/3*YLL/3/	65.8	64.4	168.7	29.0	10.1	9.8
43 + d	MT1750	MT08185//YLL(L)/NX05M4391	65.6	64.4	175.3	28.8	8.1	10.5
49 + d	MTS1731(w)	MTS0531*2//PI640431/MTS04114	65.0	64.4	168.0	27.5	9.8	10.6
33	MT1564 (Flathead)	Montana, 2019	64.4	64.0	167.0	30.6	9.3	10.1
31 #+ d	ASC116	Europe/All Star Seeds experiment	64.3	62.2	165.0	28.0	8.3	12.2
16 #	SY Legend CL2	Syngenta, 2018 (07CL046-2)	64.3	64.6	168.7	30.4	9.9	10.8
47 +	MT1793	Decade-Fhb1	63.4	63.7	167.3	30.8	9.7	11.2
4	Brawl CL Plus	Plainsgold/Colorado Wheat Res F	63.1	65.0	165.0	28.9	9.3	10.9
30 #+ d	ASC107	Europe/All Star Seeds experiment	57.2	63.8	170.3	28.8	10.6	10.7
11 d	Ray	Montana, 2018	56.7	61.4	175.0	36.4	7.9	9.0
Average			71.2	63.2	170.1	30.5	9.3	10.1
LSD (0.05)			9.4	1.7	2.5	2.3	ns	0.6
C. V. (%)			7.6	1.6	0.9	4.4	14.2	3.8
P-value (Varieties)			<.0001	<.0001	<.0001	<.0001	0.1414	<.0001

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 8. 2019 Intrastate Winter Wheat Test (Exp. 3508): Huntley

Entry	Cultivar/Line	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Lodg- ing %	Grain moisture %	Protein %
d = cultivars/lines dropped for 2020 test + = new for 2019, # = paid entry			RCB	LAT	LAT	LAT	RCB	RCB	LAT
lattice efficiency relative to RCB				106%	107%	106%			127%
17 #+	SY Wolverine	Syngenta 2019 (08BC379-40-1)	133.1	63.1	162.6	35.2	0	9.5	11.8
9	Keldin	WestBred, 2011	133.0	62.5	168.4	38.6	3	9.3	11.2
23 #	LCS Jet	Limagrains Cereal Seeds, 2015	129.1	60.3	168.6	37.7	0	8.9	12.5
42 + d	MT1747	MT06103//MTW0881/SD06W166	128.1	64.3	167.3	38.5	13	9.5	11.8
15 #	SY 517 CL2	Syngenta (AgriPro), 2017	126.8	64.3	160.3	36.8	0	9.7	12.1
45 + d	MT1782	MT0859//MT0860/MT0885	126.2	63.4	166.2	40.4	6	9.5	11.8
4	Brawl CL Plus	Plainsgold/Colorado Wheat Res F	123.2	63.9	159.1	37.6	8	9.3	12.9
22 # d	LCS Chrome	Limagrains Cereal Seeds, 2016	122.0	63.0	164.0	41.3	8	9.2	12.0
33	MT1564 (Flathead)	Montana, 2019	120.7	62.3	163.3	40.0	0	9.4	12.2
19 #+	WB4311	WestBred, 2017	120.5	63.2	164.3	36.5	0	9.2	12.2
41 +	MT1746	MT06103//MTW0881/SD06W166	120.3	64.1	167.5	37.8	3	9.6	11.6
36	MT1642	Yellowstone/Madsen//Yellowstone	119.9	61.5	172.1	40.9	0	9.0	12.2
28 #	Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2	119.7	60.6	163.4	41.9	19	9.4	11.2
24 # d	LCS Zoom	Limagrains Cereal Seeds, 2018 (LV	119.3	58.5	163.5	37.3	0	8.7	12.3
14 #	SY Monument	Syngenta (AgriPro), 2014	118.4	60.5	165.7	37.5	12	8.9	11.6
31 #+ d	ASC116	Europe/All Star Seeds experiment	117.4	62.0	158.5	36.0	0	9.2	12.7
48 + d	MT1796	Decade-Fhb1	117.0	63.3	165.9	42.2	9	9.2	11.7
39 +	MTCL1737	YLL-2CL/3/YLL*2/Pelsart//PROM/	116.9	61.4	171.5	37.3	0	8.7	12.0
25 #	Long Branch	Limagrains; Dyna-Gro Wheat, 2016	116.7	62.1	161.9	37.9	28	9.3	11.5
13 d	MTW1491	MT08189//MT08187/(MTW08166,	116.3	61.9	169.2	42.4	3	9.4	11.4
5 d	Decade	Montana/North Dakota, 2010	115.5	62.0	166.6	41.0	13	9.1	11.6
38 +	MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/I	114.4	59.8	167.7	38.4	0	9.2	12.2
18 #+	WB4269	WestBred, 2017	114.4	62.8	162.2	36.7	0	9.4	11.2
47 +	MT1793	Decade-Fhb1	114.1	61.5	164.9	39.3	3	9.0	11.9
40 +	MT1745	Decade*2/NI06732	112.7	61.2	168.4	39.0	0	9.0	12.1
6	SY Clearstone 2CL	Montana/Syngenta, 2012	111.2	59.9	168.4	41.8	32	8.9	12.1
37	MT1683	Yellowstone(L)*2/CDC Buteo	111.0	60.2	168.8	41.8	13	8.9	12.4
7	Northern	Montana, 2015	110.9	62.2	170.8	39.8	22	8.9	12.2
35	MTCS1601R	MTS0531/7/MTS0532/6/96X17E6	110.8	62.9	166.7	38.4	15	9.6	12.4
46 +	MT1787	MT08185//YLL*2/PI640431/3/PRO	108.5	61.9	168.5	34.7	6	9.2	12.5
43 + d	MT1750	MT08185//YLL(L)/NX05M4391	108.4	63.2	169.9	35.6	4	9.3	12.3
20 #+	WB4418	WestBred, 2018	107.7	61.4	163.4	35.9	3	8.9	12.0
3	Warhorse	Montana, 2013	107.5	62.1	168.6	38.7	6	8.9	13.1
12 d	Oahe	South Dakota, 2016	106.5	63.7	164.9	42.2	55	9.5	12.0
49 + d	MTS1731(w)	MTS0531*2//PI640431/MTS04114	106.0	61.6	165.2	34.7	29	9.6	12.4
44 + d	MT1773	MTS04114*2/PI640431	105.8	60.1	168.6	38.7	43	8.9	12.4
1	Yellowstone	Montana 2005	105.6	60.3	169.6	41.3	3	9.0	12.4
10	FourOsix	Montana, 2018	105.2	61.6	168.5	38.9	0	9.3	12.4
26 #	Incline AX	Plainsgold/Colorado Wheat Res F	104.1	59.9	166.3	39.1	0	8.8	11.2
21 + d	MT1764	YLL*3/NE01533//PROM/3*YLL/3/	102.7	60.6	164.7	35.4	34	8.8	12.2
30 #+ d	ASC107	Europe/All Star Seeds experiment	101.0	60.7	164.6	35.0	0	9.1	13.6
11 d	Ray	Montana, 2018	100.5	59.1	173.1	47.1	67	8.7	12.7
34	MTS1588 (Bobcat)	Montana, 2019	99.9	62.1	169.7	36.9	10	9.3	12.8
16 #	SY Legend CL2	Syngenta, 2018 (07CL046-2)	97.9	59.8	163.7	39.4	70	9.3	12.2
29 #	AAC Wildfire	Alberta/SECAN, 2015	97.8	62.0	173.5	42.1	24	9.1	12.8
2	Judee	Montana, 2011	96.0	61.0	168.5	40.0	6	9.1	12.9
27 #+ d	Canvas	Plainsgold/Colorado Wheat Res F	95.6	61.7	165.2	37.0	0	9.5	11.7
8	Loma	Montana, 2016	93.2	60.5	171.3	39.4	15	9.0	12.1
32 #+ d	ASC122	Europe/All Star Seeds experiment	89.0	61.1	166.2	31.3	0	8.8	14.4
Average			112.2	61.7	166.6	38.6	12.0	9.2	12.2
LSD (0.05)			9.2	0.9	1.5	2.9	8.0	0.3	0.6
C. V. (%)			5.2	0.9	0.5	4.4	17.1	1.8	2.7
P-value (Varieties)									

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 9. 2019 Intrastate Winter Wheat Test (Exp. 3518): Conrad

Entry	Cultivar/Line	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Lodging/Sawfly cutting %		Protein %
			LAT	LAT	RCB	LAT	30-Jul LAT	harvest LAT	LAT
		lattice efficiency relative to RCB	212%	188%	103%	125%	126%	112%	304%
46 +	MT1787	MT08185//YLL*2/PI640431/3/PRO	79.7	58.1	167.7	26.9	11	44	13.7
4 d	Brawl CL Plus	Plainsgold/Colorado Wheat Res F	79.5	58.4	159.7	29.2	17	48	13.1
31 #+	ASC116	Europe/All Star Seeds experiment	76.7	57.4	159.7	27.8	39	64	14.4
27 #+	d Canvas	Plainsgold/Colorado Wheat Res F	75.4	60.4	164.3	27.9	19	45	12.0
18 #+	WB4269	WestBred, 2017	75.2	59.3	163.3	26.3	20	40	12.2
21 +	MT1764	YLL*3/NE01533//PROM/3*YLL/3/\	73.3	57.3	164.0	28.2	32	71	13.3
23 #	d LCS Jet	Limagrain Cereal Seeds, 2015	73.0	55.1	168.0	26.4	19	37	13.5
9	Keldin	WestBred, 2011	72.8	56.9	166.7	29.2	57	79	13.7
25 #	d Long Branch	Limagrain; Dyna-Gro Wheat, 2016	72.8	57.6	161.0	29.4	23	41	12.7
32 #+	ASC122	Europe/All Star Seeds experiment	72.1	59.7	167.0	26.0	9	17	14.4
14 #	SY Monument	Syngenta (AgriPro), 2014	71.6	56.5	165.0	28.7	45	80	12.6
40 +	MT1745	Decade*2/NI06732	71.6	57.0	168.3	30.6	9	43	13.0
17 #+	SY Wolverine	Syngenta 2019 (08BC379-40-1)	71.5	59.8	163.3	27.3	15	38	13.7
39 +	d MTCL1737	YLL-2CL/3/YLL*2/Pelsart//PROM/	70.7	56.9	169.0	27.1	16	43	13.7
49 +	MTS1731(w)	MTS0531*2//PI640431/MTS04114	69.9	58.1	164.7	28.0	5	21	13.6
19 #+	WB4311	WestBred, 2017	69.3	59.3	165.7	27.1	12	55	13.3
7 d	Northern	Montana, 2015	69.1	57.3	168.3	32.2	23	40	14.0
42 +	MT1747	MT06103//MTW0881/SD06W166	68.5	58.2	166.0	29.0	20	32	13.7
34	MTS1588 (Bobcat)	Montana, 2019	68.3	58.0	168.7	27.6	2	20	14.1
24 #	d LCS Zoom	Limagrain Cereal Seeds, 2018 (LV	67.4	53.5	166.3	28.6	42	78	13.6
45 +	MT1782	MT0859//MT0860/MT0885	66.9	60.1	164.0	29.4	14	48	12.9
13 d	MTW1491	MT08189//MT08187/(MTW08166,	66.7	57.7	168.3	29.6	19	37	13.5
12	Oahe	South Dakota, 2016	66.6	57.8	163.7	32.4	19	49	12.9
47 +	MT1793	Decade-Fhb1	66.0	56.8	164.0	28.5	62	81	13.4
28 #	Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 21	65.7	55.9	164.7	30.8	16	30	13.3
36 d	MT1642	Yellowstone/Madsen//Yellowstone	65.5	57.4	169.3	29.7	19	62	13.7
35 d	MTCS1601R	MTS0531/7/MTS0532/6/96X17E6	64.7	58.0	168.3	29.1	23	49	14.5
44 +	MT1773	MTS04114*2/PI640431	64.7	57.2	167.7	28.6	22	62	13.5
10	FourOsix	Montana, 2018	64.4	56.3	165.7	28.1	22	66	13.7
8 d	Loma	Montana, 2016	64.1	56.8	167.7	27.0	23	48	14.0
15 #	d SY 517 CL2	Syngenta (AgriPro), 2017	63.9	58.9	161.3	26.8	31	60	12.7
33	MT1564 (Flathead)	Montana, 2019	63.1	55.6	163.3	28.8	23	57	13.5
41 +	MT1746	MT06103//MTW0881/SD06W166	62.8	58.0	166.7	27.9	10	53	13.4
6	SY Clearstone 2CL	Montana/Syngenta, 2012	62.7	55.4	167.3	29.7	47	66	13.9
20 #+	WB4418	WestBred, 2018	62.0	55.8	162.0	25.7	11	25	13.3
30 #+	d ASC107	Europe/All Star Seeds experiment	61.6	57.9	165.0	25.5	31	65	13.6
22 #	LCS Chrome	Limagrain Cereal Seeds, 2016	60.9	57.4	164.7	30.6	65	77	13.7
26 #	d Incline AX	Plainsgold/Colorado Wheat Res F	60.7	55.7	165.7	29.3	12	42	12.5
48 +	MT1796	Decade-Fhb1	60.4	57.8	164.3	29.1	61	82	13.5
16 #	SY Legend CL2	Syngenta, 2018 (07CL046-2)	59.9	56.5	165.7	29.1	69	90	13.8
1	Yellowstone	Montana 2005	57.4	56.1	168.7	31.1	30	58	13.6
37	MT1683	Yellowstone(L)*2/CDC Buteo	56.5	56.0	166.7	30.9	30	60	13.8
11	Ray	Montana, 2018	56.1	56.6	171.0	34.0	23	49	14.1
5	Decade	Montana/North Dakota, 2010	56.0	56.0	165.0	29.3	21	56	14.1
43 +	MT1750	MT08185//YLL(L)/NX05M4391	53.4	57.6	168.0	25.9	4	45	13.9
38 +	d MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3//	52.2	55.5	167.3	27.1	4	5	13.9
29 #	AAC Wildfire	Alberta/SECAN, 2015	50.3	57.5	171.3	29.0	25	51	14.8
3 d	Warhorse	Montana, 2013	49.6	55.2	167.7	28.5	9	27	14.3
2 d	Judee	Montana, 2011	48.7	57.1	166.3	28.9	20	52	14.9
Average			65.3	57.3	165.9	28.7	24.5	50.8	13.6
LSD (0.05)			10.3	1.8	1.6	2.1	15.5	23.5	0.8
C. V. (%)			9.0	1.8	0.6	4.3	36.5	27.2	3.2
P-value (Varieties)			<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 10. 2019 Intrastate Winter Wheat Test (Exp. 35FB): Fort Benton/Carter (Northern Seeds)

Entry	Cultivar/Line	Pedigree	Yield bu/ac	Test weight lb/bu	Sawfly cutting/ Lodging %		Protein %
					29-Jul	4-Aug	
					RCB	RCB	
d = cultivars/lines dropped for 2020 test + = new for 2019, # = paid entry			RCB	RCB	RCB	RCB	
49 + d	MTS1731(w)	MTS0531*2//PI640431/MTS04114	74.6	61.4	7	43	12.6
12 d	Oahe	South Dakota, 2016	63.7	61.5	68	67	12.5
27 #+ d	Canvas	Plainsgold/Colorado Wheat Res F	62.2	61.4	55	75	12.6
34	MTS1588 (Bobcat)	Montana, 2019	62.0	60.6	2	18	13.1
4	Brawl CL Plus	Plainsgold/Colorado Wheat Res F	61.1	61.1	73	73	12.6
2	Judee	Montana, 2011	60.9	61.3	25	45	13.4
40 +	MT1745	Decade*2/NI06732	59.7	59.8	33	45	12.3
8	Loma	Montana, 2016	59.7	60.1	15	32	13.0
15 #	SY 517 CL2	Syngenta (AgriPro), 2017	59.4	61.3	40	53	13.1
33	MT1564 (Flathead)	Montana, 2019	59.0	59.8	48	77	12.4
24 # d	LCS Zoom	Limagrain Cereal Seeds, 2018 (LV	59.0	54.7	82	92	12.7
25 #	Long Branch	Limagrain; Dyna-Gro Wheat, 2016	58.2	59.9	70	67	12.1
46 +	MT1787	MT08185//YLL*2/PI640431/3/PRC	58.0	60.4	17	57	13.2
3	Warhorse	Montana, 2013	57.5	61.0	1	13	13.5
43 + d	MT1750	MT08185//YLL(L)/NX05M4391	57.5	62.0	17	25	13.1
19 #+	WB4311	WestBred, 2017	57.4	61.0	33	58	13.0
36	MT1642	Yellowstone/Madsen//Yellowstone	57.1	59.4	28	58	13.3
38 +	MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/	56.9	59.2	7	23	12.7
21 + d	MT1764	YLL*3/NE01533//PROM/3*YLL/3/	56.8	59.8	37	63	13.1
5 d	Decade	Montana/North Dakota, 2010	56.7	59.5	62	63	13.3
10	FourOsix	Montana, 2018	56.7	58.8	70	73	13.0
41 +	MT1746	MT06103//MTW0881/SD06W166	56.7	62.3	6	28	12.8
35	MTCS1601R	MTS0531/7/MTS0532/6/96X17E6	56.7	60.3	33	67	12.9
42 + d	MT1747	MT06103//MTW0881/SD06W166	56.7	62.4	20	43	12.6
6	SY Clearstone 2CL	Montana/Syngenta, 2012	56.7	59.3	85	77	13.1
14 #	SY Monument	Syngenta (AgriPro), 2014	56.6	59.0	67	65	12.3
18 #+	WB4269	WestBred, 2017	56.2	60.8	38	62	12.2
7	Northern	Montana, 2015	56.1	60.1	57	50	13.4
47 +	MT1793	Decade-Fhb1	56.0	60.4	68	65	13.5
9	Keldin	WestBred, 2011	55.6	59.7	70	63	13.0
44 + d	MT1773	MTS04114*2/PI640431	54.9	60.0	50	77	12.7
37	MT1683	Yellowstone(L)*2/CDC Buteo	54.8	59.0	80	80	13.1
16 #	SY Legend CL2	Syngenta, 2018 (07CL046-2)	54.6	58.8	93	92	13.1
20 #+	WB4418	WestBred, 2018	54.2	60.2	42	55	12.4
22 # d	LCS Chrome	Limagrain Cereal Seeds, 2016	54.1	60.2	87	78	12.9
13 d	MTW1491	MT08189//MT08187/(MTW08166,	53.8	57.9	77	73	12.8
45 + d	MT1782	MT0859//MT0860/MT0885	53.7	62.0	35	50	12.6
39 +	MTCL1737	YLL-2CL/3/YLL*2/Pelsart//PROM/	53.4	59.0	22	52	13.6
48 + d	MT1796	Decade-Fhb1	53.2	61.1	48	60	13.7
32 #+ d	ASC122	Europe/All Star Seeds experiment	52.9	59.7	3	10	14.1
31 #+ d	ASC116	Europe/All Star Seeds experiment	52.3	59.0	52	43	14.8
23 #	LCS Jet	Limagrain Cereal Seeds, 2015	52.3	56.5	28	50	12.6
1	Yellowstone	Montana 2005	51.9	58.9	78	80	12.9
26 #	Incline AX	Plainsgold/Colorado Wheat Res F	50.7	58.1	15	37	12.1
11 d	Ray	Montana, 2018	48.1	56.6	75	63	13.2
28 #	Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2	46.4	57.0	52	63	12.0
29 #	AAC Wildfire	Alberta/SECAN, 2015	45.1	61.0	52	53	13.3
17 #+	SY Wolverine	Syngenta 2019 (08BC379-40-1)	44.1	60.7	45	60	14.0
30 #+ d	ASC107	Europe/All Star Seeds experiment	40.9	58.9	85	77	13.6
Average			57.9	59.9	46.0	57.0	13.0
LSD (0.05)			11.5	1.9	24.4	18.4	0.5
C. V. (%)			12.2	1.9	32.7	20.0	2.2
P-value (Varieties)			0.0092	<.0001	<.0001	<.0001	<.0001

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 11. 2019 Intrastate Winter Wheat Test (Exp. 35): Multi-Location Yield (bu/a)

Cultivar/Line	Bozeman LAT	Havre LAT	Sidney RCB	Williston LAT	Kalispell RCB	Moccasin LAT	Huntley RCB	Conrad LAT	Ft. Benton RCB	9 Loc Avg.
lattice efficiency	129%	128%		154%		147%		212%		
d MTW1491	149.6	57.5	87.3	63.9	145.2	76.4	116.3	66.7	53.8	90.7
# LCS Jet	146.0	58.9	75.6	48.8	145.7	86.0	129.1	73.0	52.3	90.6
Northern	145.1	57.7	86.6	53.1	139.1	79.4	110.9	69.1	56.1	88.6
Keldin	152.8	52.4	66.8	52.4	135.4	73.0	133.0	72.8	55.6	88.2
MT1642	144.0	51.3	68.4	63.2	135.7	83.6	119.9	65.5	57.1	87.6
+ MT1745	137.2	57.5	87.8	52.3	124.4	77.9	112.7	71.6	59.7	86.8
SY Clearstone 2CL	144.5	56.8	73.7	45.5	140.2	80.6	111.2	62.7	56.7	85.8
MT1683	139.2	51.6	79.0	56.8	138.7	74.7	111.0	56.5	54.8	84.7
+ MTCL1737	125.0	56.4	76.2	56.1	132.5	71.6	116.9	70.7	53.4	84.3
+ MT1746	129.7	54.8	70.1	52.3	128.3	73.3	120.3	62.8	56.7	83.1
+ MT1787	125.6	52.3	68.6	60.3	120.7	72.7	108.5	79.7	58.0	82.9
+ d MT1782	130.1	53.5	59.7	48.9	132.9	72.9	126.2	66.9	53.7	82.8
MTCS1601R	127.7	61.6	79.3	50.8	122.6	68.0	110.8	64.7	56.7	82.5
+ d MTS1731(w)	131.7	54.0	68.1	53.0	119.5	65.0	106.0	69.9	74.6	82.4
Yellowstone	142.4	54.8	73.3	55.6	127.9	71.9	105.6	57.4	51.9	82.3
MT1564 (Flathead)	134.9	49.1	66.6	44.7	136.9	64.4	120.7	63.1	59.0	82.2
+ d MT1773	138.6	49.1	70.7	43.8	142.2	69.6	105.8	64.7	54.9	82.2
FourOsix	128.6	57.5	64.6	56.7	129.1	76.3	105.2	64.4	56.7	82.1
# d LCS Zoom	133.0	48.7	50.7	56.4	128.5	73.9	119.3	67.4	59.0	81.9
+ d MT1747	134.8	52.6	52.8	47.1	123.7	72.1	128.1	68.5	56.7	81.8
# SY Monument	130.8	57.4	38.7	58.5	121.0	77.6	118.4	71.6	56.6	81.2
# Long Branch	120.7	61.5	50.8	52.2	121.1	75.0	116.7	72.8	58.2	81.0
# AAC Wildfire	125.3	54.0	88.8	54.1	134.4	77.9	97.8	50.3	45.1	80.9
Loma	128.7	51.1	71.8	57.9	130.3	71.6	93.2	64.1	59.7	80.9
MTS1588 (Bobcat)	119.5	62.6	65.2	57.5	117.6	71.4	99.9	68.3	62.0	80.4
# Byrd CL Plus	138.1	51.0	51.2	48.6	126.2	76.2	119.7	65.7	46.4	80.3
WB4311	126.6	51.1	45.4	49.4	121.8	77.2	120.5	69.3	57.4	79.9
Judee	122.5	52.6	81.1	49.3	135.1	69.6	96.0	48.7	60.9	79.5
d Decade	127.4	55.5	68.8	47.6	115.0	72.0	115.5	56.0	56.7	79.4
+ MT1793	124.6	58.5	65.1	43.2	121.7	63.4	114.1	66.0	56.0	79.2
d Ray	138.8	58.9	64.6	52.8	131.4	56.7	100.5	56.1	48.1	78.7
+ d MT1764	130.1	51.6	45.8	52.7	128.2	65.8	102.7	73.3	56.8	78.6
# Incline AX	122.0	63.1	48.3	57.0	122.5	78.1	104.1	60.7	50.7	78.5
+ MTCL1732	118.5	53.0	65.0	51.3	123.3	71.3	114.4	52.2	56.9	78.4
# d LCS Chrome	129.9	48.2	50.7	56.5	113.3	67.2	122.0	60.9	54.1	78.1
+ d MT1750	130.0	49.8	46.2	56.2	134.8	65.6	108.4	53.4	57.5	78.0
d Oahe	138.0	46.7	38.6	45.5	125.4	67.6	106.5	66.6	63.7	77.6
WB4311	113.1	55.5	46.8	55.3	127.7	65.8	95.6	75.4	62.2	77.5
Brawl CL Plus	126.3	52.2	35.8	43.8	110.0	63.1	123.2	79.5	61.1	77.2
+ d MT1796	127.6	47.8	63.5	44.2	103.3	68.6	117.0	60.4	53.2	76.2
Warhorse	118.9	46.5	53.4	50.8	118.4	66.0	107.5	49.6	57.5	74.3
WB4311	112.6	48.9	25.5	47.6	111.3	73.5	133.1	71.5	44.1	74.2
WB4269	113.7	53.5	33.9	37.4	112.8	68.3	114.4	75.2	56.2	73.9
WB4418	112.0	53.5	40.7	38.7	122.2	71.0	107.7	62.0	54.2	73.6
# SY 517 CL2	117.3	46.4	26.3	44.1	93.6	73.1	126.8	63.9	59.4	72.3
# SY Legend CL2	113.7	53.6	38.7	45.4	119.0	64.3	97.9	59.9	54.6	71.9
WB4311	120.9	41.3	20.6	22.5	100.4	64.3	117.4	76.7	52.3	68.5
ASC122	103.0	39.5	15.5	27.4	110.0	66.9	89.0	72.1	52.9	64.0
ASC107	107.3	38.0	5.5	34.4	118.9	57.2	101.0	61.6	40.9	62.8
Average	128.5	52.9	57.5	49.9	124.9	71.2	112.2	65.3	57.9	79.8
LSD (0.05)	12.7	7.4	15.9	12.5	13.0	9.4	9.2	10.3	11.5	8.5
C. V. (%)	5.7	8.0	17.1	14.3	6.4	7.6	5.2	9.0	12.2	11.5
P-value (Varieties)	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001		<.0001	0.0092	<.0001

+ = new for 2019, # = paid entry

d = cultivars/lines dropped for 2020 test

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 12. 2019 Intrastate Winter Wheat Test (Exp. 35): Multi-Location Test Weight (lb/bu)

Cultivar/Line	Bozeman LAT	Havre LAT	Sidney RCB	Williston LAT	Kalispell RCB	Moccasin RCB	Huntley LAT	Conrad LAT	Ft. Benton RCB	9 Loc Avg.
lattice efficiency	113%	143%		111%	104%	101%	106%	188%		
#+ d Canvas	64.5	62.4	64.7	62.5	61.6	64.0	61.7	60.4	61.4	62.6
+ MT1746	64.6	61.5	64.1	61.2	62.3	64.6	64.1	58.0	62.3	62.5
+ d MT1747	64.7	61.6	63.4	60.8	61.9	64.9	64.3	58.2	62.4	62.5
+ d MT1782	64.3	60.9	64.0	60.7	62.1	64.1	63.4	60.1	62.0	62.4
# SY 517 CL2	64.6	61.3	63.4	61.7	63.3	63.0	64.3	58.9	61.3	62.4
+ d MT1750	64.5	61.4	62.9	61.7	62.7	64.4	63.2	57.6	62.0	62.3
Brawl CL Plus	64.5	62.0	63.3	60.8	61.2	65.0	63.9	58.4	61.1	62.2
Judee	63.5	61.3	65.1	61.9	62.4	64.5	61.0	57.1	61.3	62.0
MTCS1601R	63.8	60.7	64.4	60.2	62.4	63.8	62.9	58.0	60.3	61.8
d Oahe	64.0	60.2	63.0	60.8	60.7	64.6	63.7	57.8	61.5	61.8
#+ WB4311	64.2	60.4	63.2	60.3	61.8	62.5	63.2	59.3	61.0	61.8
MTS1588 (Bobcat)	63.2	60.6	64.2	60.7	62.1	63.7	62.1	58.0	60.6	61.7
#+ SY Wolverine	63.2	60.3	61.9	60.6	61.2	63.3	63.1	59.8	60.7	61.6
#+ WB4269	63.2	60.8	62.9	59.4	61.4	64.0	62.8	59.3	60.8	61.6
# Long Branch	63.6	60.9	63.4	60.9	61.6	63.8	62.1	57.6	59.9	61.5
+ d MT1796	62.9	60.0	63.5	60.5	60.5	63.9	63.3	57.8	61.1	61.5
+ d MTS1731(w)	63.3	59.8	63.5	60.3	61.4	64.4	61.6	58.1	61.4	61.5
#+ d ASC122	63.5	59.9	61.5	60.3	62.0	64.2	61.1	59.7	59.7	61.4
+ MT1787	63.0	60.3	63.1	60.9	61.4	63.6	61.9	58.1	60.4	61.4
Keldin	63.6	59.9	63.8	61.2	60.8	63.5	62.5	56.9	59.7	61.3
# d LCS Chrome	63.4	59.6	63.3	61.0	61.0	63.0	63.0	57.4	60.2	61.3
MT1564 (Flathead)	64.1	60.4	64.0	60.6	61.3	64.0	62.3	55.6	59.8	61.3
Northern	63.0	60.3	63.6	61.0	61.2	63.1	62.2	57.3	60.1	61.3
# AAC Wildfire	63.0	58.8	64.5	60.5	62.3	61.3	62.0	57.5	61.0	61.2
+ MT1745	63.4	60.9	64.0	60.9	60.9	62.9	61.2	57.0	59.8	61.2
# SY Legend CL2	64.0	60.6	63.2	61.4	61.2	64.6	59.8	56.5	58.8	61.1
Warhorse	62.8	60.2	63.0	61.4	60.6	63.6	62.1	55.2	61.0	61.1
d Decade	62.6	60.1	63.6	60.5	59.8	63.8	62.0	56.0	59.5	60.9
Loma	63.0	59.7	62.5	60.7	61.6	63.0	60.5	56.8	60.1	60.9
+ d MT1773	62.9	60.2	63.6	59.7	61.1	63.7	60.1	57.2	60.0	60.9
+ MT1793	62.5	59.7	63.4	60.1	60.0	63.7	61.5	56.8	60.4	60.9
d MTW1491	63.6	59.6	63.7	59.9	60.6	63.3	61.9	57.7	57.9	60.9
#+ d ASC107	63.0	59.7	<u>1/</u>	59.9	62.5	63.8	60.7	57.9	58.9	60.8
FourOsix	63.1	60.0	62.9	60.8	60.2	63.1	61.6	56.3	58.8	60.8
MT1642	62.7	58.8	62.1	60.1	62.0	62.8	61.5	57.4	59.4	60.8
+ d MT1764	63.0	59.9	62.2	59.2	60.6	64.4	60.6	57.3	59.8	60.8
MT1683	62.3	59.8	62.7	60.7	60.9	62.7	60.2	56.0	59.0	60.5
Yellowstone	62.2	59.5	62.8	60.3	60.7	62.9	60.3	56.1	58.9	60.4
+ MTCL1737	62.3	58.6	62.9	59.7	60.5	61.2	61.4	56.9	59.0	60.3
# SY Monument	62.4	59.5	60.8	60.4	59.8	63.4	60.5	56.5	59.0	60.3
# Byrd CL Plus	62.9	60.6	63.0	61.1	59.5	61.0	60.6	55.9	57.0	60.2
SY Clearstone 2CL	61.6	59.5	63.1	60.1	60.5	62.6	59.9	55.4	59.3	60.2
#+ WB4418	61.8	59.9	62.8	57.8	59.5	62.9	61.4	55.8	60.2	60.2
+ MTCL1732	61.1	59.6	62.8	59.5	60.7	62.4	59.8	55.5	59.2	60.1
#+ d ASC116	61.8	60.1	59.1	56.8	59.6	62.2	62.0	57.4	59.0	59.8
# Incline AX	61.6	59.8	61.4	60.0	59.1	62.1	59.9	55.7	58.1	59.7
d Ray	61.7	58.7	60.8	59.5	60.4	61.4	59.1	56.6	56.6	59.4
# LCS Jet	61.4	57.5	60.2	57.3	58.8	59.9	60.3	55.1	56.5	58.6
# d LCS Zoom	59.4	57.6	58.1	57.9	58.0	60.5	58.5	53.5	54.7	57.6
Average	63.0	60.1	62.9	60.3	61.0	63.2	61.7	57.3	59.9	61.0
LSD (0.05)	0.6	0.6	1.3	0.9	0.4	1.7	0.9	1.8	1.9	0.7
C. V. (%)	0.6	0.6	1.2	0.8	0.4	1.6	0.9	1.8	1.9	1.3
P-value (Varieties)	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001		<.0001	<.0001	<.0001

+ = new for 2019, # = paid entry

d = cultivars/lines dropped for 2020 test

bold = indicates highest value within a column

1/ = not in overall statistics, due to no value at Sidney

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 13. 2019 Intrastate Winter Wheat Test (Exp. 35): Multi-Location Winter Survival (%)

Cultivar/Line		Sidney			Williston	2 Loc Avg.
		Eval #1	Eval #2	Average		
lattice efficiency					131%	
+	MT1793	42	37	39	87	63
+	MT1745	28	32	30	81	55
	MT1564 (Flathead)	25	27	26	82	54
#	AAC Wildfire	18	20	19	87	53
	Judee	17	23	20	85	53
d	Decade	27	22	24	80	52
	MT1683	18	22	20	84	52
	SY Clearstone 2CL	18	17	18	85	51
#	Long Branch	19	17	18	84	51
	MTCS1601R	22	23	23	80	51
+	d MT1796	22	22	22	80	51
+	d MT1782	15	25	20	81	50
+	MT1746	20	23	22	79	50
+	d MT1773	17	17	17	84	50
	Yellowstone	18	22	20	80	50
d	MTW1491	22	20	21	79	50
d	Oahe	19	25	22	77	50
#	SY Monument	12	14	13	85	49
	Loma	14	12	13	85	49
+	d MT1764	13	17	15	82	49
	Brawl CL Plus	11	18	15	82	49
+	MTCL1737	15	17	16	79	48
+	MT1787	13	14	14	81	47
+	d MTS1731(w)	17	18	18	77	47
	Keldin	15	20	18	75	47
	Warhorse	11	15	13	80	46
	Northern	21	22	22	71	46
# d	LCS Chrome	10	10	10	82	46
+	MTCL1732	12	17	15	77	46
+	d MT1747	11	13	12	80	46
#+	WB4418	10	10	10	81	45
	FourOsix	10	13	12	79	45
d	Ray	12	14	13	76	45
# d	LCS Zoom	12	10	11	77	44
#+	WB4311	12	15	14	74	44
+	d MT1750	7	8	8	80	44
#	SY Legend CL2	7	10	9	78	44
	MTS1588 (Bobcat)	12	13	13	74	43
#	SY 517 CL2	12	12	12	74	43
	MT1642	12	11	11	72	42
#+	d ASC116	10	11	11	72	42
#	Byrd CL Plus	13	13	13	70	41
#	Incline AX	9	9	9	73	41
#+	d Canvas	9	10	10	71	40
#+	WB4269	10	8	9	67	38
#+	SY Wolverine	7	6	6	66	36
#+	d ASC107	2	1	2	54	28
#	LCS Jet	12	13	13	39	26
#+	d ASC122	2	3	2	40	21
Average		14.7	16.1	15.4	76.4	45.9
LSD (0.05)		9.4	10.7		12.5	12.3
C. V. (%)		39.2	40.8		9.5	13.3
P-value (Varieties)		<.0001	<.0001		<.0001	0.0002

+ = new for 2019, # = paid entry

d = cultivars/lines dropped for 2020 test

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 14. 2019 Intrastate Winter Wheat Test (Exp. 35): Multi-Location Heading Date (days from Jan. 1)

Cultivar/Line	Bozeman RCB	Havre LAT	Sidney RCB	Williston LAT	Kalispell LAT	Moccasin RCB	Huntley LAT	Conrad RCB	Ft. Benton not taken	8 Loc Avg.
lattice efficiency		119%		155%	110%	97%	107%	103%		
#+ d ASC116	166.3	161.8	157.0	157.1	157.7	165.0	158.5	159.7		160.4
Brawl CL Plus	167.7	160.5	157.0	156.3	159.4	165.0	159.1	159.7		160.6
# Long Branch	167.0	160.8	157.3	156.8	158.2	164.0	161.9	161.0		160.9
# SY 517 CL2	168.3	162.9	157.0	156.6	158.4	168.7	160.3	161.3		161.7
#+ WB4418	169.3	163.1	158.3	157.6	162.7	167.0	163.4	162.0		162.9
#+ SY Wolverine	170.3	163.6	160.0	157.6	160.6	166.3	162.6	163.3		163.0
MT1564 (Flathead)	170.7	163.8	159.0	157.4	161.9	167.0	163.3	163.3		163.3
#+ WB4269	169.7	162.7	160.0	157.8	164.9	167.7	162.2	163.3		163.5
+ MT1793	170.7	164.4	161.0	159.4	163.1	167.3	164.9	164.0		164.4
# Byrd CL Plus	171.0	163.7	161.0	159.5	164.0	168.7	163.4	164.7		164.5
d Oahe	171.0	165.0	161.0	159.2	164.2	167.7	164.9	163.7		164.6
+ d MT1764	171.0	163.9	161.0	160.1	164.3	168.7	164.7	164.0		164.7
+ d MT1796	171.0	164.9	161.0	159.8	163.5	168.0	165.9	164.3		164.8
# d LCS Chrome	172.3	166.8	162.3	160.3	162.8	165.7	164.0	164.7		164.9
# SY Legend CL2	172.3	165.9	162.3	159.3	164.8	168.7	163.7	165.7		165.3
#+ WB4311	170.3	164.4	161.0	161.8	165.9	169.3	164.3	165.7		165.3
#+ d Canvas	173.7	165.8	161.0	160.2	164.8	168.7	165.2	164.3		165.5
+ d MTS1731(w)	174.0	166.0	161.7	160.8	163.9	168.0	165.2	164.7		165.5
#+ d ASC107	171.3	166.1	162.0	162.7	164.8	170.3	164.6	165.0		165.9
+ d MT1782	174.3	165.4	163.0	161.0	164.8	168.7	166.2	164.0		165.9
# SY Monument	175.0	165.7	161.0	160.8	165.2	169.0	165.7	165.0		165.9
d Decade	174.0	167.2	162.0	160.3	164.9	169.3	166.6	165.0		166.2
# d LCS Zoom	172.0	167.3	163.0	162.7	164.2	170.3	163.5	166.3		166.2
+ d MT1747	174.7	168.3	161.7	161.1	165.0	169.7	167.3	166.0		166.7
FourOsix	175.0	166.8	162.7	161.3	165.1	171.0	168.5	165.7		167.0
#+ d ASC122	175.0	166.1	163.7	164.1	165.2	170.3	166.2	167.0		167.2
# Incline AX	175.0	166.7	163.7	163.0	167.4	171.7	166.3	165.7		167.4
Judee	175.0	168.9	162.3	161.6	166.6	170.3	168.5	166.3		167.4
+ MT1746	175.3	169.4	163.0	162.3	165.1	170.3	167.5	166.7		167.5
+ d MT1773	176.0	169.3	163.0	161.7	164.9	169.3	168.6	167.7		167.6
MTCs1601R	176.0	168.0	164.7	163.7	166.0	169.7	166.7	168.3		167.9
# LCS Jet	176.0	167.6	164.3	163.5	166.4	170.3	168.6	168.0		168.1
+ MTCL1732	176.0	168.7	164.3	161.1	168.0	172.0	167.7	167.3		168.1
SY Clearstone 2CL	178.0	168.8	164.0	161.8	166.9	171.3	168.4	167.3		168.3
Warhorse	176.7	170.4	165.0	162.7	165.6	170.0	168.6	167.7		168.3
Keldin	175.7	169.2	164.3	163.9	166.1	174.0	168.4	166.7		168.5
MT1683	178.3	170.2	164.0	162.7	165.5	172.0	168.8	166.7		168.5
MTS1588 (Bobcat)	177.0	168.1	165.0	162.8	168.1	171.3	169.7	168.7		168.8
Yellowstone	178.0	169.7	165.0	162.3	167.6	170.7	169.6	168.7		169.0
+ MT1745	176.7	169.7	164.3	162.4	166.9	176.0	168.4	168.3		169.1
d MTW1491	178.0	169.6	164.3	162.7	167.8	172.7	169.2	168.3		169.1
+ MT1787	178.3	169.1	165.0	162.6	168.1	174.0	168.5	167.7		169.2
+ d MT1750	177.0	171.7	163.7	163.3	166.6	175.3	169.9	168.0		169.4
Northern	177.3	170.0	165.7	163.7	168.9	173.7	170.8	168.3		169.8
Loma	179.3	172.2	167.3	163.2	168.0	171.3	171.3	167.7		170.0
MT1642	179.7	173.2	165.0	164.1	168.1	172.3	172.1	169.3		170.5
+ MTCL1737	179.7	173.5	165.0	164.0	169.1	175.3	171.5	169.0		170.9
d Ray	180.7	173.8	169.0	165.0	171.0	175.0	173.1	171.0		172.3
# AAC Wildfire	181.7	174.3	168.3	167.4	170.7	177.0	173.5	171.3		173.0
Average	174.3	167.3	162.6	161.3	165.2	170.1	166.6	165.9		166.6
LSD (0.05)	1.1	1.7	1.6	1.8	1.5	2.5	1.5	1.6		1.0
C. V. (%)	0.4	0.6	0.6	0.6	0.5	0.9	0.5	0.6		0.6
P-value (Varieties)	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001		<.0001		0.0001

+ = new for 2019, # = paid entry

d = cultivars/lines dropped for 2020 test

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p=0.05)

Table 15. 2019 Intrastate Winter Wheat Test (Exp. 35): Multi-Location Plant Height (in)

Cultivar/Line	Bozeman LAT	Havre RCB	Sidney RCB	Williston LAT	Kalispell LAT	Moccasin LAT	Huntley LAT	Conrad LAT	Ft. Benton not taken	8 Loc Avg.
lattice efficiency	107%			126%	115%	112%	106%	125%		
## d ASC122	28.5	24.3	22.0	18.8	29.9	27.4	31.3	26.0		26.0
## d ASC107	29.4	23.0	21.0	20.0	29.6	28.8	35.0	25.5		26.5
## SY Wolverine	29.1	23.0	24.3	18.4	29.8	27.0	35.2	27.3		26.8
## WB4269	30.2	25.3	22.7	16.8	29.5	27.9	36.7	26.3		26.9
## WB4311	29.6	22.6	24.0	18.7	30.8	28.7	36.5	27.1		27.3
## WB4418	31.2	22.6	25.6	18.7	31.0	27.9	35.9	25.7		27.3
## d ASC116	31.0	22.7	23.9	17.7	33.0	28.0	36.0	27.8		27.5
+ MT1787	30.7	25.5	24.3	17.3	31.8	28.6	34.7	26.9		27.5
+ d MT1750	31.9	22.4	25.6	18.1	32.8	28.8	35.6	25.9		27.6
# LCS Jet	31.8	20.7	23.6	19.8	33.2	29.0	37.7	26.4		27.8
## d Canvas	31.9	21.5	26.5	18.5	32.1	27.9	37.0	27.9		27.9
# SY 517 CL2	31.2	22.4	24.3	19.2	31.2	31.0	36.8	26.8		27.9
+ d MT1764	31.9	24.9	24.9	18.0	32.4	29.0	35.4	28.2		28.1
+ d MTS1731(w)	31.5	27.6	26.1	19.1	32.1	27.5	34.7	28.0		28.3
# d LCS Zoom	32.6	24.5	24.7	18.3	32.9	29.2	37.3	28.6		28.5
# Long Branch	33.3	23.4	25.9	18.0	32.0	27.9	37.9	29.4		28.5
+ MT1746	32.4	22.6	25.3	18.6	35.1	30.2	37.8	27.9		28.7
# SY Monument	33.0	25.3	24.0	17.6	34.0	29.6	37.5	28.7		28.7
+ d MT1747	32.6	23.9	25.7	19.1	33.3	29.4	38.5	29.0		28.9
MTS1588 (Bobcat)	32.2	25.6	26.2	20.4	32.7	29.9	36.9	27.6		28.9
+ MTCL1732	31.9	27.4	26.2	17.3	33.8	29.6	38.4	27.1		29.0
+ MTCL1737	31.5	29.0	25.9	18.8	33.1	29.0	37.3	27.1		29.0
# SY Legend CL2	31.9	26.0	26.0	18.1	32.9	30.4	39.4	29.1		29.2
Brawl CL Plus	33.0	25.3	26.1	21.0	32.9	28.9	37.6	29.2		29.3
Loma	34.0	23.7	26.2	19.1	35.5	30.5	39.4	27.0		29.4
FourOsix	34.1	25.4	27.0	20.1	33.6	30.5	38.9	28.1		29.7
+ MT1793	32.8	26.2	28.7	17.3	35.4	30.8	39.3	28.5		29.9
+ d MT1773	35.2	26.3	26.2	18.1	36.9	31.0	38.7	28.6		30.1
+ d MT1782	32.9	25.9	28.3	17.9	35.0	31.2	40.4	29.4		30.1
Keldin	33.6	25.4	29.3	18.6	35.0	31.6	38.6	29.2		30.2
MT1564 (Flathead)	35.2	24.6	27.0	19.0	36.2	30.6	40.0	28.8		30.2
Warhorse	34.0	26.2	28.7	19.1	35.6	30.4	38.7	28.5		30.2
# Incline AX	33.8	27.3	27.2	20.8	34.7	31.3	39.1	29.3		30.4
+ d MT1796	34.1	23.7	28.3	19.4	36.6	32.3	42.2	29.1		30.7
MTCS1601R	35.1	25.8	28.7	20.4	36.6	31.8	38.4	29.1		30.7
+ MT1745	34.7	26.2	28.7	18.7	36.9	32.1	39.0	30.6		30.9
# d LCS Chrome	34.4	26.2	29.0	20.1	35.9	30.6	41.3	30.6		31.0
Judee	36.1	27.0	28.9	19.3	37.5	31.3	40.0	28.9		31.1
# Byrd CL Plus	35.6	24.3	28.9	19.3	37.5	32.2	41.9	30.8		31.3
Northern	37.0	24.4	28.2	18.7	38.9	31.9	39.8	32.2		31.4
d Decade	35.8	29.2	30.4	17.4	38.3	33.0	41.0	29.3		31.8
MT1642	35.8	28.0	29.7	25.4	36.6	31.6	40.9	29.7		32.2
# AAC Wildfire	37.9	25.4	30.1	21.3	40.1	34.7	42.1	29.0		32.6
SY Clearstone 2CL	38.6	28.1	28.2	20.2	39.5	34.7	41.8	29.7		32.6
MT1683	38.4	27.4	29.8	22.3	38.1	33.2	41.8	30.9		32.7
Yellowstone	38.6	30.0	29.1	20.5	37.2	33.9	41.3	31.1		32.7
d MTW1491	38.8	27.5	31.1	20.2	41.0	33.5	42.4	29.6		33.0
d Oahe	38.6	28.6	30.1	18.9	40.4	33.6	42.2	32.4		33.1
d Ray	40.0	31.4	31.1	24.2	42.9	36.4	47.1	34.0		35.9
Average	33.7	25.4	26.8	19.2	34.8	30.5	38.6	28.7		29.7
LSD (0.05)	1.2	2.0	2.5	3.0	2.2	2.3	2.9	2.1		1.3
C. V. (%)	2.1	4.8	5.7	9.2	3.6	4.4	4.4	4.3		4.5
P-value (Varieties)	<.0001	<.0001	<.0001	0.0009	<.0001	<.0001		<.0001		<.0001

+ = new for 2019, # = paid entry

d = cultivars/lines dropped for 2020 test

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 16. 2019 Intrastate Winter Wheat Test (Exp. 35): Multi-Location Sawfly Cutting (%)

Cultivar/Line	Havre LAT	may be mixed with lodging		3 Loc Avg.
		Conrad LAT	Ft. Benton RCB	
lattice efficiency	106%	112%		
MTS1588 (Bobcat)	1	20	18	13
#+ d ASC122	13	17	10	13
+ MTCL1732	14	5	23	14
Warhorse	3	27	13	14
+ d MTS1731(w)	8	21	43	24
+ d MT1750	10	45	25	27
# Incline AX	15	42	37	31
Loma	15	48	32	32
+ MT1746	13	53	28	32
#+ WB4418	15	25	55	32
+ d MT1747	24	32	43	33
+ MT1745	18	43	45	35
Judee	11	52	45	36
#+ WB4269	12	40	62	38
# Byrd CL Plus	21	30	63	38
+ MTCL1737	23	43	52	39
+ d MT1782	20	48	50	39
# Long Branch	12	41	67	40
# LCS Jet	35	37	50	41
#+ d ASC116	18	64	43	42
#+ SY Wolverine	29	38	60	42
MTCS1601R	12	49	67	43
Northern	38	40	50	43
# SY 517 CL2	16	60	53	43
+ MT1787	30	44	57	44
Brawl CL Plus	14	48	73	45
# AAC Wildfire	32	51	53	46
d MTW1491	30	37	73	47
d Decade	22	56	63	47
#+ WB4311	30	55	58	48
#+ d Canvas	24	45	75	48
d Oahe	36	49	67	50
d Ray	39	49	63	51
MT1642	34	62	58	51
+ d MT1764	21	71	63	52
+ d MT1773	21	62	77	53
+ d MT1796	18	82	60	53
MT1564 (Flathead)	27	57	77	54
#+ d ASC107	23	65	77	55
+ MT1793	22	81	65	56
Yellowstone	30	58	80	56
# SY Monument	32	80	65	59
FourOsix	39	66	73	60
MT1683	46	60	80	62
SY Clearstone 2CL	44	66	77	62
Keldin	46	79	63	63
# d LCS Chrome	51	77	78	69
# SY Legend CL2	27	90	92	70
# d LCS Zoom	48	78	92	73
Average	24.2	50.8	57.0	44.0
LSD (0.05)	14.1	23.5	18.4	18.0
C. V. (%)	34.6	27.2	20.0	25.3
P-value (Varieties)	<.0001	<.0001	<.0001	<.0001

+ = new for 2019, # = paid entry

d = cultivars/lines dropped for 2020 test

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 17. 2019 Intrastate Winter Wheat Test (Exp. 35): Multi-Location Grain Protein (%)

Cultivar/Line	Bozeman Bulk	Havre LAT	Sidney LAT	Williston LAT	Kalispell LAT	Moccasin LAT	Huntley LAT	Conrad LAT	Ft. Benton RCB	9 Loc Avg.
lattice efficiency		115%	105%	187%	112%	108%	127%	304%		
#+ d ASC116	13.8	15.9	17.9	21.2	10.0	12.2	12.7	14.4	14.8	14.8
#+ d ASC122	13.1	16.0	15.4	17.5	8.9	11.0	14.4	14.4	14.1	13.9
+ d MT1796	12.3	16.5	16.3	20.2	8.8	11.6	11.7	13.5	13.7	13.8
Warhorse	12.6	16.2	15.8	18.2	8.6	10.3	13.1	14.3	13.5	13.6
#+ d ASC107	12.5	15.6	14.9	18.3	9.6	10.7	13.6	13.6	13.6	13.6
+ MT1793	12.4	16.1	15.2	19.5	8.8	11.2	11.9	13.4	13.5	13.6
Brawl CL Plus	12.3	15.3	15.7	18.7	9.3	10.9	12.9	13.1	12.6	13.4
Judee	12.4	15.8	14.0	18.4	8.5	10.1	12.9	14.9	13.4	13.4
# d LCS Chrome	12.5	15.1	15.0	18.1	9.5	11.3	12.0	13.7	12.9	13.4
#+ SY Wolverine	12.6	15.7	15.2	18.3	8.3	10.6	11.8	13.7	14.0	13.4
# SY 517 CL2	12.5	16.0	16.0	17.6	9.7	10.4	12.1	12.7	13.1	13.3
d Decade	12.3	15.5	14.5	19.3	8.4	10.4	11.6	14.1	13.3	13.3
#+ WB4311	12.0	15.0	15.6	17.8	9.6	10.8	12.2	13.3	13.0	13.3
MTCS1601R	12.4	15.1	14.1	18.2	8.8	10.4	12.4	14.5	12.9	13.2
+ d MTS1731(w)	12.2	15.6	14.2	18.9	8.5	10.6	12.4	13.6	12.6	13.2
+ d MT1764	11.6	15.5	15.4	18.8	8.8	9.8	12.2	13.3	13.1	13.2
+ d MT1782	11.8	15.5	15.1	18.5	8.6	10.6	11.8	12.9	12.6	13.0
+ d MT1750	11.8	15.3	13.8	17.3	8.5	10.5	12.3	13.9	13.1	12.9
# SY Legend CL2	11.2	14.8	14.2	17.9	8.5	10.8	12.2	13.8	13.1	12.9
+ MT1787	12.2	15.0	14.3	16.7	8.6	9.8	12.5	13.7	13.2	12.9
# AAC Wildfire	12.5	14.6	13.1	16.7	8.4	9.7	12.8	14.8	13.3	12.9
d Oahe	11.9	15.1	14.8	17.6	8.6	10.4	12.0	12.9	12.5	12.9
MTS1588 (Bobcat)	11.9	14.9	13.4	17.1	8.7	9.8	12.8	14.1	13.1	12.9
+ MTCL1737	12.4	14.8	13.4	17.6	8.3	9.8	12.0	13.7	13.6	12.8
Northern	11.5	14.8	13.6	17.7	8.5	9.8	12.2	14.0	13.4	12.8
SY Clearstone 2CL	12.4	15.3	13.3	18.0	7.9	9.3	12.1	13.9	13.1	12.8
+ d MT1773	11.5	14.9	13.2	18.6	8.3	10.1	12.4	13.5	12.7	12.8
Loma	11.6	15.2	13.7	17.2	8.7	9.6	12.1	14.0	13.0	12.8
MT1564 (Flathead)	11.6	15.1	13.7	18.2	8.3	10.1	12.2	13.5	12.4	12.8
MT1642	11.8	15.7	13.5	16.5	8.3	10.0	12.2	13.7	13.3	12.8
d Ray	12.4	14.5	14.1	16.2	8.4	9.0	12.7	14.1	13.2	12.7
FourOsix	12.0	14.9	14.1	16.9	8.0	9.5	12.4	13.7	13.0	12.7
MT1683	12.2	15.1	13.3	16.5	8.5	9.6	12.4	13.8	13.1	12.7
+ d MT1747	11.8	14.8	13.7	17.7	8.3	9.8	11.8	13.7	12.6	12.7
+ MT1746	11.9	14.7	13.5	17.3	8.6	10.1	11.6	13.4	12.8	12.7
#+ WB4418	11.6	14.4	13.2	18.0	8.4	10.4	12.0	13.3	12.4	12.6
Yellowstone	11.7	15.1	13.5	16.9	8.1	9.6	12.4	13.6	12.9	12.6
+ MTCL1732	11.7	14.4	12.8	17.8	8.0	9.6	12.2	13.9	12.7	12.6
Keldin	11.5	15.1	14.1	16.6	8.1	9.6	11.2	13.7	13.0	12.5
#+ d Canvas	11.5	14.2	14.0	17.3	8.3	10.4	11.7	12.0	12.6	12.4
#+ WB4269	11.6	13.7	14.2	17.0	8.8	10.9	11.2	12.2	12.2	12.4
# d LCS Zoom	12.0	14.2	13.8	15.1	8.2	9.4	12.3	13.6	12.7	12.4
d MTW1491	11.3	14.7	12.7	16.8	8.1	9.2	11.4	13.5	12.8	12.3
+ MT1745	11.4	14.4	12.9	16.3	7.8	9.9	12.1	13.0	12.3	12.2
# SY Monument	11.1	14.0	14.0	16.3	8.4	9.6	11.6	12.6	12.3	12.2
# LCS Jet	11.4	14.6	13.1	15.6	7.5	8.8	12.5	13.5	12.6	12.2
# Long Branch	11.2	13.9	13.3	15.8	8.6	9.8	11.5	12.7	12.1	12.1
# Byrd CL Plus	11.0	13.9	12.8	16.1	7.8	9.0	11.2	13.3	12.0	11.9
# Incline AX	10.7	13.7	12.9	14.7	7.4	9.3	11.2	12.5	12.1	11.6
Average	12.0	15.0	14.2	17.5	8.5	10.1	12.2	13.6	13.0	12.9
LSD (0.05)		0.5	0.8	1.3	0.5	0.6	0.6	0.8	0.5	0.5
C. V. (%)		1.8	3.1	4.4	3.6	3.8	2.7	3.2	2.2	4.3
P-value (Varieties)		<.0001	<.0001	<.0001	<.0001	<.0001		<.0001	<.0001	<.0001

+ = new for 2019, # = paid entry

d = cultivars/lines dropped for 2020 test

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p=0.05)

Table 18. 2019 Intrastate Winter Wheat Test (Exp. 35): Multi-Location Stem Solidness (5-25)

Cultivar/Line	Bozeman	Conrad	Havre	Northern Seeds - Carter	4 Loc Average
	stem clipping date % sawfly Infestation	3-Jul 16%	3-Jul 20%	2-Jul 18%	
MTS1588	= Bobcat: Montana, 2019	24.2	24.8	23.8	24.1
+ MTS1731(w)	MTS0531*2//PI640431/MTS04114	21.5	24.5	22.5	22.6
Warhorse	Montana, 2013	20.1	23.9	21.1	21.5
Loma	Montana, 2016	17.6	23.7	20.1	20.4
Judee	Montana, 2011	18.7	21.8	18.7	19.6
MTCs1601R	MTS0531/7/MTS0532/6/96X17E69/3/	15.9	22.9	18.6	18.8
#+ WB4418	WestBred, 2018	7.8	8.5	8.1	7.8
Yellowstone	Montana 2005	6.2	7.7	6.7	6.8
Average		16.5	19.7	17.5	17.7
LSD (0.05)		2.3	2.3	1.6	1.5
C. V. (%)		7.9	6.7	5.4	5.7
P-value (Varieties)		<.0001	<.0001	<.0001	<.0001

+ = new for 2019, # = paid entry

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 19. 2019 Intrastate Winter Wheat Test (Exp. 35): Multi-Location Stripe Rust Evaluation, including data from Pullman and Mt. Vernon, WA

Cultivar/Line	Stripe Rust						Aluminum tolerance	
	Montana (%)			MT. Vernon, WA			Rockford, WA	
	Kalispell	Bozeman	FT Ellis	Milk	Stem elong.	Heading/flowering	'Early'	'Later'
d = cultivars/lines dropped + = new for 2019, # = paid entry	10-Jun	19-Jul	5-Aug	IT ^{1/} %	IT ^{1/} %	IT ^{1/} %	higher # is better	
# AAC Wildfire	10			8 20	8 40	5 30	3	2
#+ d ASC107				8 30	3 10	2 15	1	1
#+ d ASC116				5 30	2 5	2 15	2	3
#+ d ASC122				2 5	2 5	2 15	3	4
Brawl CL Plus	18	5	15	8 60	5 30	2 15	1	1
# Byrd CL Plus		2	30	8 80	5 30	5 40	2	2
#+ d Canvas		3	20	8 40	2 5	2 5	1	1
d Decade	33		40	8 90	5 30	5 40	2	2
FourOsix				8 10	2 10	2 10	1	1
# Incline AX	5	tr	30	8 80	8 30	8 60	1	1
Judee				2 10	2 10	2 10	2	2
Keldin		tr		8 30	2 10	3 20	1	1
# d LCS Chrome	tr			8 40	2 5	2 10	2	2
# LCS Jet				8 30	2 2	2 5	1	1
# d LCS Zoom				2 5	2 2	2 2	1	1
# Loma				2 5	3 20	2 10	1	1
# Long Branch	5			2 5	3 10	2 10	1	1
MT1564 (Flathead)				2 5	2 2	2 10	1	1
MT1642	tr			5 10	2 10	2 5	1	1
MT1683	7			2 2	2 10	2 5	1	1
+ MT1745			10	2 5	2 10	2 10	2	2
+ MT1746				2 2	2 5	2 10	2	2
+ d MT1747				2 2	2 5	2 10	2	2
+ d MT1750				2 5	2 5	2 10	3	3
+ d MT1764				8 20	3 10	8 80	1	1
+ d MT1773				2 5	2 5	2 10	2	2
+ d MT1782				2 2	2 5	2 5	1	1
+ MT1787				2 2	2 2	2 10	2	2
+ MT1793	17	tr	50	8 40	5 30	8 80	3	3
+ d MT1796	38	tr	70	8 60	8 40	8 100	3	3
+ MTCL1732				2 2	3 10	2 5	1	1
+ MTCL1737				3 20	3 10	2 15	1	1
MTCS1601R				2 5	3 10	2 10	1	1
MTS1588 (Bobcat)				2 5	2 2	2 10	1	1
+ d MTS1731(w)	tr			2 5	2 10	2 10	1	1
d MTW1491				2 5	2 10	2 5	1	1
Northern				5 30	3 20	2 5	1	1
d Oahe				8 30	2 10	2 5	2	2
d Ray				2,8 2,20	2 10	2 10	1	1
# SY 517 CL2				8 90	8 30	5 30	3	4
SY Clearstone 2CL				2 10	3 20	2 10	2	2
# SY Legend CL2				8 50	2 10	2 10	1	1
# SY Monument	3			8 60	2 5	2 5	3	2
#+ SY Wolverine				8 70	2 10	5 30	1	1
Warhorse				2 2	2 10	2 10	2	2
#+ WB4269				5 30	2 2	2 10	2	1
#+ WB4311				8 10	2 2	2 5	2	1
#+ WB4418				8 40	2 2	2 5	1	1
Yellowstone		tr		2 20	2 10	2 10	1	1
Average				25	12	17	1.6	1.6

1/ Infection Type (IT) was recorded based on the 0-9 scale with ITs 8 and 9 combined as 8 (the most susceptible reaction) in field data. Generally IT 0-3 are considered resistant, 4-6 intermediate, and 7-9 susceptible. Heterogenous reactions of an entry were indicated by two or more ITs separated by "," for most plants with the first IT and few plants with the second IT or connected with "-" for entries containing plants with continuous ITs.

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 20. 2019 Winter Wheat Quality Drill Strips, Northern Agricultural Research Center

Entry	ID	Yield*	Test Weight	Moisture	Protein	Head Date	Plant Ht	Sawfly
		bu/ac	lb/bu	%	%	day	in	% cut
1	Yellowstone	58.9	59.6	14.4	11.5	6/20/19	31.1	43
2	MTCS1601	62.3	61.3	14.8	11.2	6/19/19	29.6	22
3	MT1642	60.3	59.1	15.1	11.4	6/19/19	32.3	48
4	MT1683	63.0	59.6	14.6	11.4	6/19/19	33.4	37

*Yield adjusted to 13% moisture.

Seeded October 10, 2018

Harvested August 9, 2019

Precipitation:

Seeding to Harvest: 7.58"

April 1 to June 30: 5.69"

Table 21. 2016-2019 Intrastate Winter Wheat Test (Exp. 3501): Bozeman Yield, Test Weight and Protein

Cultivar/Line	Grain Yield (bushels/acre)				Test Weight (lb/bu)				Protein (%)			
	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19
	1y	2y	3y	4y	1y	2y	3y	4y	1y	2y	3y	4y
# AAC Wildfire	125.3	130.3			63.0	63.5			12.5	12.5		
#+ ASC107	107.3				63.0				12.5			
#+ ASC116	120.9				61.8				13.8			
#+ ASC122	103.0				63.5				13.1			
Brawl CL Plus	126.3	120.8	101.4	96.4	64.5	64.9	62.0	61.8	12.3	12.9	13.1	13.3
# Byrd CL Plus	138.1	136.8	112.0		62.9	63.7	61.2		11.0	11.1	11.6	
#+ Canvas	113.1				64.5				11.5			
Decade	127.4	128.4	99.8	87.6	62.6	63.4	61.1	60.6	12.3	12.4	12.7	12.9
FourOsix	128.6	131.5	122.5	114.0	63.1	63.8	62.9	62.2	12.0	12.0	12.4	12.8
# Incline AX	122.0	126.8			61.6	62.4			10.7	11.0		
Judee	122.5	125.4	113.6	102.3	63.5	64.3	63.1	62.2	12.4	12.3	12.7	13.2
Keldin	152.8	148.7	131.7	120.2	63.6	64.1	62.8	61.9	11.5	11.8	12.1	12.3
# LCS Chrome	129.9	122.8	117.6		63.4	63.9	63.0		12.5	12.9	13.0	
# LCS Jet	146.0	145.7	138.7		61.4	61.9	60.9		11.4	11.7	12.2	
# LCS Zoom	133.0	136.5			59.4	60.7			12.0	11.9		
Loma	128.7	134.2	121.4	114.1	63.0	63.4	62.4	62.0	11.6	11.8	12.2	12.0
# Long Branch	120.7	127.8	121.8		63.6	64.0	63.1		11.2	11.6	11.7	
MT1564 (Flathead)	134.9	132.7	128.0		64.1	64.4	64.0		11.6	11.9	12.1	
MT1642	144.0	142.2			62.7	63.1			11.8	12.0		
MT1683	139.2	140.4			62.3	63.0			12.2	12.2		
+ MT1745	137.2				63.4				11.4			
+ MT1746	129.7				64.6				11.9			
+ MT1747	134.8				64.7				11.8			
+ MT1750	130.0				64.5				11.8			
+ MT1764	130.1				63.0				11.6			
+ MT1773	138.6				62.9				11.5			
+ MT1782	130.1				64.3				11.8			
+ MT1787	125.6				63.0				12.2			
+ MT1793	124.6				62.5				12.4			
+ MT1796	127.6				62.9				12.3			
+ MTCL1732	118.5				61.1				11.7			
+ MTCL1737	125.0				62.3				12.4			
MTCS1601R	127.7	131.5			63.8	64.2			12.4	12.6		
MTS1588 (Bobcat)	119.5	127.0	115.1		63.2	64.1	62.9		11.9	12.0	12.5	
+ MTS1731(w)	131.7				63.3				12.2			
MTW1491	149.6	149.9	138.5	130.9	63.6	64.0	63.5	63.1	11.3	11.6	11.8	12.1
Northern	145.1	146.5	127.8	116.9	63.0	63.4	61.8	61.2	11.5	11.8	12.3	12.9
Oahe	138.0	129.4			64.0	64.6			11.9	12.4		
Ray	138.8	138.7	128.3		61.7	61.7	60.8		12.4	12.5	12.5	
# SY 517 CL2	117.3	115.5	103.3		64.6	64.9	63.0		12.5	12.6	12.6	
SY Clearstone 2CL	144.5	143.5	128.6	119.0	61.6	62.5	61.1	60.6	12.4	12.4	12.3	12.5
# SY Legend CL2	113.7	115.4			64.0	64.4			11.2	11.6		
# SY Monument	130.8	133.8	122.2	114.9	62.4	63.0	61.3	60.3	11.1	11.5	11.8	12.3
#+ SY Wolverine	112.6				63.2				12.6			
Warhorse	118.9	119.8	111.0	102.6	62.8	63.3	62.3	61.6	12.6	12.8	13.1	13.4
#+ WB4269	113.7				63.2				11.6			
#+ WB4311	126.6				64.2				12.0			
#+ WB4418	112.0				61.8				11.6			
Yellowstone	142.4	139.9			62.2	63.0			11.7	11.8		
Average	128.5	132.9	120.2	110.8	63.0	63.5	62.3	61.6	12.0	12.0	12.4	12.7
LSD (0.05)	12.7	11.6	19.4	14.0	0.6	0.7	1.9	1.6		0.5	0.6	0.7
C.V.	5.7	4.2	9.8	8.7	0.6	0.6	1.9	1.8		2.2	2.8	3.9

+ = new for 2019, # = paid entry

1/ Yellowstone mis-planted in 2017: no 3 and 4 year data

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 22. 2016-2019 Intrastate Winter Wheat Test (Exp. 3502): Havre Yield, Test Weight and Protein

Cultivar/Line	Grain Yield (bushels/acre)				Test Weight (lb/bu)				Protein (%)			
	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19
	1y	2y	3y	4y	1y	2y	3y	4y	1y	2y	3y	4y
# AAC Wildfire	54.0	63.3			58.8	60.5			14.6	14.2		
#+ ASC107	38.0				59.7				15.6			
#+ ASC116	41.3				60.1				15.9			
#+ ASC122	39.5				59.9				16.0			
Brawl CL Plus	52.2	54.9	51.1	60.8	62.0	63.2	63.0	62.5	15.3	14.7	14.5	13.6
# Byrd CL Plus	51.0	54.9	54.1		60.6	62.0	61.8		13.9	13.3	13.4	
#+ Canvas	55.5				62.4				14.2			
Decade	55.5	54.6	52.5	59.5	60.1	61.4	61.5	60.6	15.5	15.1	14.9	13.7
FourOsix	57.5	58.9	56.1	66.7	60.0	61.3	61.7	61.3	14.9	14.9	14.7	13.9
# Incline AX	63.1	63.4			59.8	61.2			13.7	13.1		
Judee	52.6	54.2	52.6	60.8	61.3	62.5	62.6	62.3	15.8	15.7	15.2	13.9
Keldin	52.4	60.5	59.2	71.4	59.9	61.5	61.7	61.6	15.1	14.4	13.9	13.1
# LCS Chrome	48.2	51.4	50.1		59.6	61.3	61.4		15.1	14.9	14.6	
# LCS Jet	58.9	59.2	55.6		57.5	59.1	59.5		14.6	14.2	13.8	
# LCS Zoom	48.7	51.3			57.6	59.3			14.2	14.0		
Loma	51.1	55.8	53.4	60.3	59.7	61.2	61.5	60.8	15.2	14.8	14.6	13.5
# Long Branch	61.5	63.1	58.9		60.9	62.1	61.5		13.9	13.1	13.1	
MT1564 (Flathead)	49.1	55.2	53.9		60.4	62.0	62.1		15.1	14.5	14.2	
MT1642	51.3	55.7			58.8	59.7			15.7	15.5		
MT1683	51.6	56.6			59.8	60.6			15.1	14.9		
+ MT1745	57.5				60.9				14.4			
+ MT1746	54.8				61.5				14.7			
+ MT1747	52.6				61.6				14.8			
+ MT1750	49.8				61.4				15.3			
+ MT1764	51.6				59.9				15.5			
+ MT1773	49.1				60.2				14.9			
+ MT1782	53.5				60.9				15.5			
+ MT1787	52.3				60.3				15.0			
+ MT1793	58.5				59.7				16.1			
+ MT1796	47.8				60.0				16.5			
+ MTCL1732	53.0				59.6				14.4			
+ MTCL1737	56.4				58.6				14.8			
MTCS1601R	61.6	58.6			60.7	61.8			15.1	14.9		
MTS1588 (Bobcat)	62.6	62.7	60.5		60.6	61.7	61.9		14.9	14.6	14.4	
+ MTS1731(w)	54.0				59.8				15.6			
MTW1491	57.5	59.0	59.3	72.1	59.6	61.0	61.6	61.2	14.7	14.4	14.1	13.1
Northern	57.7	57.1	55.4	67.5	60.3	61.3	61.6	61.0	14.8	14.5	14.5	13.6
Oahe	46.7	48.0			60.2	61.8			15.1	14.7		
Ray	58.9	59.8	57.3		58.7	59.3	60.1		14.5	14.4	14.0	
# SY 517 CL2	46.4	48.9	44.5		61.3	62.7	62.8		16.0	15.1	14.8	
SY Clearstone 2CL	56.8	59.3	55.5	66.2	59.5	60.5	61.0	60.6	15.3	14.8	14.7	13.7
# SY Legend CL2	53.6	54.3			60.6	61.9			14.8	14.4		
# SY Monument	57.4	58.4	56.6	68.3	59.5	61.0	61.1	60.7	14.0	13.5	13.3	12.5
#+ SY Wolverine	48.9				60.3				15.7			
Warhorse	46.5	51.8	49.2	59.3	60.2	61.4	61.6	61.3	16.2	15.6	15.4	14.2
#+ WB4269	53.5				60.8				13.7			
#+ WB4311	51.1				60.4				15.0			
#+ WB4418	53.5				59.9				14.4			
Yellowstone	54.8	58.4			59.5	60.2			15.1	14.7		
Average	52.9	56.7	54.5	64.8	60.1	61.2	61.6	61.3	15.0	14.5	14.3	13.5
LSD (0.05)	7.4	7.8	5.3	7.1	0.6	0.9	1.0	0.8	0.5	0.7	0.6	0.7
C.V.	8.0	6.7	5.9	7.6	0.6	0.7	1.0	0.9	1.8	2.2	2.6	3.4

+ = new for 2019, # = paid entry

1/ Yellowstone mis-planted in 2017: no 3 and 4 year data

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 23. 2016-2019 Intrastate Winter Wheat Test (Exp. 3503): Sidney Yield, Test Weight and Protein

Cultivar/Line	Grain Yield (bushels/acre)				Test Weight (lb/bu)				Protein (%)			
	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19
	1y	2y	3y	4y	1y	2y	3y	4y	1y	2y	3y	4y
# AAC Wildfire	88.8	79.6			64.5	63.2			13.1	11.8		
#+ ASC107	5.5				<u>1/</u>				14.9			
#+ ASC116	20.6				59.1				17.9			
#+ ASC122	15.5				61.5				15.4			
Brawl CL Plus	35.8	48.3	41.7	49.9	63.3	63.9	64.3	63.8	15.7	14.0	12.9	12.5
# Byrd CL Plus	51.2	64.3	56.9		63.0	62.8	63.4		12.8	11.3	9.9	
#+ Canvas	46.8				64.7				14.0			
Decade	68.8	71.1	64.3	62.6	63.6	63.1	63.7	62.8	14.5	12.7	11.4	11.3
FourOsix	64.6	66.3	57.9	58.4	62.9	62.7	63.4	62.6	14.1	12.4	11.0	10.7
# Incline AX	48.3	58.6			61.4	62.1			12.9	11.9		
Judee	81.1	73.9	53.8	53.8	65.1	64.5	64.3	63.8	14.0	12.9	12.7	12.1
Keldin	66.8	79.5	62.9	66.9	63.8	64.0	64.2	63.7	14.1	12.2	11.2	11.1
# LCS Chrome	50.7	63.7	55.8		63.3	63.8	64.3		15.0	13.2	12.2	
# LCS Jet	75.6	58.9	49.9		60.2	58.6	59.8		13.1	13.0	11.7	
# LCS Zoom	50.7	48.1			58.1	56.5			13.8	13.1		
Loma	71.8	71.9	60.1	56.8	62.5	62.2	62.4	61.5	13.7	12.9	12.1	12.6
# Long Branch	50.8	59.6	51.0		63.4	62.9	63.5		13.3	11.8	10.8	
MT1564 (Flathead)	66.6	61.9	54.4		64.0	64.0	64.7		13.7	12.2	11.3	
MT1642	68.4	65.9			62.1	61.8			13.5	12.8		
MT1683	79.0	80.5			62.7	62.4			13.3	12.1		
+ MT1745	87.8				64.0				12.9			
+ MT1746	70.1				64.1				13.5			
+ MT1747	52.8				63.4				13.7			
+ MT1750	46.2				62.9				13.8			
+ MT1764	45.8				62.2				15.4			
+ MT1773	70.7				63.6				13.2			
+ MT1782	59.7				64.0				15.1			
+ MT1787	68.6				63.1				14.3			
+ MT1793	65.1				63.4				15.2			
+ MT1796	63.5				63.5				16.3			
+ MTCL1732	65.0				62.8				12.8			
+ MTCL1737	76.2				62.9				13.4			
MTCS1601R	79.3	74.6			64.4	64.5			14.1	11.8		
MTS1588 (Bobcat)	65.2	64.8	55.8		64.2	64.1	64.3		13.4	12.1	11.2	
+ MTS1731(w)	68.1				63.5				14.2			
MTW1491	87.3	80.1	65.8	65.9	63.7	63.3	63.8	62.9	12.7	11.9	11.0	10.7
Northern	86.6	85.2	69.0	66.4	63.6	63.4	63.7	62.7	13.6	12.4	11.4	11.2
Oahe	38.6	56.4			63.0	63.7			14.8	13.1		
Ray	64.6	68.3	60.0		60.8	60.7	61.5		14.1	12.6	11.4	
# SY 517 CL2	26.3	43.3	37.5		63.4	63.8	64.6		16.0	13.5	12.4	
SY Clearstone 2CL	73.7	69.4	60.0	60.6	63.1	62.2	62.9	62.2	13.3	12.4	11.1	10.6
# SY Legend CL2	38.7	50.9			63.2	63.0			14.2	12.9		
# SY Monument	38.7	59.5	54.6	58.5	60.8	61.3	62.1	61.7	14.0	11.8	10.4	10.4
#+ SY Wolverine	25.5				61.9				15.2			
Warhorse	53.4	61.3	51.7	50.4	63.0	62.8	63.0	62.5	15.8	13.8	12.7	12.3
#+ WB4269	33.9				62.9				14.2			
#+ WB4311	45.4				63.2				15.6			
#+ WB4418	40.7				62.8				13.2			
Yellowstone	73.3	73.0			62.8	62.5			13.5	12.0		
Average	57.5	65.7	56.0	59.1	62.9	62.6	63.4	62.7	14.2	12.5	11.5	11.4
LSD (0.05)	15.9	ns	ns	ns	1.3	1.8	1.2	1.0	0.8	ns	1.2	1.2
C.V.	17.1	20.1	21.4	20.6	1.2	1.4	1.2	1.1	3.1	6.0	6.4	7.6

+ = new for 2019, # = paid entry

1/ = not enough sample to do test weight

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 24. 2016//2019 Intrastate Winter Wheat Test (Exp. 3504): Williston Yield, Test Weight and Protein

		No harvest in 2017 due to extreme winter-kill						
Cultivar/Line	Grain Yield (bushels/acre)			Test Weight (lb/bu)			Protein (%)	
	2019	2018-19	2016//19	2019	2018-19	2016//19	2019	2018-19
	1y	2y	3y	1y	2y	3y	1y	2y
# AAC Wildfire	54.1	54.6		60.5	60.8		16.7	15.3
#+ ASC107	34.4			59.9			18.3	
#+ ASC116	22.5			56.8			21.2	
#+ ASC122	27.4			60.3			17.5	
Brawl CL Plus	43.8	41.2	44.1	60.8	61.0	60.6	18.7	16.4
# Byrd CL Plus	48.6	46.0		61.1	60.5		16.1	14.3
#+ Canvas	55.3			62.5			17.3	
Decade	47.6	46.0	47.2	60.5	60.1	59.5	19.3	16.7
FourOsix	56.7	51.8	50.9	60.8	60.5	59.8	16.9	15.4
# Incline AX	57.0	49.9		60.0	59.9		14.7	13.8
Judee	49.3	46.6	46.6	61.9	61.6	60.8	18.4	16.4
Keldin	52.4	48.9	50.9	61.2	61.0	60.5	16.6	14.7
# LCS Chrome	56.5	47.7		61.0	60.9		18.1	15.9
# LCS Jet	48.8	45.9		57.3	57.7		15.6	14.6
# LCS Zoom	56.4	50.2		57.9	57.1		15.1	14.2
Loma	57.9	52.3	50.8	60.7	60.2	59.7	17.2	15.6
# Long Branch	52.2	43.0		60.9	60.0		15.8	14.2
MT1564 (Flathead)	44.7	44.6		60.6	60.4		18.2	15.8
MT1642	63.2	57.0		60.1	59.8		16.5	15.3
MT1683	56.8	52.8		60.7	60.3		16.5	14.9
+ MT1745	52.3			60.9			16.3	
+ MT1746	52.3			61.2			17.3	
+ MT1747	47.1			60.8			17.7	
+ MT1750	56.2			61.7			17.3	
+ MT1764	52.7			59.2			18.8	
+ MT1773	43.8			59.7			18.6	
+ MT1782	48.9			60.7			18.5	
+ MT1787	60.3			60.9			16.7	
+ MT1793	43.2			60.1			19.5	
+ MT1796	44.2			60.5			20.2	
+ MTCL1732	51.3			59.5			17.8	
+ MTCL1737	56.1			59.7			17.6	
MTCS1601R	50.8	46.9		60.2	59.8		18.2	16.2
MTS1588 (Bobcat)	57.5	52.3		60.7	60.2		17.1	15.8
+ MTS1731(w)	53.0			60.3			18.9	
MTW1491	63.9	55.8	58.0	59.9	60.2	59.5	16.8	15.0
Northern	53.1	49.3	49.6	61.0	60.8	60.3	17.7	16.0
Oahe	45.5	44.0		60.8	60.7		17.6	15.3
Ray	52.8	47.2		59.5	58.7		16.2	15.1
# SY 517 CL2	44.1	41.8		61.7	60.9		17.6	15.5
SY Clearstone 2CL	45.5	45.5	48.0	60.1	59.9	59.6	18.0	16.0
# SY Legend CL2	45.4	41.7		61.4	60.9		17.9	15.8
# SY Monument	58.5	50.4	52.1	60.4	59.6	58.8	16.3	14.4
#+ SY Wolverine	47.6			60.6			18.3	
Warhorse	50.8	48.0	45.7	61.4	60.7	60.1	18.2	16.3
#+ WB4269	37.4			59.4			17.0	
#+ WB4311	49.4			60.3			17.8	
#+ WB4418	38.7			57.8			18.0	
Yellowstone	55.6	51.3		60.3	60.2		16.9	15.4
Average	49.9	48.3	49.5	60.3	60.1	59.9	17.5	15.3
LSD (0.05)	12.5	7.6	6.7	0.9	1.0	0.7	1.3	1.3
C.V.	14.3	7.7	8.0	0.8	0.8	0.7	4.4	4.2

+ = new for 2019, # = paid entry

1/ Yellowstone mis-planted in 2017: no 3 and 4 year data

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 25. 2016//2019 Intrastate Winter Wheat Test (Exp. 3505): Kalispell Yield, Test Weight and Protein

Cultivar/Line	*** No harvest in 2017; Spring flodded - test abandoned ***								
	Grain Yield (bushels/acre)			Test Weight (lb/bu)			Protein (%)		
	2019	2018-19	2016//19	2019	2018-19	2016//19	2019	2018-19	2016//19
	1y	2y	3y	1y	2y	3y	1y	2y	3y
# AAC Wildfire	134.4	108.8		62.3	59.1		8.4	10.2	
#+ ASC107	118.9			62.5			9.6		
#+ ASC116	100.4			59.6			10.0		
#+ ASC122	110.0			62.0			8.9		
Brawl CL Plus	110.0	98.5	83.8	61.2	60.7	54.9	9.3	10.8	11.8
# Byrd CL Plus	126.2	98.2		59.5	57.4		7.8	9.8	
#+ Canvas	127.7			61.6			8.3		
Decade	115.0	81.7	60.6	59.8	56.5	51.9	8.4	10.0	11.4
FourOsix	129.1	110.8	118.8	60.2	60.7	60.0	8.0	9.6	10.3
# Incline AX	122.5	87.7		59.1	55.9		7.4	9.4	
Judee	135.1	114.8	116.1	62.4	60.4	59.7	8.5	10.9	11.3
Keldin	135.4	118.4	112.6	60.8	61.3	59.4	8.1	9.7	10.2
# LCS Chrome	113.3	95.9		61.0	61.0		9.5	10.7	
# LCS Jet	145.7	134.0		58.8	58.9		7.5	8.9	
# LCS Zoom	128.5	125.4		58.0	58.8		8.2	9.8	
Loma	130.3	109.0	115.3	61.6	58.5	58.1	8.7	10.5	10.9
# Long Branch	121.1	111.3		61.6	61.9		8.6	10.0	
MT1564 (Flathead)	136.9	121.6		61.3	61.7		8.3	9.8	
MT1642	135.7	116.0		62.0	58.2		8.3	10.0	
MT1683	138.7	119.4		60.9	60.2		8.5	10.0	
+ MT1745	124.4			60.9			7.8		
+ MT1746	128.3			62.3			8.6		
+ MT1747	123.7			61.9			8.3		
+ MT1750	134.8			62.7			8.5		
+ MT1764	128.2			60.6			8.8		
+ MT1773	142.2			61.1			8.3		
+ MT1782	132.9			62.1			8.6		
+ MT1787	120.7			61.4			8.6		
+ MT1793	121.7			60.0			8.8		
+ MT1796	103.3			60.5			8.8		
+ MTCL1732	123.3			60.7			8.0		
+ MTCL1737	132.5			60.5			8.3		
MTCS1601R	122.6	104.0		62.4	61.5		8.8	10.8	
MTS1588 (Bobcat)	117.6	105.9		62.1	61.0		8.7	10.4	
+ MTS1731(w)	119.5			61.4			8.5		
MTW1491	145.2	118.8	125.5	60.6	60.1	59.9	8.1	9.8	10.1
Northern	139.1	108.7	117.0	61.2	58.7	58.1	8.5	10.4	10.8
Oahe	125.4	113.0		60.7	61.5		8.6	10.3	
Ray	131.4	114.3		60.4	57.2		8.4	10.0	
# SY 517 CL2	93.6	73.4		63.3	59.7		9.7	10.7	
SY Clearstone 2CL	140.2	114.9	115.7	60.5	59.8	58.2	7.9	9.5	10.1
# SY Legend CL2	119.0	95.1		61.2	61.0		8.5	10.3	
# SY Monument	121.0	102.6	110.7	59.8	59.3	57.8	8.4	10.0	10.8
#+ SY Wolverine	111.3			61.2			8.3		
Warhorse	118.4	105.2	112.4	60.6	60.8	60.4	8.6	10.6	11.4
#+ WB4269	112.8			61.4			8.8		
#+ WB4311	121.8			61.8			9.6		
#+ WB4418	122.2			59.5			8.4		
Yellowstone	127.9	105.8		60.7	59.3		8.1	9.6	
Average	124.9	107.6	108.0	61.0	59.7	58.0	8.5	10.1	10.8
LSD (0.05)	13.0	21.2	32.1	0.4	ns	ns	0.5	0.8	1.0
C.V.	6.4	9.6	17.4	0.4	3.6	6.0	3.6	3.9	5.5

+ = new for 2019, # = paid entry

1/ Yellowstone mis-planted in 2017: no 3 and 4 year data

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 26. 2016-2019 Intrastate Winter Wheat Test (Exp. 3507): Moccasin Yield, Test Weight and Protein

Cultivar/Line	Grain Yield (bushels/acre)				Test Weight (lb/bu)				Protein (%)			
	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19
	1y	2y	3y	4y	1y	2y	3y	4y	1y	2y	3y	4y
# AAC Wildfire	77.9	71.5			61.3	61.4			9.7	10.8		
#+ ASC107	57.2				63.8				10.7			
#+ ASC116	64.3				62.2				12.2			
#+ ASC122	66.9				64.2				11.0			
Brawl CL Plus	63.1	61.6	63.0	62.0	65.0	64.6	63.7	63.9	10.9	12.3	12.4	11.2
# Byrd CL Plus	76.2	72.0	68.9		61.0	62.5	60.3		9.0	10.3	10.8	
#+ Canvas	65.8				64.0				10.4			
Decade	72.0	66.0	63.7	61.5	63.8	63.2	61.6	61.8	10.4	11.7	12.4	11.3
FourOsix	76.3	72.8	68.3	69.2	63.1	63.4	61.7	61.8	9.5	11.1	11.9	11.0
# Incline AX	78.1	73.1			62.1	61.7			9.3	10.4		
Judee	69.6	63.4	62.3	58.9	64.5	64.2	62.5	62.8	10.1	11.4	12.3	11.1
Keldin	73.0	69.4	69.3	69.1	63.5	63.4	61.7	61.9	9.6	10.9	11.7	10.6
# LCS Chrome	67.2	60.5	62.2		63.0	63.5	61.9		11.3	12.2	12.5	
# LCS Jet	86.0	77.9	73.8		59.9	59.7	57.9		8.8	10.0	11.0	
# LCS Zoom	73.9	71.4			60.5	60.3			9.4	10.5		
Loma	71.6	69.5	65.8	63.9	63.0	62.7	61.1	61.4	9.6	10.7	11.7	10.7
# Long Branch	75.0	68.5	66.6		63.8	63.6	62.1		9.8	10.9	11.5	
MT1564 (Flathead)	64.4	65.0	66.4		64.0	63.8	61.9		10.1	11.2	11.8	
MT1642	83.6	79.8			62.8	62.0			10.0	10.9		
MT1683	74.7	78.3			62.7	62.6			9.6	10.8		
+ MT1745	77.9				62.9				9.9			
+ MT1746	73.3				64.6				10.1			
+ MT1747	72.1				64.9				9.8			
+ MT1750	65.6				64.4				10.5			
+ MT1764	65.8				64.4				9.8			
+ MT1773	69.6				63.7				10.1			
+ MT1782	72.9				64.1				10.6			
+ MT1787	72.7				63.6				9.8			
+ MT1793	63.4				63.7				11.2			
+ MT1796	68.6				63.9				11.6			
+ MTCL1732	71.3				62.4				9.6			
+ MTCL1737	71.6				61.2				9.8			
MTCS1601R	68.0	68.2			63.8	63.6			10.4	11.5		
MTS1588 (Bobcat)	71.4	67.6	65.3		63.7	63.7	62.2		9.8	10.8	11.6	
+ MTS1731(w)	65.0				64.4				10.6			
MTW1491	76.4	73.6	71.3	69.8	63.3	63.2	61.6	61.7	9.2	10.2	11.1	10.1
Northern	79.4	72.4	68.4	65.7	63.1	63.0	61.1	61.4	9.8	11.0	12.1	11.1
Oahe	67.6	66.4			64.6	64.4			10.4	11.4		
Ray	56.7	67.3	65.3		61.4	60.6	59.2		9.0	10.3	11.4	
# SY 517 CL2	73.1	66.8	65.2		63.0	63.7	61.9		10.4	11.5	11.9	
SY Clearstone 2CL	80.6	74.8	71.1	69.7	62.6	62.3	60.9	61.0	9.3	10.5	11.4	10.5
# SY Legend CL2	64.3	57.5			64.6	64.4			10.8	12.0		
# SY Monument	77.6	75.2	73.4	70.8	63.4	63.2	61.3	61.2	9.6	10.7	11.1	10.1
#+ SY Wolverine	73.5				63.3				10.6			
Warhorse	66.0	62.9	63.0	63.2	63.6	63.1	61.1	61.3	10.3	11.5	12.2	11.2
#+ WB4269	68.3				64.0				10.9			
#+ WB4311	77.2				62.5				10.8			
#+ WB4418	71.0				62.9				10.4			
Yellowstone	71.9	70.8			62.9	62.6			9.6	10.7		
Average	71.2	69.4	67.0	65.8	63.2	62.8	61.4	61.8	10.1	11.0	11.7	10.8
LSD (0.05)	9.4	11.2	ns	5.9	1.7	1.3	1.2	0.8	0.6	0.4	0.9	0.7
C.V.	7.6	7.9	7.9	6.2	1.6	1.0	1.2	0.9	3.8	1.9	4.4	4.3

+ = new for 2019, # = paid entry

1/ Yellowstone mis-planted in 2017: no 3 and 4 year data

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 27. 2016-2019 Intrastate Winter Wheat Test (Exp. 3508): Huntley Yield, Test Weight and Protein

Cultivar/Line	Grain Yield (bushels/acre)				Test Weight (lb/bu)				Protein (%)			
	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19
	1y	2y	3y	4y	1y	2y	3y	4y	1y	2y	3y	4y
# AAC Wildfire	97.8	98.3			62.0	62.4			12.8	12.8		
#+ ASC107	101.0				60.7				13.6			
#+ ASC116	117.4				62.0				12.7			
#+ ASC122	89.0				61.1				14.4			
Brawl CL Plus	123.2	118.6	117.7	115.5	63.9	63.5	63.8	63.8	12.9	12.9	13.0	12.6
# Byrd CL Plus	119.7	122.6	123.5		60.6	61.3	61.5		11.2	11.4	11.5	
#+ Canvas	95.6				61.7				11.7			
Decade	115.5	115.0	110.3	107.2	62.0	61.5	61.7	61.6	11.6	11.9	12.3	12.0
FourOsix	105.2	108.1	110.9	111.2	61.6	61.9	62.2	62.2	12.4	12.5	12.7	12.3
# Incline AX	104.1	106.4			59.9	60.4			11.2	11.3		
Judee	96.0	98.1	103.9	103.3	61.0	61.6	62.1	62.2	12.9	12.8	13.2	12.7
Keldin	133.0	134.8	134.9	129.6	62.5	62.8	63.1	62.8	11.2	11.5	11.8	11.7
# LCS Chrome	122.0	115.2	117.6		63.0	63.0	63.0		12.0	12.3	12.6	
# LCS Jet	129.1	132.0	134.8		60.3	60.9	61.2		12.5	12.6	13.0	
# LCS Zoom	119.3	125.6			58.5	59.4			12.3	12.2		
Loma	93.2	95.6	100.8	103.3	60.5	60.8	61.0	61.3	12.1	12.3	12.5	12.1
# Long Branch	116.7	117.6	120.9		62.1	62.5	62.5		11.5	11.4	11.7	
MT1564 (Flathead)	120.7	118.8	123.1		62.3	62.7	62.8		12.2	12.0	12.3	
MT1642	119.9	120.1			61.5	61.6			12.2	12.5		
MT1683	111.0	108.1			60.2	61.0			12.4	12.4		
+ MT1745	112.7				61.2				12.1			
+ MT1746	120.3				64.1				11.6			
+ MT1747	128.1				64.3				11.8			
+ MT1750	108.4				63.2				12.3			
+ MT1764	102.7				60.6				12.2			
+ MT1773	105.8				60.1				12.4			
+ MT1782	126.2				63.4				11.8			
+ MT1787	108.5				61.9				12.5			
+ MT1793	114.1				61.5				11.9			
+ MT1796	117.0				63.3				11.7			
+ MTCL1732	114.4				59.8				12.2			
+ MTCL1737	116.9				61.4				12.0			
MTCS1601R	110.8	107.9			62.9	62.9			12.4	12.8		
MTS1588 (Bobcat)	99.9	100.4	103.5		62.1	62.2	62.2		12.8	12.8	13.2	
+ MTS1731(w)	106.0				61.6				12.4			
MTW1491	116.3	111.5	116.3	115.9	61.9	62.4	62.5	62.5	11.4	11.8	12.3	12.0
Northern	110.9	109.7	110.8	112.5	62.2	62.3	62.0	62.0	12.2	12.3	12.7	12.4
Oahe	106.5	108.5			63.7	63.6			12.0	12.2		
Ray	100.5	102.7	106.2		59.1	60.1	60.1		12.7	12.9	13.1	
# SY 517 CL2	126.8	123.7	117.0		64.3	63.9	64.1		12.1	12.0	12.2	
SY Clearstone 2CL	111.2	107.3	111.3	111.6	59.9	60.7	60.9	61.0	12.1	12.3	12.8	12.4
# SY Legend CL2	97.9	100.2			59.8	61.5			12.2	12.1		
# SY Monument	118.4	120.3	123.5	121.0	60.5	61.4	61.9	61.7	11.6	11.8	12.0	11.8
#+ SY Wolverine	133.1				63.1				11.8			
Warhorse	107.5	109.1	109.5	107.6	62.1	62.4	62.6	62.4	13.1	13.3	13.4	13.0
#+ WB4269	114.4				62.8				11.2			
#+ WB4311	120.5				63.2				12.2			
#+ WB4418	107.7				61.4				12.0			
Yellowstone	105.6	105.1			60.3	60.9			12.4	12.5		
Average	112.2	112.2	115.6	112.6	61.7	61.8	62.2	62.1	12.2	12.2	12.5	12.3
LSD (0.05)	9.2	8.7	10.5	9.8	0.9	1.4	0.9	0.9	0.6	0.5	0.4	0.5
C.V.	5.2	3.8	5.5	6.0	0.9	1.1	0.9	1.0	2.7	1.9	2.1	2.7

+ = new for 2019, # = paid entry

1/ Yellowstone mis-planted in 2017: no 3 and 4 year data

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 28. 2016-2019 Intrastate Winter Wheat Test (Exp. 3518): Conrad Yield, Test Weight and Protein

Cultivar/Line	Grain Yield (bushels/acre)				Test Weight (lb/bu)				Protein (%)			
	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19
	1y	2y	3y	4y	1y	2y	3y	4y	1y	2y	3y	4y
# AAC Wildfire	50.3	56.0			57.5	59.1			14.8	14.3		
#+ ASC107	61.6				57.9				13.6			
#+ ASC116	76.7				57.4				14.4			
#+ ASC122	72.1				59.7				14.4			
Brawl CL Plus	79.5	72.5	75.1	79.7	58.4	61.0	61.9	62.4	13.1	13.1	12.9	13.0
# Byrd CL Plus	65.7	71.1	75.2		55.9	58.5	59.2		13.3	13.1	12.7	
#+ Canvas	75.4				60.4				12.0			
Decade	56.0	54.3	58.6	67.9	56.0	59.2	60.1	60.7	14.1	14.5	14.0	13.4
FourOsix	64.4	62.6	65.5	75.2	56.3	58.8	59.4	60.2	13.7	13.9	13.6	13.1
# Incline AX	60.7	64.5			55.7	58.4			12.5	12.2		
Judee	48.7	52.9	59.7	67.2	57.1	60.2	60.8	61.5	14.9	15.1	14.5	14.1
Keldin	72.8	67.2	71.5	81.0	56.9	59.7	60.5	61.2	13.7	13.8	13.5	12.9
# LCS Chrome	60.9	58.5	64.3		57.4	59.8	60.4		13.7	14.0	13.7	
# LCS Jet	73.0	69.9	74.9		55.1	57.7	57.8		13.5	13.7	13.3	
# LCS Zoom	67.4	70.1			53.5	56.8			13.6	13.2		
Loma	64.1	64.4	67.1	74.4	56.8	59.7	60.0	60.0	14.0	14.5	14.1	13.6
# Long Branch	72.8	68.3	76.2		57.6	60.4	61.0		12.7	12.9	12.6	
MT1564 (Flathead)	63.1	58.1	63.0		55.6	58.5	59.5		13.5	14.4	13.7	
MT1642	65.5	63.2			57.4	59.0			13.7	14.2		
MT1683	56.5	57.5			56.0	58.6			13.8	14.2		
+ MT1745	71.6				57.0				13.0			
+ MT1746	62.8				58.0				13.4			
+ MT1747	68.5				58.2				13.7			
+ MT1750	53.4				57.6				13.9			
+ MT1764	73.3				57.3				13.3			
+ MT1773	64.7				57.2				13.5			
+ MT1782	66.9				60.1				12.9			
+ MT1787	79.7				58.1				13.7			
+ MT1793	66.0				56.8				13.4			
+ MT1796	60.4				57.8				13.5			
+ MTCL1732	52.2				55.5				13.9			
+ MTCL1737	70.7				56.9				13.7			
MTCS1601R	64.7	68.0			58.0	60.0			14.5	14.1		
MTS1588 (Bobcat)	68.3	67.7	71.6		58.0	60.4	60.5		14.1	14.3	14.1	
+ MTS1731(w)	69.9				58.1				13.6			
MTW1491	66.7	62.0	64.9	74.1	57.7	59.6	59.8	60.6	13.5	13.8	13.5	13.0
Northern	69.1	62.1	66.1	75.5	57.3	59.7	59.8	60.3	14.0	14.3	13.8	13.3
Oahe	66.6	63.9			57.8	59.8			12.9	13.1		
Ray	56.1	58.8	62.3		56.6	58.3	58.0		14.1	14.0	13.6	
# SY 517 CL2	63.9	66.5	69.8		58.9	61.0	61.7		12.7	12.8	12.7	
SY Clearstone 2CL	62.7	64.1	69.7	76.7	55.4	57.7	58.5	59.6	13.9	14.0	13.7	13.2
# SY Legend CL2	59.9	65.7			56.5	59.0			13.8	13.6		
# SY Monument	71.6	67.7	71.4	81.4	56.5	59.0	59.2	59.9	12.6	12.9	12.6	12.2
#+ SY Wolverine	71.5				59.8				13.7			
Warhorse	49.6	49.8	55.2	62.6	55.2	57.8	58.2	59.2	14.3	14.7	14.2	13.7
#+ WB4269	75.2				59.3				12.2			
#+ WB4311	69.3				59.3				13.3			
#+ WB4418	62.0				55.8				13.3			
Yellowstone	57.4	56.9			56.1	58.5			13.6	14.1		
Average	65.3	63.0	67.5	74.1	57.3	59.1	59.8	60.5	13.6	13.8	13.5	13.2
LSD (0.05)	10.3	11.2	7.4	7.0	1.8	1.3	1.2	1.1	0.8	0.9	0.5	0.7
C.V.	9.0	8.7	6.6	6.5	1.8	1.1	1.2	1.2	3.2	3.2	2.4	3.4

+ = new for 2019, # = paid entry

1/ Yellowstone mis-planted in 2017: no 3 and 4 year data

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 29. 2016-2019 Intrastate Winter Wheat Test (Exp. 3503): Ft. Benton Yield, Test Weight and Protein

Cultivar/Line	Grain Yield (bushels/acre)				Test Weight (lb/bu)				Protein (%)			
	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19
	1y	2y	3y	4y	1y	2y	3y	4y	1y	2y	3y	4y
# AAC Wildfire	45.1	57.7			61.0	60.2			13.3	12.8		
#+ ASC107	40.9				58.9				13.6			
#+ ASC116	52.3				59.0				14.8			
#+ ASC122	52.9				59.7				14.1			
Brawl CL Plus	61.1	62.2	57.4	61.6	61.1	61.9	60.3	60.8	12.6	12.5	12.6	12.5
# Byrd CL Plus	46.4	60.1	57.5		57.0	58.6	58.1		12.0	11.8	11.9	
#+ Canvas	62.2				61.4				12.6			
Decade	56.7	61.8	58.8	62.3	59.5	59.7	59.1	59.4	13.3	12.9	12.9	12.4
FourOsix	56.7	55.1	54.3	58.2	58.8	59.5	58.8	59.5	13.0	12.6	12.7	12.4
# Incline AX	50.7	52.8			58.1	58.6			12.1	11.8		
Judee	60.9	62.5	59.7	60.5	61.3	61.2	59.3	59.9	13.4	12.9	12.9	12.7
Keldin	55.6	57.8	57.6	61.4	59.7	59.9	58.9	59.2	13.0	12.5	12.6	12.3
# LCS Chrome	54.1	59.8	53.7		60.2	60.4	59.1		12.9	12.5	12.5	
# LCS Jet	52.3	53.5	54.2		56.5	57.2	57.1		12.6	12.3	12.3	
# LCS Zoom	59.0	56.5			54.7	54.9			12.7	12.4		
Loma	59.7	63.4	61.3	65.4	60.1	59.7	59.2	59.5	13.0	12.7	12.7	12.1
# Long Branch	58.2	62.7	58.0		59.9	60.4	59.5		12.1	11.5	11.5	
MT1564 (Flathead)	59.0	58.9	59.2		59.8	60.0	59.1		12.4	12.1	12.3	
MT1642	57.1	61.9			59.4	59.0			13.3	12.8		
MT1683	54.8	61.2			59.0	59.3			13.1	12.4		
+ MT1745	59.7				59.8				12.3			
+ MT1746	56.7				62.3				12.8			
+ MT1747	56.7				62.4				12.6			
+ MT1750	57.5				62.0				13.1			
+ MT1764	56.8				59.8				13.1			
+ MT1773	54.9				60.0				12.7			
+ MT1782	53.7				62.0				12.6			
+ MT1787	58.0				60.4				13.2			
+ MT1793	56.0				60.4				13.5			
+ MT1796	53.2				61.1				13.7			
+ MTCL1732	56.9				59.2				12.7			
+ MTCL1737	53.4				59.0				13.6			
MTCS1601R	56.7	54.8			60.3	60.4			12.9	12.7		
MTS1588 (Bobcat)	62.0	65.3	62.7		60.6	61.0	60.0		13.1	12.4	12.4	
+ MTS1731(w)	74.6				61.4				12.6			
MTW1491	53.8	57.4	55.8	59.8	57.9	58.6	57.3	57.9	12.8	12.4	12.6	12.2
Northern	56.1	62.9	56.2	59.7	60.1	60.0	58.1	58.7	13.4	12.8	12.7	12.3
Oahe	63.7	73.4			61.5	61.4			12.5	12.0		
Ray	48.1	52.4	48.2		56.6	57.4	57.1		13.2	12.7	12.7	
# SY 517 CL2	59.4	59.2	59.2		61.3	61.6	61.0		13.1	12.7	12.7	
SY Clearstone 2CL	56.7	62.6	56.2	60.2	59.3	59.2	58.2	58.4	13.1	12.7	12.7	12.2
# SY Legend CL2	54.6	62.0			58.8	59.5			13.1	12.5		
# SY Monument	56.6	66.5	59.1	64.0	59.0	58.8	57.1	58.1	12.3	11.9	12.1	11.7
#+ SY Wolverine	44.1				60.7				14.0			
Warhorse	57.5	65.0	61.0	61.4	61.0	60.9	59.2	59.6	13.5	13.1	13.0	12.5
#+ WB4269	56.2				60.8				12.2			
#+ WB4311	57.4				61.0				13.0			
#+ WB4418	54.2				60.2				12.4			
Yellowstone	51.9	61.0			58.9	58.9			12.9	12.5		
Average	57.9	60.3	57.4	61.3	59.9	59.5	58.8	59.2	13.0	12.4	12.5	12.3
LSD (0.05)	11.5	ns	ns	ns	1.9	1.3	1.7	1.3	0.5	0.4	0.4	0.5
C.V.	12.2	9.8	9.9	8.5	1.9	1.0	1.8	1.5	2.2	1.6	1.7	2.7

+ = new for 2019, # = paid entry

1/ Yellowstone mis-planted in 2017: no 3 and 4 year data

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 30. 2016-2019 Intrastate Winter Wheat Test (Exp. 3501): Combined Locations Yield, Test Weight and Protein

Cultivar/Line	Grain Yield (bushels/acre)				Test Weight (lb/bu)				Protein (%)			
	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19
location-years	9	18	25	34	9	18	25	34	9	18	25	33
# AAC Wildfire	80.9	80.0			61.2	61.1			12.9	12.7		
#+ ASC107	62.8				60.8				13.6			
#+ ASC116	68.5				59.8				14.8			
#+ ASC122	64.0				61.4				13.9			
Brawl CL Plus	77.2	75.4	72.1	73.1	62.2	62.7	62.4	61.8	13.4	13.3	13.1	12.8
# Byrd CL Plus	80.3	80.7	77.3		60.2	60.8	60.5		11.9	11.8	11.7	
#+ Canvas	77.5				62.6				12.4			
Decade	79.4	75.4	71.2	69.3	60.9	60.9	60.8	60.1	13.3	13.1	13.0	12.6
FourOsix	82.1	79.8	77.3	80.0	60.8	61.4	61.3	61.1	12.7	12.7	12.7	12.3
# Incline AX	78.5	75.9			59.7	60.1			11.6	11.6		
Judee	79.5	76.8	73.6	74.0	62.0	62.3	61.9	61.8	13.4	13.4	13.4	12.9
Keldin	88.2	87.2	83.8	85.0	61.3	61.9	61.7	61.4	12.5	12.4	12.4	12.0
# LCS Chrome	78.1	75.0	74.0		61.3	61.9	61.7		13.4	13.2	13.1	
# LCS Jet	90.6	86.3	84.2		58.6	59.1	59.0		12.2	12.3	12.3	
# LCS Zoom	81.9	81.7			57.6	58.2			12.4	12.4		
Loma	80.9	79.5	76.5	78.0	60.9	60.9	60.8	60.6	12.8	12.8	12.9	12.4
# Long Branch	81.0	80.2	78.7		61.5	61.9	61.7		12.1	11.9	11.9	
MT1564 (Flathead)	82.2	79.6	79.1		61.3	61.9	61.9		12.8	12.6	12.6	
MT1642	87.6	84.6			60.8	60.4			12.8	12.9		
MT1683	84.7	83.8			60.5	60.9			12.7	12.6		
+ MT1745	86.8				61.2				12.2			
+ MT1746	83.1				62.5				12.7			
+ MT1747	81.8				62.5				12.7			
+ MT1750	78.0				62.3				12.9			
+ MT1764	78.6				60.8				13.2			
+ MT1773	82.2				60.9				12.8			
+ MT1782	82.8				62.4				13.0			
+ MT1787	82.9				61.4				12.9			
+ MT1793	79.2				60.9				13.6			
+ MT1796	76.2				61.5				13.8			
+ MTCL1732	78.4				60.1				12.6			
+ MTCL1737	84.3				60.3				12.8			
MTCS1601R	82.5	79.4			61.8	62.0			13.2	13.0		
MTS1588 (Bobcat)	80.4	79.3	76.8		61.7	62.0	61.8		12.9	12.8	12.8	
+ MTS1731(w)	82.4				61.5				13.2			
MTW1491	90.7	85.3	82.6	85.4	60.9	61.3	61.2	61.1	12.3	12.3	12.4	11.9
Northern	88.6	83.7	79.1	81.1	61.3	61.4	60.9	60.7	12.8	12.8	12.8	12.5
Oahe	77.6	78.1			61.8	62.4			12.9	12.7		
Ray	78.7	78.8	76.2		59.4	59.3	59.3		12.7	12.7	12.7	
# SY 517 CL2	72.3	71.0	68.8		62.4	62.4	62.3		13.3	12.9	12.8	
SY Clearstone 2CL	85.8	82.4	79.1	80.8	60.2	60.5	60.4	60.2	12.8	12.7	12.7	12.2
# SY Legend CL2	71.9	71.4			61.1	61.7			12.9	12.8		
# SY Monument	81.2	81.6	79.5	82.5	60.3	60.7	60.4	60.1	12.2	12.0	11.9	11.7
#+ SY Wolverine	74.2				61.6				13.4			
Warhorse	74.3	74.7	72.3	73.6	61.1	61.4	61.1	61.0	13.6	13.5	13.4	13.0
#+ WB4269	73.9				61.6				12.4			
#+ WB4311	79.9				61.8				13.3			
#+ WB4418	73.6				60.2				12.6			
Yellowstone	82.3				60.4	60.7			12.6	12.6		
Average	79.8	79.6	77.0	78.4	61.0	61.2	61.1	60.9	12.9	12.7	12.7	12.4
LSD (0.05)	8.5	5.8	5.1	4.8	0.7	0.6	0.6	0.7	0.5	0.3	0.3	0.3
C.V.	11.5	11.2	11.8	12.9	1.3	1.6	1.6	2.3	4.3	4.0	4.0	4.5

+ = new for 2019, # = paid entry

1/ Yellowstone mis-planted in 2017: no 3 and 4 year data

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 31. 2015//2019 Intrastate Winter Wheat Test (Exp. 35): Combined Locations Winter Survival and associated Yield (Locations: Williston (2015, 2019), Sidney (2017, 2018, 2019) = 5 locations

*** No recordable Winterkill, with a harvest, in 2016 ***								
	Winter Survival (%)				Yield under Winterkill conditions			
	2019	2018-19	2017-19	2015//19	2019	2018-19	2017-19	2015//19
location-years	2	3	4	5	2	3	4	5
# AAC Wildfire	53	57			71.5	71.1		
#+ ASC107	28				20.0			
#+ ASC116	42				21.6			
#+ ASC122	21				21.5			
Brawl CL Plus	49	47	42	44	39.8	46.8	42.2	38.9
# Byrd CL Plus	41	47	44		49.9	59.0	54.8	
#+ Canvas	40				51.1			
Decade	52	58	59	63	58.2	63.3	60.1	57.6
FourOsix	45	46	46		60.7	63.1	57.6	
# Incline AX	41	38			52.7	58.1		
Judee	53	51	45	44	65.2	65.7	52.7	47.7
Keldin	47	50	45	42	59.6	70.4	60.3	53.9
# LCS Chrome	46	45	44		53.6	61.3	56.0	
# LCS Jet	26	22	19		62.2	55.5	49.7	
# LCS Zoom	44	35			53.6	50.9		
Loma	49	48	46	56	64.9	67.2	59.6	58.1
# Long Branch	51	51	51		51.5	57.1	51.3	
MT1564 (Flathead)	54	51	50		55.7	56.2	52.0	
MT1642	42	41			65.8	65.0		
MT1683	52	52			67.9	72.6		
+ MT1745	55				70.1			
+ MT1746	50				61.2			
+ MT1747	46				50.0			
+ MT1750	44				51.2			
+ MT1764	49				49.3			
+ MT1773	50				57.3			
+ MT1782	50				54.3			
+ MT1787	47				64.5			
+ MT1793	63				54.2			
+ MT1796	51				53.9			
+ MTCL1732	46				58.2			
+ MTCL1737	48				66.2			
MTCS1601R	51	54			65.1	66.6		
MTS1588 (Bobcat)	43	46	40		61.4	62.3	56.2	
+ MTS1731(w)	47				60.6			
MTW1491	50	52	50		75.6	74.7	65.3	
Northern	46	47	45	53	69.9	74.5	65.0	62.1
Oahe	50	51			42.1	52.8		
Ray	45	45	42		58.7	63.1	58.2	
# SY 517 CL2	43	42	36		35.2	43.6	39.1	
SY Clearstone 2CL	51	50	49	54	59.6	61.4	56.4	54.3
# SY Legend CL2	44	40			42.1	49.1		
# SY Monument	49	53	52	56	48.6	59.1	55.6	52.6
#+ SY Wolverine	36				36.6			
Warhorse	46	48	49	54	52.1	57.8	51.5	49.3
#+ WB4269	38				35.7			
#+ WB4311	44				47.4			
#+ WB4418	45				39.7			
Yellowstone 1/	50	54	-	-	64.5	67.2	-	-
Average	45.9	47.2	44.9	51.7	53.7	61.3	54.9	52.7
LSD (0.05)	12.3	11.8	10.7	ns	23.1	ns	ns	ns
C.V.	13.3	15.3	16.8	21.6	21.4	17.8	18.9	19.7

+ = new for 2019, # = paid entry

1/ Yellowstone mis-planted in 2017: no 3 and 4 year data

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 32. 2016-2019 Intrastate Winter Wheat Test (Exp. 35): Combined Locations Heading Date, Height, and Lodging

Cultivar/Line	Heading Date (Julian)				Plant Height (in)				Lodging %	
	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19	2019	2016//19
location-years	8	16	22	29	8	17	23	32	1	2
# AAC Wildfire	173.0	168.9			32.6	33.0			24	
#+ ASC107	165.9				26.5				0	
#+ ASC116	160.4				27.5				0	
#+ ASC122	167.2				26.0				0	
Brawl CL Plus	160.6	157.7	155.6	154.4	29.3	28.9	29.4	31.1	8	4
# Byrd CL Plus	164.5	160.7	158.5		31.3	31.7	31.6		19	
#+ Canvas	165.5				27.9				0	
Decade	166.2	162.7	160.5	159.3	31.8	31.6	31.2	32.1	13	17
FourOsix	167.0	163.5	161.3	160.0	29.7	29.7	29.6	30.9	0	0
# Incline AX	167.4	163.6			30.4	30.0			0	
Judee	167.4	164.0	161.7	160.3	31.1	31.1	30.8	31.8	6	9
Keldin	168.5	164.7	162.3	160.6	30.2	30.5	30.6	31.7	3	2
# LCS Chrome	164.9	161.5	159.1		31.0	30.8	30.9		8	
# LCS Jet	168.1	165.0	162.6		27.8	27.6	27.6		0	
# LCS Zoom	166.2	162.2			28.5	28.3			0	
Loma	170.0	166.7	164.3	162.7	29.4	29.3	29.0	30.4	15	29
# Long Branch	160.9	157.9	155.9		28.5	28.2	28.8		28	
MT1564 (Flathead)	163.3	159.9	157.7		30.2	30.1	30.6		0	
MT1642	170.5	167.6			32.2	32.1			0	
MT1683	168.5	165.2			32.7	32.8			13	
+ MT1745	169.1				30.9				0	
+ MT1746	167.5				28.7				3	
+ MT1747	166.7				28.9				13	
+ MT1750	169.4				27.6				4	
+ MT1764	164.7				28.1				34	
+ MT1773	167.6				30.1				43	
+ MT1782	165.9				30.1				6	
+ MT1787	169.2				27.5				6	
+ MT1793	164.4				29.9				3	
+ MT1796	164.8				30.7				9	
+ MTCL1732	168.1				29.0				0	
+ MTCL1737	170.9				29.0				0	
MTCS1601R	167.9	164.3			30.7	30.9			15	
MTS1588 (Bobcat)	168.8	165.4	163.0		28.9	28.6	28.5		10	
+ MTS1731(w)	165.5				28.3				29	
MTW1491	169.1	165.5	163.1	161.6	33.0	32.6	32.4	33.6	3	13
Northern	169.8	166.3	164.0	162.5	31.4	31.2	30.7	32.0	22	18
Oahe	164.6	161.0			33.1	33.1			55	
Ray	172.3	168.6	166.2		35.9	35.9	35.7		67	
# SY 517 CL2	161.7	158.3	156.0		27.9	28.2	28.2		0	
SY Clearstone 2CL	168.3	165.6	163.0	161.3	32.6	33.4	33.3	34.5	32	16
# SY Legend CL2	165.3	161.6			29.2	28.8			70	
# SY Monument	165.9	162.2	159.9	158.7	28.7	28.9	29.2	30.9	12	6
#+ SY Wolverine	163.0				26.8				0	
Warhorse	168.3	165.1	162.8	161.4	30.2	30.0	29.8	31.0	6	11
#+ WB4269	163.5				26.9				0	
#+ WB4311	165.3				27.3				0	
#+ WB4418	162.9				27.3				3	
Yellowstone 1/	169.0	165.8	-	-	32.7	32.6	-	-	3	
Average	166.6	163.6	160.9	160.3	29.7	30.7	30.4	31.8	12.0	11.2
LSD (0.05)	1.0	0.8	0.7	0.5	1.3	0.9	0.8	0.7	8.0	ns
C.V.	0.6	0.7	0.7	0.6	4.5	4.4	4.5	4.3	17.1	102

+ = new for 2019, # = paid entry

1/ Yellowstone mis-planted in 2017: no 3 and 4 year data

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 33. 2016-2019 Intrastate Winter Wheat Test (Exp. 35): Combined Locations Sawfly Cutting and Stripe Rust

Cultivar/Line	Test Average above 10%				no data for 2018 and 2019	
	Sawfly Cutting (%) Conrad, Havre and Ft. Benton				Stripe Rust (%) Bozeman, Huntley and Kalispell	
	2019	2018-19	2017-19	2016-19	2017	2016-17
location-years	3	5	6	7	2	4
# AAC Wildfire	46	33				
#+ ASC107	55					
#+ ASC116	42					
#+ ASC122	13					
Brawl CL Plus	45	37	41	41	70	75
# Byrd CL Plus	38	36	42		10	
#+ Canvas	48					
Decade	47	38	38	34	74	75
FourOsix	60	56	58	52	6	14
# Incline AX	31	30				
Judee	36	29	28	25	5	13
Keldin	63	52	52	48	41	45
# LCS Chrome	69	62	67		2	
# LCS Jet	41	37	39		2	
# LCS Zoom	73	68				
Loma	32	25	25	23	4	13
# Long Branch	40	38	44		6	
MT1564 (Flathead)	54	52	51		3	
MT1642	51	41				
MT1683	62	61				
+ MT1745	35					
+ MT1746	32					
+ MT1747	33					
+ MT1750	27					
+ MT1764	52					
+ MT1773	53					
+ MT1782	39					
+ MT1787	44					
+ MT1793	56					
+ MT1796	53					
+ MTCL1732	14					
+ MTCL1737	39					
MTCS1601R	43	35				
MTS1588 (Bobcat)	13	9	8		5	
+ MTS1731(w)	24					
MTW1491	47	47	50	49	7	
Northern	43	38	42	37	8	20
Oahe	50	48				
Ray	51	43	46		11	
# SY 517 CL2	43	36	35		31	
SY Clearstone 2CL	62	59	62	56	16	32
# SY Legend CL2	70	51				
# SY Monument	59	53	56	52	4	11
#+ SY Wolverine	42					
Warhorse	14	9	8	7	5	13
#+ WB4269	38					
#+ WB4311	48					
#+ WB4418	32					
Yellowstone 1/	56	56			-	
Average	44.0	42.1	41.7	38.5	22.6	32.3
LSD (0.05)	18.0	15.2	13.5	13.0	18.2	16.9
C.V.	25.3	28.8	28.2	31.5	38	37

+ = new for 2019, # = paid entry

1/ Yellowstone mis-planted in 2017: no 3 and 4 year data

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 34. 2019 Off-Station Winter Wheat Tests: Summary

Cultivar/Line + = new for 2019	Origin/Pedigree	Locations				Yield bu/ac	Test weight lb/bu	Plant height in	Sawfly cutting %	Falling number	Protein %
		13	15	4	13						
Northern	Montana, 2015	70.8	61.5	49	421	12.0					
+ Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2018 (CO130)	70.7	61.1	42	374	11.0					
MT1642	Yellowstone/Madsen//Yellowstone	70.2	60.8	40	424	12.1					
Keldin	Westbred, 2011	69.4	61.3	47	398	11.9					
MTS1588 (Bobcat)	Montana, 2019	69.4	61.4	11	403	11.9					
Loma	Montana, 2016	69.3	61.3	29	374	12.1					
+ MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/MTCL01158	68.8	60.2	23	428	11.8					
+ MT1750	MT08185/YLL(L)/NX05M4391	68.6	62.6	18	405	11.9					
Yellowstone	Montana 2005	68.3	60.7	61	441	11.8					
+ MT1747	MT06103/MTW0881/SD06W166	68.0	62.5	31	394	11.8					
+ AAC Wildfire	Alberta: SECAN, 2015	67.9	61.1	33	403	11.9					
+ MT1683	Yellowstone(L)*2/CDC Buteo	67.5	60.7	70	422	11.8					
Decade	Montana/North Dakota, 2010	67.2	61.1	32	390	12.3					
SY Clearstone 2CL	Montana/Syngenta, 2012	67.1	60.4	64	450	11.8					
MTW1491	MT08189/MT08187/(MTW08166, WB3768 sit	66.8	61.3	61	424	11.5					
FourOsix	Montana, 2018 (MT1465)	66.2	60.9	61	417	11.9					
SY Monument	Syngenta, 2015	65.8	60.3	45	379	11.4					
+ MT1782	MT0859/MT0860/MT0885	65.3	62.2	33	408	12.4					
LCS Jet	Limagrain Cereal Seeds, 2015	64.8	58.6	60	382	11.5					
Judee	Montana, 2011	63.6	62.3	44	388	12.4					
MTCS1601	MTS0531/7/MTS0532/6/96X17E69/3/MTCL031	63.6	61.8	32	420	12.1					
Ray	Montana, 2018 (MTF1432)	63.3	60.1	51	439	11.8					
Warhorse	Montana, 2013	63.1	61.2	17	473	12.6					
MT1564 (Flathead)	Montana, 2019	60.5	61.4	53	401	12.2					
Brawl CLP	Colorado Research Foundation, 2011	59.1	62.0	38	375	13.1					
Average		66.6	61.1	30.8	409.3	12.0					
LSD (0.05)		4.2	0.4	0.8	51.6	0.3					
C.V. (%)		8.1	0.9	3.5	25.7	3.3					

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 35. 2019 Off-Station Winter Wheat Test (Exp. 3851): Turner (NARC)

Entry	Cultivar/Line	Origin/Pedigree	Yield bu/ac	Test weight lb/bu	Plant height in	Falling number	Protein %
+ = new for 2019			LAT	LAT	RCB	RCB	LAT
lattice efficiency relative to RCB			124%	116%	105%	100%	110%
1	Yellowstone	Montana 2005	74.7	59.3	28.8	397	14.1
14	MTS1588 (Bobcat)	Montana, 2019	73.4	59.8	27.5	392	13.8
19	+ MT1683	Yellowstone(L)*2/CDC Buteo	73.3	59.3	29.1	377	14.2
9	Loma	Montana, 2016	70.9	58.9	23.4	340	14.7
8	Northern	Montana, 2015	65.4	59.7	24.5	331	14.3
6	Keldin	Westbred, 2011	63.9	59.7	26.3	381	13.9
22	+ MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/MT	62.4	58.6	25.1	404	14.0
17	MT1642	Yellowstone/Madsen//Yellowstone	62.0	58.5	26.9	379	14.3
7	SY Clearstone 2CL	Montana/Syngenta, 2012	61.8	59.1	26.9	404	14.4
13	Ray	Montana, 2018 (MTF1432)	61.7	57.6	33.9	426	13.8
11	FourOsix	Montana, 2018 (MT1465)	61.7	58.6	24.7	393	14.3
12	MTW1491	MT08189//MT08187/(MTW08166, W	61.2	60.2	26.8	380	13.5
24	+ MT1750	MT08185//YLL(L)/NX05M4391	60.9	60.4	24.5	387	14.1
23	+ MT1747	MT06103//MTW0881/SD06W166	60.3	60.2	26.3	363	13.9
25	+ MT1782	MT0859//MT0860/MT0885	60.1	60.4	25.1	377	14.6
5	Decade	Montana/North Dakota, 2010	59.4	58.9	26.3	359	14.7
2	Judee	Montana, 2011	59.0	60.2	28.5	360	14.6
21	+ AAC Wildfire	Alberta: SECAN, 2015	58.3	58.1	28.7	393	13.8
20	+ Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2011	56.4	59.7	25.9	341	13.2
16	MTCS1601	MTS0531/7/MTS0532/6/96X17E69/3	55.9	60.3	27.4	406	14.0
18	LCS Jet	Limagrain Cereal Seeds, 2015	55.4	56.4	22.7	360	13.7
10	SY Monument	Syngenta, 2015	55.2	58.8	24.5	362	13.4
15	MT1564 (Flathead)	Montana, 2019	52.2	59.3	24.1	350	14.7
3	Warhorse	Montana, 2013	51.9	58.7	25.5	449	14.4
4	Brawl CLP	Colorado Research Foundation, 2011	46.6	59.8	22.1	322	15.2
Average			61.0	59.2	26.2	377.3	14.1
LSD (0.05)			7.8	0.5	2.4	19.3	0.2
C.V. (%)			7.1	0.5	5.5	3.1	1.0
P-value (Varieties)			<.0001	<.0001	<.0001	<.0001	<.0001

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 36. 2019 Off-Station Winter Wheat Test (Exp. 3853): Loma (NARC)

Entry	Cultivar/Line	Origin/Pedigree	Yield bu/ac	Test weight lb/bu	Plant height in	Sawfly cutting %	Falling number	Protein %
+ = new for 2019								
		lattice efficiency relative to RCB	97%	122%	101%	112%	116%	120%
10	SY Monument	Syngenta, 2015	74.2	60.4	24.7	38	396	12.0
14	MTS1588 (Bobcat)	Montana, 2019	73.9	61.8	28.2	6	414	11.8
17	MT1642	Yellowstone/Madsen//Yellowstone	70.3	60.6	31.4	46	469	12.7
24	+ MT1750	MT08185/YLL(L)/NX05M4391	66.1	62.0	24.2	21	424	12.4
6	Keldin	Westbred, 2011	63.6	60.7	27.8	49	416	12.5
22	+ MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/MT	63.5	60.6	26.1	19	452	12.6
2	Judee	Montana, 2011	62.0	62.4	28.3	41	415	12.1
23	+ MT1747	MT06103/MTW0881/SD06W166	61.8	62.0	24.3	20	425	11.8
13	Ray	Montana, 2018 (MTF1432)	61.6	59.6	34.3	32	453	11.9
11	FourOsix	Montana, 2018 (MT1465)	61.3	60.5	25.1	66	441	12.1
5	Decade	Montana/North Dakota, 2010	61.3	61.0	32.9	35	421	11.8
4	Brawl CLP	Colorado Research Foundation, 201	61.0	61.6	28.9	39	429	13.3
8	Northern	Montana, 2015	60.7	60.3	27.1	51	510	13.1
20	+ Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 201	60.4	61.4	28.2	39	406	11.8
19	+ MT1683	Yellowstone(L)*2/CDC Buteo	60.2	60.1	30.9	88	467	12.2
21	+ AAC Wildfire	Alberta: SECAN, 2015	60.0	59.9	31.4	20	413	12.9
9	Loma	Montana, 2016	60.0	60.7	27.8	22	408	13.3
12	MTW1491	MT08189/MT08187/(MTW08166, W	58.6	60.6	28.8	62	467	11.6
25	+ MT1782	MT0859/MT0860/MT0885	58.6	62.0	28.8	26	438	12.5
18	LCS Jet	Limagrain Cereal Seeds, 2015	58.3	57.8	24.2	53	404	11.6
7	SY Clearstone 2CL	Montana/Syngenta, 2012	55.4	59.4	30.9	62	496	12.4
15	MT1564 (Flathead)	Montana, 2019	54.5	60.9	28.9	56	451	13.3
1	Yellowstone	Montana 2005	53.2	59.2	30.6	53	484	13.3
16	MTCS1601	MTS0531/7/MTS0532/6/96X17E69/3	50.5	60.9	28.0	45	434	12.8
3	Warhorse	Montana, 2013	44.5	61.4	28.6	17	497	14.1
Average			60.6	60.7	28.4	40.2	441.3	12.5
LSD (0.05)			8.3	0.7	2.1	20.6	25.5	0.5
C.V. (%)			8.4	0.7	4.5	29.2	3.3	2.5
P-value (Varieties)			<.0001	<.0001	<.0001	<.0001	<.0001	<.0001

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 37. 2019 Off-Station Winter Wheat Test (Exp. 3862): The Knees (WTARC)

		Not Harvested, field sprayed out				
Entry	Cultivar/Line	Origin/Pedigree	Yield bu/ac	Test weight lb/bu	Plant height in	Lodging % Protein %
+ = new for 2019						
		lattice efficiency relative to RCB				
1	Yellowstone	Montana 2005				
2	Judee	Montana, 2011				
3	Warhorse	Montana, 2013				
4	Brawl CLP	Colorado Research Foundation, 2011				
5	Decade	Montana/North Dakota, 2010				
6	Keldin	Westbred, 2011				
7	SY Clearstone 2CL	Montana/Syngenta, 2012				
8	Northern	Montana, 2015				
9	Loma	Montana, 2016				
10	SY Monument	Syngenta, 2015				
11	FourOsix	Montana, 2018 (MT1465)				
12	MTW1491	MT08189//MT08187/(MTW08166, WB3768 sib)				
13	Ray	Montana, 2018 (MTF1432)				
14	MTS1588 (Bobcat)	Montana, 2019				
15	MT1564 (Flathead)	Montana, 2019				
16	MTCS1601	MTS0531/7/MTS0532/6/96X17E69/3/MTCL0309/CDC Teal 11A//MTW01143/4/MT				
17	MT1642	Yellowstone/Madsen//Yellowstone				
18	LCS Jet	Limagrain Cereal Seeds, 2015				
19	+ MT1683	Yellowstone(L)*2/CDC Buteo				
20	+ Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2018 (CO13003C)				
21	+ AAC Wildfire	Alberta: SECAN, 2015				
22	+ MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/MTCL01158/CDC Teal 11A//JAG				
23	+ MT1747	MT06103//MTW0881/SD06W166				
24	+ MT1750	MT08185//YLL(L)/NX05M4391				
25	+ MT1782	MT0859//MT0860/MT0885				
Average						
LSD (0.05)						
C.V. (%)						
P-value (Varieties)						

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 38. 2019 Off-Station Winter Wheat Test (Exp. 3864): Cut Bank (WTARC)

Entry	Cultivar/Line	Origin/Pedigree	Yield bu/ac	Test weight lb/bu	Plant height in	Protein %
+ = new for 2019			LAT	RCB	RCB	RCB
lattice efficiency relative to RCB			122%	100%	103%	102%
18	LCS Jet	Limagrain Cereal Seeds, 2015	74.4	57.8	26.7	12.2
14	MTS1588 (Bobcat)	Montana, 2019	73.7	59.4	28.7	13.5
10	SY Monument	Syngenta, 2015	72.3	59.2	30.0	12.5
13	Ray	Montana, 2018 (MTF1432)	71.7	60.3	36.0	12.0
8	Northern	Montana, 2015	71.5	60.0	30.3	12.7
9	Loma	Montana, 2016	70.9	60.1	29.7	13.2
21	+ AAC Wildfire	Alberta: SECAN, 2015	70.2	59.5	31.7	12.7
6	Keldin	Westbred, 2011	70.1	60.3	29.7	12.9
1	Yellowstone	Montana 2005	70.1	60.0	32.0	12.7
19	+ MT1683	Yellowstone(L)*2/CDC Buteo	70.1	58.1	31.3	13.0
7	SY Clearstone 2CL	Montana/Syngenta, 2012	69.6	59.6	34.3	12.1
17	MT1642	Yellowstone/Madsen//Yellowstone	68.8	59.3	31.7	13.0
11	FourOsix	Montana, 2018 (MT1465)	68.6	60.3	29.7	12.8
25	+ MT1782	MT0859//MT0860/MT0885	68.1	61.3	27.3	13.4
16	MTCS1601	MTS0531/7/MTS0532/6/96X17E69/3	67.9	60.2	29.0	13.1
24	+ MT1750	MT08185//YLL(L)/NX05M4391	67.6	60.7	27.3	12.7
20	+ Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2018	67.5	59.5	29.7	12.1
23	+ MT1747	MT06103//MTW0881/SD06W166	67.0	60.6	29.0	13.1
15	MT1564 (Flathead)	Montana, 2019	66.4	60.5	29.3	13.2
2	Judee	Montana, 2011	64.9	61.0	28.7	14.1
5	Decade	Montana/North Dakota, 2010	64.1	59.7	31.3	14.1
4	Brawl CLP	Colorado Research Foundation, 2018	63.9	61.2	27.7	14.6
12	MTW1491	MT08189//MT08187/(MTW08166, W	62.1	60.5	30.0	12.1
22	+ MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/MT	61.8	57.8	28.7	13.0
3	Warhorse	Montana, 2013	60.9	58.2	30.0	14.0
Average			68.2	59.8	30.0	13.0
LSD (0.05)			ns	1.3	1.8	1.0
C.V. (%)			8.6	1.4	3.6	4.5
P-value (Varieties)			0.4726	<.0001	<.0001	0.0002

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 39. 2019 Off-Station Winter Wheat Test (Exp. 3865): Shelby/Devon (WTARC)

Entry	Cultivar/Line	Origin/Pedigree	Yield bu/ac	Test weight lb/bu	Plant height in	Cutting/ Lodg- ing %		Protein %
	+ = new for 2019		LAT	RCB	RCB	RCB		LAT
		lattice efficiency relative to RCB	105%	101%	99%	99%		115%
14	MTS1588 (Bobcat)	Montana, 2019	64.8	61.5	26.3	12		12.7
8	Northern	Montana, 2015	59.1	61.9	29.0	60		12.7
5	Decade	Montana/North Dakota, 2010	58.1	60.8	26.7	50		13.0
17	MT1642	Yellowstone/Madsen//Yellowstone	55.0	61.5	26.3	59		12.9
3	Warhorse	Montana, 2013	54.6	61.8	24.7	17		13.2
1	Yellowstone	Montana 2005	53.7	59.8	27.3	85		12.8
9	Loma	Montana, 2016	52.9	61.9	26.0	47		13.2
16	MTCS1601	MTS0531/7/MTS0532/6/96X17E69/3	52.8	62.5	27.7	50		12.5
22	+ MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/MT	52.5	60.2	25.7	23		12.4
13	Ray	Montana, 2018 (MTF1432)	49.8	59.9	31.3	70		12.4
24	+ MT1750	MT08185//YLL(L)/NX05M4391	49.7	62.5	23.3	30		12.3
23	+ MT1747	MT06103//MTW0881/SD06W166	48.7	62.2	24.7	72		12.2
19	+ MT1683	Yellowstone(L)*2/CDC Buteo	48.0	60.7	29.3	80		13.0
20	+ Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2011	47.9	61.7	27.0	70		11.7
21	+ AAC Wildfire	Alberta: SECAN, 2015	46.7	60.7	27.0	70		12.8
11	FourOsix	Montana, 2018 (MT1465)	46.0	60.8	24.0	92		12.7
6	Keldin	Westbred, 2011	45.9	61.1	25.0	67		12.5
12	MTW1491	MT08189//MT08187/(MTW08166, W	45.8	61.7	28.0	72		12.6
7	SY Clearstone 2CL	Montana/Syngenta, 2012	44.7	60.1	27.3	88		13.1
2	Judee	Montana, 2011	43.9	62.3	26.3	73		13.7
10	SY Monument	Syngenta, 2015	42.2	59.7	24.0	76		11.9
4	Brawl CLP	Colorado Research Foundation, 2011	42.1	63.1	24.0	70		12.6
25	+ MT1782	MT0859//MT0860/MT0885	40.7	61.7	23.0	40		13.0
15	MT1564 (Flathead)	Montana, 2019	38.9	61.6	26.3	83		12.9
18	LCS Jet	Limagrain Cereal Seeds, 2015	37.9	58.4	22.3	92		12.4
Average			48.9	61.2	26.1	61.9		12.7
LSD (0.05)			11.8	1.3	2.8	32.3		0.5
C.V. (%)			13.9	1.3	6.5	31.8		2.3
P-value (Varieties)			0.0048	<.0001	<.0001	<.0001		<.0001

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 40. 2019 Off-Station Winter Wheat Test (Exp. 3866): Choteau (WTARC)

			Sawfly/				
Entry	Cultivar/Line	Origin/Pedigree	Yield bu/ac	Test weight lb/bu	Plant height in	Lodg- ing %	Protein %
+ = new for 2019			LAT	LAT	RCB	RCB	LAT
lattice efficiency relative to RCB			110%	109%	101%	86%	107%
9	Loma	Montana, 2016	88.5	62.1	31.7	43	13.8
6	Keldin	Westbred, 2011	88.5	62.8	32.7	53	13.4
12	MTW1491	MT08189//MT08187/(MTW08166, W	88.5	62.3	36.7	83	13.1
21	+ AAC Wildfire	Alberta: SECAN, 2015	88.0	62.5	38.3	37	13.2
14	MTS1588 (Bobcat)	Montana, 2019	86.9	62.6	31.0	27	13.3
20	+ Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2011	86.8	62.8	35.0	45	12.1
17	MT1642	Yellowstone/Madsen//Yellowstone	86.2	61.9	32.7	37	12.9
1	Yellowstone	Montana 2005	81.8	61.2	35.0	79	13.1
22	+ MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/MT	81.2	62.2	32.7	43	12.9
23	+ MT1747	MT06103//MTW0881/SD06W166	81.2	64.2	30.7	30	12.7
24	+ MT1750	MT08185//YLL(L)/NX05M4391	80.6	64.6	30.0	20	12.9
16	MTCS1601	MTS0531/7/MTS0532/6/96X17E69/3	79.0	63.4	34.0	25	13.2
25	+ MT1782	MT0859//MT0860/MT0885	78.5	64.0	32.7	53	13.7
8	Northern	Montana, 2015	77.7	62.2	31.0	63	13.3
11	FourOsix	Montana, 2018 (MT1465)	77.6	62.5	31.7	67	13.1
13	Ray	Montana, 2018 (MTF1432)	76.8	60.6	36.0	70	13.0
3	Warhorse	Montana, 2013	75.8	61.8	32.0	33	13.9
19	+ MT1683	Yellowstone(L)*2/CDC Buteo	75.0	61.6	35.3	82	13.4
18	LCS Jet	Limagrain Cereal Seeds, 2015	74.8	60.3	28.0	80	13.3
7	SY Clearstone 2CL	Montana/Syngenta, 2012	73.9	61.5	34.0	73	13.3
2	Judee	Montana, 2011	73.3	63.8	33.0	60	13.9
10	SY Monument	Syngenta, 2015	73.1	61.9	31.0	57	12.7
4	Brawl CLP	Colorado Research Foundation, 2011	69.7	63.8	30.7	33	14.1
15	MT1564 (Flathead)	Montana, 2019	69.6	62.6	32.7	53	13.2
5	Decade	Montana/North Dakota, 2010	67.7	62.2	33.3	40	13.8
Average			79.2	62.4	32.9	51.5	13.3
LSD (0.05)			12.1	0.9	2.9	32.9	0.4
C.V. (%)			8.7	0.9	5.5	38.9	1.6
P-value (Varieties)			0.0099	<.0001	<.0001	<.0001	<.0001

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 41. 2019 Off-Station Winter Wheat Test (Exp. 3871): Denton (CARC)

Entry	Cultivar/Line	Origin/Pedigree	Yield bu/ac	Test weight lb/bu	Plant height in	Protein %
+ = new for 2019			LAT	LAT	LAT	LAT
lattice efficiency relative to RCB			176%	160%	186%	271%
6	Keldin	Westbred, 2011	70.1	60.4	30.2	12.4
11	FourOsix	Montana, 2018 (MT1465)	69.1	59.0	27.7	11.9
25	+ MT1782	MT0859//MT0860/MT0885	67.5	61.7	29.1	12.3
5	Decade	Montana/North Dakota, 2010	67.4	59.7	31.1	12.3
8	Northern	Montana, 2015	67.2	61.0	28.7	11.9
18	LCS Jet	Limagrain Cereal Seeds, 2015	66.5	57.1	26.7	11.4
20	+ Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2011	65.9	59.6	30.5	11.2
24	+ MT1750	MT08185//YLL(L)/NX05M4391	65.1	61.6	27.6	12.2
23	+ MT1747	MT06103//MTW0881/SD06W166	64.3	62.4	28.1	11.7
22	+ MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/MT	63.8	58.3	28.0	11.8
16	MTCS1601	MTS0531/7/MTS0532/6/96X17E69/3	62.2	61.0	28.7	11.9
3	Warhorse	Montana, 2013	61.8	60.5	27.9	11.9
9	Loma	Montana, 2016	61.6	60.0	26.9	11.3
14	MTS1588 (Bobcat)	Montana, 2019	60.8	60.9	26.4	11.4
12	MTW1491	MT08189//MT08187/(MTW08166, W	60.4	60.7	30.3	11.4
19	+ MT1683	Yellowstone(L)*2/CDC Buteo	60.2	60.6	29.5	10.8
10	SY Monument	Syngenta, 2015	60.1	59.6	27.6	11.3
17	MT1642	Yellowstone/Madsen//Yellowstone	59.7	58.3	30.3	12.2
7	SY Clearstone 2CL	Montana/Syngenta, 2012	59.7	59.2	32.9	11.6
21	+ AAC Wildfire	Alberta: SECAN, 2015	59.4	58.5	32.2	12.9
1	Yellowstone	Montana 2005	59.4	60.2	31.4	11.3
13	Ray	Montana, 2018 (MTF1432)	58.2	58.8	35.6	11.9
2	Judee	Montana, 2011	56.5	60.1	29.4	12.6
4	Brawl CLP	Colorado Research Foundation, 2011	56.1	61.8	25.2	12.4
15	MT1564 (Flathead)	Montana, 2019	54.2	60.6	27.9	12.0
Average			62.3	60.1	29.2	11.8
LSD (0.05)			7.5	1.3	1.6	0.9
C.V. (%)			6.6	1.2	2.9	4.3
P-value (Varieties)			0.0062	<.0001	<.0001	0.0126

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD ($p = 0.05$)

Table 42. 2019 Off-Station Winter Wheat Test (Exp. 3872): Geraldine (CARC)

Entry	Cultivar/Line	Origin/Pedigree	Yield bu/ac	Test weight lb/bu	Plant height in	Lodg- ing %	Protein %
+ = new for 2019			RCB	LAT	LAT	LAT	LAT
lattice efficiency relative to RCB			100%	132%	108%	133%	142%
20	+ Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2011	85.4	61.1	29.2	15	10.8
8	Northern	Montana, 2015	85.0	61.6	31.6	11	11.5
10	SY Monument	Syngenta, 2015	84.8	60.3	29.3	4	10.8
7	SY Clearstone 2CL	Montana/Syngenta, 2012	84.1	60.3	34.0	15	11.4
6	Keldin	Westbred, 2011	82.8	61.6	29.9	11	11.2
23	+ MT1747	MT06103//MTW0881/SD06W166	81.1	63.1	27.9	3	11.6
4	Brawl CLP	Colorado Research Foundation, 2011	80.9	62.3	27.6	4	12.9
22	+ MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/MT	80.0	60.4	28.5	6	11.4
21	+ AAC Wildfire	Alberta: SECAN, 2015	79.5	61.4	31.4	5	11.4
12	MTW1491	MT08189//MT08187/(MTW08166, W	78.7	61.4	31.0	18	10.9
5	Decade	Montana/North Dakota, 2010	78.1	61.4	33.1	9	11.6
1	Yellowstone	Montana 2005	77.7	60.9	31.2	18	11.1
9	Loma	Montana, 2016	77.6	61.4	28.2	14	11.3
25	+ MT1782	MT0859//MT0860/MT0885	77.5	62.1	29.0	10	12.0
16	MTCS1601	MTS0531/7/MTS0532/6/96X17E69/3	76.9	61.8	29.3	13	11.8
24	+ MT1750	MT08185//YLL(L)/NX05M4391	76.8	62.6	27.3	0	11.6
17	MT1642	Yellowstone/Madsen//Yellowstone	76.5	60.7	30.0	19	11.2
19	+ MT1683	Yellowstone(L)*2/CDC Buteo	73.8	60.8	30.7	22	11.3
18	LCS Jet	Limagrain Cereal Seeds, 2015	73.4	58.3	26.7	10	11.0
3	Warhorse	Montana, 2013	73.1	61.1	29.4	1	11.9
2	Judee	Montana, 2011	72.4	62.4	28.5	9	11.6
15	MT1564 (Flathead)	Montana, 2019	71.5	61.9	29.2	19	11.6
14	MTS1588 (Bobcat)	Montana, 2019	70.5	61.2	27.3	0	11.7
11	FourOsix	Montana, 2018 (MT1465)	69.9	61.2	29.2	17	11.4
13	Ray	Montana, 2018 (MTF1432)	61.7	60.1	36.1	23	11.7
Average			77.2	61.3	29.8	10.9	11.5
LSD (0.05)			8.5	0.7	2.1	8.1	0.4
C.V. (%)			6.7	0.6	4.1	41.4	2.0
P-value (Varieties)			0.0004	<.0001	<.0001	<.0001	<.0001

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 43. 2019 Off-Station Winter Wheat Test (Exp. 3875): Belt (CARC)

Entry	Cultivar/Line	Origin/Pedigree	Yield bu/ac	Test weight lb/bu	Plant height in	Sawfly cutting %	Protein %
+ = new for 2019			LAT	LAT	LAT	RCB	LAT
lattice efficiency relative to RCB			113%	112%	115%	98%	205%
20	+ Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2011	89.6	62.7	29.6	13	9.1
23	+ MT1747	MT06103//MTW0881/SD06W166	85.5	64.6	27.5	<u>0</u>	10.1
17	MT1642	Yellowstone/Madsen//Yellowstone	78.4	62.7	31.0	17	10.6
12	MTW1491	MT08189//MT08187/(MTW08166, W	77.5	62.8	30.5	27	9.6
16	MTCS1601	MTS0531/7/MTS0532/6/96X17E69/3	77.4	63.8	29.3	7	10.2
10	SY Monument	Syngenta, 2015	76.2	62.1	25.7	10	9.5
14	MTS1588 (Bobcat)	Montana, 2019	75.3	63.6	27.4	<u>0</u>	10.3
9	Loma	Montana, 2016	74.3	63.8	26.6	3	9.8
22	+ MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/MT	73.5	62.7	27.2	7	10.1
24	+ MT1750	MT08185//YLL(L)/NX05M4391	73.2	64.9	24.4	<u>0</u>	10.6
8	Northern	Montana, 2015	73.1	63.8	27.9	20	10.1
21	+ AAC Wildfire	Alberta: SECAN, 2015	72.9	63.2	29.7	3	9.8
19	+ MT1683	Yellowstone(L)*2/CDC Buteo	71.5	62.3	30.4	30	9.6
2	Judee	Montana, 2011	70.9	64.0	28.4	3	9.8
1	Yellowstone	Montana 2005	68.8	62.6	29.6	27	9.6
18	LCS Jet	Limagrain Cereal Seeds, 2015	68.7	59.6	23.6	17	9.7
5	Decade	Montana/North Dakota, 2010	68.2	63.2	29.9	3	10.3
7	SY Clearstone 2CL	Montana/Syngenta, 2012	64.5	62.2	29.9	30	9.7
11	FourOsix	Montana, 2018 (MT1465)	64.0	62.8	26.5	20	10.8
13	Ray	Montana, 2018 (MTF1432)	62.6	62.4	32.8	33	9.9
4	Brawl CLP	Colorado Research Foundation, 2011	62.2	62.5	26.1	10	12.8
15	MT1564 (Flathead)	Montana, 2019	62.2	63.0	28.5	20	10.2
3	Warhorse	Montana, 2013	61.8	63.9	26.8	<u>0</u>	10.7
25	+ MT1782	MT0859//MT0860/MT0885	59.0	64.1	26.8	13	10.9
6	Keldin	Westbred, 2011	57.7	62.6	27.2	20	10.5
Average			70.8	63.0	28.1	13.3	10.2
LSD (0.05)			15.3	1.0	2.7	9.0	0.8
C.V. (%)			12.3	0.9	5.4	41.2	4.2
P-value (Varieties)			0.0239	<.0001	<.0001	<.0001	<.0001

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 44. 2019 Off-Station Winter Wheat Test (Exp. 3876): Highwood (CARC)

Entry	Cultivar/Line	Origin/Pedigree	Yield bu/ac	Test weight lb/bu	Plant height in	Lodg- ing %	Protein %
+ = new for 2019			LAT	RCB	LAT	LAT	LAT
		lattice efficiency relative to RCB	219%	92%	114%	148%	268%
21	+ AAC Wildfire	Alberta: SECAN, 2015	61.9	62.4	29.8	3	11.0
10	SY Monument	Syngenta, 2015	60.6	60.9	26.9	8	10.4
20	+ Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2011	58.8	61.9	27.3	2	10.3
8	Northern	Montana, 2015	58.3	61.7	26.8	3	11.6
5	Decade	Montana/North Dakota, 2010	57.5	61.4	29.1	5	11.3
22	+ MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/MT	56.0	60.6	24.4	0	11.1
7	SY Clearstone 2CL	Montana/Syngenta, 2012	55.7	61.1	29.9	0	10.9
9	Loma	Montana, 2016	55.2	61.5	24.9	4	12.1
17	MT1642	Yellowstone/Madsen//Yellowstone	54.8	61.9	28.6	9	11.8
19	+ MT1683	Yellowstone(L)*2/CDC Buteo	54.5	61.0	29.3	6	11.4
1	Yellowstone	Montana 2005	54.2	61.4	29.3	3	11.0
25	+ MT1782	MT0859//MT0860/MT0885	53.3	62.0	26.5	8	11.5
11	FourOsix	Montana, 2018 (MT1465)	53.3	61.6	26.7	2	11.6
24	+ MT1750	MT08185/YLL(L)/NX05M4391	51.7	63.2	23.2	2	11.0
12	MTW1491	MT08189//MT08187/(MTW08166, W	51.4	61.8	28.3	0	10.8
23	+ MT1747	MT06103//MTW0881/SD06W166	50.1	62.6	24.5	1	10.9
2	Judee	Montana, 2011	49.7	63.0	25.1	0	11.7
18	LCS Jet	Limagrain Cereal Seeds, 2015	49.0	59.4	22.4	5	11.1
3	Warhorse	Montana, 2013	47.9	61.4	26.5	1	12.4
14	MTS1588 (Bobcat)	Montana, 2019	44.7	59.4	25.0	0	12.0
6	Keldin	Westbred, 2011	44.4	60.9	26.8	8	11.7
16	MTCS1601	MTS0531/7/MTS0532/6/96X17E69/3	43.0	61.3	25.3	5	12.6
13	Ray	Montana, 2018 (MTF1432)	42.1	60.5	32.3	18	11.8
15	MT1564 (Flathead)	Montana, 2019	42.1	62.0	26.9	1	11.8
4	Brawl CLP	Colorado Research Foundation, 2011	38.5	62.4	23.0	7	12.6
Average			51.5	61.5	26.7	3.9	11.5
LSD (0.05)			8.6	1.2	2.1	7.0	0.7
C.V. (%)			9.1	1.2	4.4	99.7	3.5
P-value (Varieties)			<.0001	<.0001	<.0001	0.0010	<.0001

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 45. 2019 Off-Station Winter Wheat Test (Exp. 3880): Huntley Irrigated (SARC)

Entry	Cultivar/Line	Origin/Pedigree	Yield bu/ac	Test weight lb/bu	*** Hailed Out ***			
					Heading date	Plant height in	Lodg- ing %	Protein %
+ = new for 2019								
lattice efficiency relative to RCB								
21	+ AAC Wildfire	Alberta: SECAN, 2015			87%	95%	141%	
4	Brawl CLP	Colorado Research Foundation, 2011			175.7	41.7	12	
20	+ Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2018 (CO13003C)			168.0	36.4	9	
5	Decade	Montana/North Dakota, 2010			168.3	38.8	13	
11	FourOsix	Montana, 2018 (MT1465)			168.7	40.0	7	
2	Judee	Montana, 2011			169.7	35.7	5	
6	Keldin	Westbred, 2011			170.7	37.7	12	
18	LCS Jet	Limagrain Cereal Seeds, 2015			169.7	36.7	4	
9	Loma	Montana, 2016			170.0	34.4	5	
15	MT1564 (Flathead)	Montana, 2019			171.0	36.7	27	
17	MT1642	Yellowstone/Madsen//Yellowstone			168.0	37.4	3	
19	+ MT1683	Yellowstone(L)*2/CDC Buteo			173.7	40.8	14	
23	+ MT1747	MT06103/MTW0881/SD06W166			171.0	40.6	6	
24	+ MT1750	MT08185//YLL(L)/NX05M4391			170.0	35.7	16	
25	+ MT1782	MT0859//MT0860/MT0885			171.0	37.3	21	
22	+ MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/MTCL01158/CDC Te			169.0	36.9	9	
16	MTCS1601	MTS05317/MTS0532/6/96X17E69/3/MTCL0309/CDC			170.3	37.0	19	
14	MTS1588 (Bobcat)	Montana, 2019			169.7	38.5	4	
12	MTW1491	MT08189/MT08187/(MTW08166, WB3768 sib)			170.7	36.1	0	
8	Northern	Montana, 2015			171.3	41.2	6	
13	Ray	Montana, 2018 (MTF1432)			171.7	39.8	20	
7	SY Clearstone 2CL	Montana/Syngenta, 2012			176.0	43.7	32	
10	SY Monument	Syngenta, 2015			172.7	40.3	43	
3	Warhorse	Montana, 2013			169.0	34.9	3	
1	Yellowstone	Montana 2005			172.3	37.8	0	
					170.7	39.8	27	
Average					170.7	38.2	12.6	
LSD (0.05)					2.1	2.0	23.3	
C.V. (%)					0.7	3.2	103.0	
P-value (Varieties)					<.0001	0.0001	0.0372	

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 46. 2019 Off-Station Winter Wheat Test (Exp. 3881): Rapelje (SARC)

Entry	Cultivar/Line	Origin/Pedigree	Yield bu/ac	Test weight lb/bu	Plant height in	Protein %
+ = new for 2019			LAT	RCB	RCB	LAT
lattice efficiency relative to RCB			131%	88%	101%	123%
8	Northern	Montana, 2015	87.3	63.1	35.7	12.1
6	Keldin	Westbred, 2011	85.9	63.8	33.7	12.3
1	Yellowstone	Montana 2005	84.1	62.8	36.1	12.4
7	SY Clearstone 2CL	Montana/Syngenta, 2012	81.1	62.4	37.5	12.0
5	Decade	Montana/North Dakota, 2010	81.0	63.7	35.3	13.0
24 +	MT1750	MT08185//YLL(L)/NX05M4391	80.5	65.4	30.8	12.1
19 +	MT1683	Yellowstone(L)*2/CDC Buteo	79.1	62.8	36.1	12.6
17	MT1642	Yellowstone/Madsen//Yellowstone	78.6	62.6	35.2	12.4
11	FourOsix	Montana, 2018 (MT1465)	78.4	63.7	33.9	12.5
18	LCS Jet	Limagrain Cereal Seeds, 2015	78.2	61.0	30.1	11.6
20 +	Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2011	78.2	62.9	35.2	11.4
9	Loma	Montana, 2016	78.0	63.0	33.1	12.1
14	MTS1588 (Bobcat)	Montana, 2019	77.6	63.6	31.8	12.1
22 +	MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/MT	77.1	62.3	31.9	12.2
3	Warhorse	Montana, 2013	76.2	63.1	32.9	13.4
13	Ray	Montana, 2018 (MTF1432)	76.2	61.8	41.3	12.5
12	MTW1491	MT08189//MT08187/(MTW08166, W	76.1	63.5	36.4	12.0
16	MTCS1601	MTS0531/7/MTS0532/6/96X17E69/3	75.2	63.9	33.6	12.6
23 +	MT1747	MT06103//MTW0881/SD06W166	74.8	65.2	31.6	12.5
15	MT1564 (Flathead)	Montana, 2019	74.6	63.9	32.7	13.1
2	Judee	Montana, 2011	71.6	64.2	31.8	13.0
25 +	MT1782	MT0859//MT0860/MT0885	71.5	64.4	33.1	13.3
21 +	AAC Wildfire	Alberta: SECAN, 2015	69.0	63.6	36.0	12.1
4	Brawl CLP	Colorado Research Foundation, 2011	66.6	64.4	31.9	14.6
10	SY Monument	Syngenta, 2015	66.4	62.6	31.8	12.0
Average			76.9	63.3	34.0	12.5
LSD (0.05)			10.1	0.7	2.2	0.5
C.V. (%)			7.3	0.7	3.9	2.2
P-value (Varieties)			0.0136	<.0001	<.0001	<.0001

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 47. 2019 Off-Station Winter Wheat Test (Exp. 3882): Hysham (SARC)

Entry	Cultivar/Line	Origin/Pedigree	Yield bu/ac	Test weight lb/bu	Plant height in	Protein %
+ = new for 2019			LAT	RCB	RCB	RCB
lattice efficiency relative to RCB			132%	104%	96%	103%
7	SY Clearstone 2CL	Montana/Syngenta, 2012	59.7	58.8	30.3	7.2
22	+ MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/MT	57.2	57.7	27.4	7.4
20	+ Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2018	55.4	57.7	28.7	6.8
1	Yellowstone	Montana 2005	54.7	58.8	30.8	7.2
17	MT1642	Yellowstone/Madsen//Yellowstone	54.0	60.1	29.8	8.3
8	Northern	Montana, 2015	51.7	59.8	28.2	7.7
21	+ AAC Wildfire	Alberta: SECAN, 2015	51.6	60.0	29.0	7.5
6	Keldin	Westbred, 2011	50.3	59.0	30.5	7.5
19	+ MT1683	Yellowstone(L)*2/CDC Buteo	49.2	59.0	31.3	7.6
5	Decade	Montana/North Dakota, 2010	49.1	58.7	28.8	7.7
2	Judee	Montana, 2011	49.1	60.3	29.5	7.9
18	LCS Jet	Limagrains Cereal Seeds, 2015	49.0	56.3	24.0	7.5
3	Warhorse	Montana, 2013	49.0	59.0	27.8	7.8
11	FourOsix	Montana, 2018 (MT1465)	48.7	57.7	28.2	7.1
14	MTS1588 (Bobcat)	Montana, 2019	48.5	59.5	25.8	8.1
9	Loma	Montana, 2016	48.5	60.3	26.7	8.3
15	MT1564 (Flathead)	Montana, 2019	47.5	58.8	29.7	7.3
23	+ MT1747	MT06103//MTW0881/SD06W166	46.7	59.6	27.0	7.9
12	MTW1491	MT08189//MT08187/(MTW08166, W	46.6	57.8	30.1	7.1
24	+ MT1750	MT08185//YLL(L)/NX05M4391	46.3	59.7	26.4	7.6
13	Ray	Montana, 2018 (MTF1432)	46.3	59.2	32.5	7.7
25	+ MT1782	MT0859//MT0860/MT0885	45.1	59.6	27.8	8.1
4	Brawl CLP	Colorado Research Foundation, 2018	44.0	59.1	27.1	8.6
16	MTCS1601	MTS0531/7/MTS0532/6/96X17E69/3	43.7	58.8	27.6	7.6
10	SY Monument	Syngenta, 2015	43.2	57.3	28.0	7.2
Average			49.4	58.9	28.5	7.6
LSD (0.05)			6.1	0.4	1.4	0.5
C.V. (%)			6.9	0.4	3.1	3.9
P-value (Varieties)			0.0001	<.0001	<.0001	<.0001

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 48. 2019 Off-Station Winter Wheat Test (Exp. 3884): Fly Creek (Hardin Area, SARC)

Entry	Cultivar/Line	Origin/Pedigree	Yield bu/ac	Test weight lb/bu	Plant height in	Protein %
+ = new for 2019			LAT	RCB	RCB	LAT
lattice efficiency relative to RCB			111%	105%	102%	107%
6	Keldin	Westbred, 2011	95.9	60.2	34.5	11.8
25	+ MT1782	MT0859//MT0860/MT0885	91.3	60.5	36.0	12.7
24	+ MT1750	MT08185//YLL(L)/NX05M4391	88.7	61.3	31.5	12.8
23	+ MT1747	MT06103//MTW0881/SD06W166	87.1	60.7	32.9	12.3
5	Decade	Montana/North Dakota, 2010	83.9	59.9	36.4	13.7
22	+ MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/MT	81.7	58.3	31.6	12.2
3	Warhorse	Montana, 2013	81.5	60.7	34.5	13.3
19	+ MT1683	Yellowstone(L)*2/CDC Buteo	81.4	59.2	37.1	12.6
10	SY Monument	Syngenta, 2015	81.1	58.6	35.3	11.8
21	+ AAC Wildfire	Alberta: SECAN, 2015	80.9	59.9	37.5	13.1
7	SY Clearstone 2CL	Montana/Syngenta, 2012	80.3	58.9	36.6	12.9
13	Ray	Montana, 2018 (MTF1432)	79.5	58.8	42.0	13.1
12	MTW1491	MT08189//MT08187/(MTW08166, W	78.3	60.5	34.9	12.4
20	+ Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 201	77.8	59.4	36.5	11.5
11	FourOsix	Montana, 2018 (MT1465)	77.4	58.9	33.2	12.5
9	Loma	Montana, 2016	77.3	59.3	33.2	13.1
1	Yellowstone	Montana 2005	76.2	59.3	36.5	12.8
18	LCS Jet	Limagrain Cereal Seeds, 2015	76.0	58.1	30.6	12.4
4	Brawl CLP	Colorado Research Foundation, 201	75.7	60.1	34.6	12.0
15	MT1564 (Flathead)	Montana, 2019	74.8	59.4	34.8	12.6
17	MT1642	Yellowstone/Madsen//Yellowstone	74.4	59.7	33.9	13.4
14	MTS1588 (Bobcat)	Montana, 2019	73.8	60.4	31.1	12.5
2	Judee	Montana, 2011	73.5	61.2	34.0	13.0
8	Northern	Montana, 2015	72.4	60.4	33.5	13.4
16	MTCS1601	MTS0531/7/MTS0532/6/96X17E69/3	68.7	60.8	32.9	12.8
Average			79.6	59.8	34.6	12.7
LSD (0.05)			8.5	0.4	2.0	0.5
C.V. (%)			6.1	0.4	3.5	2.4
P-value (Varieties)			<.0001	<.0001	<.0001	<.0001

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 49. 2019 Off-Station Winter Wheat Test (Exp. 3885): Molt (SARC)

			*** Hailed Out ***			
Entry	Cultivar/Line	Origin/Pedigree	Yield bu/ac	Test weight lb/bu	Plant height in RCB	Protein %
+ = new for 2019						
		lattice efficiency relative to RCB				98%
21	+ AAC Wildfire	Alberta: SECAN, 2015			36.4	
4	Brawl CLP	Colorado Research Foundation, 2011			33.1	
20	+ Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2018 (CO13003C)			36.2	
5	Decade	Montana/North Dakota, 2010			37.0	
11	FourOsix	Montana, 2018 (MT1465)			34.0	
2	Judee	Montana, 2011			34.4	
6	Keldin	Westbred, 2011			35.4	
18	LCS Jet	Limagrain Cereal Seeds, 2015			33.3	
9	Loma	Montana, 2016			34.6	
15	MT1564 (Flathead)	Montana, 2019			34.4	
17	MT1642	Yellowstone/Madsen//Yellowstone			35.0	
19	+ MT1683	Yellowstone(L)*2/CDC Buteo			35.0	
23	+ MT1747	MT06103//MTW0881/SD06W166			32.7	
24	+ MT1750	MT08185//YLL(L)/NX05M4391			32.8	
25	+ MT1782	MT0859//MT0860/MT0885			32.9	
22	+ MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/MTCL01158/CDC Te			35.7	
16	MTCS1601	MTS0531/7/MTS0532/6/96X17E69/3/MTCL0309/CDC			34.4	
14	MTS1588 (Bobcat)	Montana, 2019			31.2	
12	MTW1491	MT08189//MT08187/(MTW08166, WB3768 sib)			37.0	
8	Northern	Montana, 2015			36.5	
13	Ray	Montana, 2018 (MTF1432)			40.3	
7	SY Clearstone 2CL	Montana/Syngenta, 2012			37.3	
10	SY Monument	Syngenta, 2015			33.7	
3	Warhorse	Montana, 2013			35.0	
1	Yellowstone	Montana 2005			36.7	
Average					35.0	
LSD (0.05)					2.4	
C.V. (%)					4.2	
P-value (Varieties)					<.0001	

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 50. 2019 Off-Station Winter Wheat Test (Exp. 3886): Fort Smith (SARC)

Entry	Cultivar/Line	Origin/Pedigree	Yield bu/ac	Test weight lb/bu	Plant height in	Protein %
+ = new for 2019			LAT	LAT	LAT	LAT
lattice efficiency relative to RCB			260%	107%	155%	114%
17	MT1642	Yellowstone/Madsen//Yellowstone	94.4	63.2	35.5	12.0
8	Northern	Montana, 2015	91.5	63.7	34.4	12.0
20	+ Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2018	89.0	64.1	34.7	11.5
9	Loma	Montana, 2016	85.4	63.5	35.3	11.7
21	+ AAC Wildfire	Alberta: SECAN, 2015	84.7	64.0	36.7	11.6
24	+ MT1750	MT08185//YLL(L)/NX05M4391	84.6	65.2	30.5	11.8
11	FourOsix	Montana, 2018 (MT1465)	84.1	63.8	34.2	12.0
6	Keldin	Westbred, 2011	83.4	64.3	33.1	11.6
12	MTW1491	MT08189//MT08187/(MTW08166, W	83.3	63.3	36.4	12.2
22	+ MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/MT	83.1	63.3	31.7	12.4
18	LCS Jet	Limagrain Cereal Seeds, 2015	81.4	61.0	30.8	11.5
19	+ MT1683	Yellowstone(L)*2/CDC Buteo	81.2	63.0	37.0	11.5
7	SY Clearstone 2CL	Montana/Syngenta, 2012	81.2	62.8	36.7	11.9
3	Warhorse	Montana, 2013	81.0	63.5	33.3	12.5
2	Judee	Montana, 2011	80.5	64.6	34.9	12.8
1	Yellowstone	Montana 2005	79.5	63.3	36.1	12.0
14	MTS1588 (Bobcat)	Montana, 2019	78.5	64.3	30.9	12.0
5	Decade	Montana/North Dakota, 2010	78.4	63.9	34.7	12.5
25	+ MT1782	MT0859//MT0860/MT0885	78.3	64.5	35.1	13.1
15	MT1564 (Flathead)	Montana, 2019	78.0	63.5	32.8	13.1
23	+ MT1747	MT06103//MTW0881/SD06W166	75.1	64.9	31.2	12.3
13	Ray	Montana, 2018 (MTF1432)	74.6	61.7	40.0	12.0
16	MTCS1601	MTS0531/7/MTS0532/6/96X17E69/3	73.9	64.3	33.4	12.5
10	SY Monument	Syngenta, 2015	66.2	62.9	30.5	12.1
4	Brawl CLP	Colorado Research Foundation, 2018	60.9	64.4	32.9	14.2
Average			80.5	63.6	34.1	12.2
LSD (0.05)			8.9	0.5	2.2	0.9
C.V. (%)			6.0	0.5	3.6	4.2
P-value (Varieties)			<.0001	<.0001	<.0001	0.0003

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 51. 2019 Off-Station Winter Wheat Test (Exp. 38): Multi-Location Yield (bu/a)

Cultivar/Line		Devon/				Fly Cr/				13 Loc. Average								
		Turner NARC LAT	Loma NARC RCB	Knees WTARC sprayed	Cut Bank LAT	Shelby WTARC LAT	Choteau WTARC LAT	Denton CARC LAT	Gerald-ine RCB			Belt CARC LAT	High-wood LAT	Huntley SARC	Rapelje SARC LAT	Hysham SARC LAT	Hardin SARC LAT	Molt SARC
+ = new for 2019		124%	97%	105%	110%	122%	105%	110%	176%	100%	113%	219%	out	131%	132%	111%	out	260%
Northern		65.4	60.7	71.5	59.1	77.7	67.2	85.0	73.1	58.3	87.3	51.7	72.4	91.5	70.8			
+ Byrd CL Plus		56.4	60.4	67.5	47.9	86.8	65.9	85.4	89.6	58.8	78.2	55.4	77.8	89.0	70.7			
MT1642		62.0	70.3	68.8	55.0	86.2	59.7	76.5	78.4	54.8	78.6	54.0	74.4	94.4	70.2			
Keldin		63.9	63.6	70.1	45.9	88.5	70.1	82.8	57.7	44.4	85.9	50.3	95.9	83.4	69.4			
MTS1588 (Bobcat)		73.4	73.9	73.7	64.8	86.9	60.8	70.5	75.3	44.7	77.6	48.5	73.8	78.5	69.4			
Loma		70.9	60.0	70.9	52.9	88.5	61.6	77.6	74.3	55.2	78.0	48.5	77.3	85.4	69.3			
+ MTCL1732		62.4	63.5	61.8	52.5	81.2	63.8	80.0	73.5	56.0	77.1	57.2	81.7	83.1	68.8			
+ MT1750		60.9	66.1	67.6	49.7	80.6	65.1	76.8	73.2	51.7	80.5	46.3	88.7	84.6	68.6			
Yellowstone		74.7	53.2	70.1	53.7	81.8	59.4	77.7	68.8	54.2	84.1	54.7	76.2	79.5	68.3			
+ MT1747		60.3	61.8	67.0	48.7	81.2	64.3	81.1	85.5	50.1	74.8	46.7	87.1	75.1	68.0			
+ AAC Wildfire		58.3	60.0	70.2	46.7	88.0	59.4	79.5	72.9	61.9	69.0	51.6	80.9	84.7	67.9			
+ MT1683		73.3	60.2	70.1	48.0	75.0	60.2	73.8	71.5	54.5	79.1	49.2	81.4	81.2	67.5			
Decade		59.4	61.3	64.1	58.1	67.7	67.4	78.1	68.2	57.5	81.0	49.1	83.9	78.4	67.2			
SY Clearstone 2Cl		61.8	55.4	69.6	44.7	73.9	59.7	84.1	64.5	55.7	81.1	59.7	80.3	81.2	67.1			
MTW1491		61.2	58.6	62.1	45.8	88.5	60.4	78.7	77.5	51.4	76.1	46.6	78.3	83.3	66.8			
FourOsix		61.7	61.3	68.6	46.0	77.6	69.1	69.9	64.0	53.3	78.4	48.7	77.4	84.1	66.2			
SY Monument		55.2	74.2	72.3	42.2	73.1	60.1	84.8	76.2	60.6	66.4	43.2	81.1	66.2	65.8			
+ MT1782		60.1	58.6	68.1	40.7	78.5	67.5	77.5	59.0	53.3	71.5	45.1	91.3	78.3	65.3			
LCS Jet		55.4	58.3	74.4	37.9	74.8	66.5	73.4	68.7	49.0	78.2	49.0	76.0	81.4	64.8			
Judee		59.0	62.0	64.9	43.9	73.3	56.5	72.4	70.9	49.7	71.6	49.1	73.5	80.5	63.6			
MTCS1601		55.9	50.5	67.9	52.8	79.0	62.2	76.9	77.4	43.0	75.2	43.7	68.7	73.9	63.6			
Ray		61.7	61.6	71.7	49.8	76.8	58.2	61.7	62.6	42.1	76.2	46.3	79.5	74.6	63.3			
Warhorse		51.9	44.5	60.9	54.6	75.8	61.8	73.1	61.8	47.9	76.2	49.0	81.5	81.0	63.1			
MT1564 (Flathead)		52.2	54.5	66.4	38.9	69.6	54.2	71.5	62.2	42.1	74.6	47.5	74.8	78.0	60.5			
Brawl CLP		46.6	61.0	63.9	42.1	69.7	56.1	80.9	62.2	38.5	66.6	44.0	75.7	60.9	59.1			
Average		61.0	60.6	68.2	48.9	79.2	62.3	77.2	70.8	51.5	76.9	49.4	79.6	80.5	66.6			
LSD (0.05)		7.8	8.3	ns	11.8	12.1	7.5	8.5	15.3	8.6	10.1	6.1	8.5	8.9	4.2			
C.V. (%)		7.1	8.4	8.6	13.9	8.7	6.6	6.7	12.3	9.1	7.3	6.9	6.1	6.0	8.1			

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 52. 2019 Off-Station Winter Wheat Test (Exp. 38): Multi-Location Test Weight (lb/bu)

Cultivar/Line		Turner		Loma		Knees		Cut		Shelby Choteau		Denton		Gerald-		Belt		High-		Fly Cr/				13 Loc.	
		NARC	LAT	NARC	LAT	WTARC	Bank	RCB	RCB	WTARC	RCB	LAT	LAT	LAT	LAT	LAT	CARC	wood	SARC	SARC	SARC	SARC	SARC	Ft Smith	
+ = new for 2019		LAT	LAT	LAT	LAT	sprayed	RCB	RCB	RCB	LAT	LAT	LAT	LAT	LAT	LAT	LAT	RCB	RCB	RCB	RCB	RCB	RCB	LAT	Average	
		116%	122%			out				109%		160%	132%	112%					out		out	107%			
+ MT1750		60.4	62.0				60.7	62.5	64.6	60.7	62.5	61.6	62.6	64.9	63.2			65.4	59.7	61.3	65.2	60.7	65.2	62.6	
+ MT1747		60.2	62.0				60.6	62.2	64.2	60.6	62.2	62.4	63.1	64.6	62.6			65.2	59.6	60.7	64.9	60.5	64.9	62.5	
Judee		60.2	62.4				61.0	62.3	63.8	61.0	62.3	60.1	62.4	64.0	63.0			64.2	60.3	61.2	64.6	60.5	64.6	62.3	
+ MT1782		60.4	62.0				61.3	61.7	64.0	61.3	61.7	61.7	62.1	64.1	62.0			64.4	59.6	60.5	64.5	60.5	64.5	62.2	
Brawl CLP		59.8	61.6				61.2	63.1	63.8	61.2	63.1	61.8	62.3	62.5	62.4			64.4	59.1	60.1	64.4	60.1	64.4	62.0	
MTCS1601		60.3	60.9				60.2	62.5	63.4	60.2	62.5	61.0	61.8	63.8	61.3			63.9	58.8	60.8	64.3	60.8	64.3	61.8	
Northern		59.7	60.3				60.0	61.9	62.2	60.0	61.9	61.0	61.6	63.8	61.7			63.1	59.8	60.4	63.7	60.4	63.7	61.5	
MT1564 (Flathead)		59.3	60.9				60.5	61.6	62.6	60.6	61.6	60.6	61.9	63.0	62.0			63.9	58.8	59.4	63.5	59.4	63.5	61.4	
MTS1588 (Bobcat)		59.8	61.8				59.4	61.5	62.6	60.9	61.5	60.9	61.2	63.6	59.4			63.6	59.5	60.4	64.3	60.4	64.3	61.4	
Keldin		59.7	60.7				60.3	61.1	62.8	60.4	61.1	60.4	61.6	62.6	60.9			63.8	59.0	60.2	64.3	60.2	64.3	61.3	
Loma		58.9	60.7				60.1	61.9	62.1	60.0	61.9	60.0	61.4	63.8	61.5			63.0	60.3	59.3	63.5	59.3	63.5	61.3	
MTW1491		60.2	60.6				60.5	61.7	62.3	60.7	61.7	60.7	61.4	62.8	61.8			63.5	57.8	60.5	63.3	60.5	63.3	61.3	
Warhorse		58.7	61.4				58.2	61.8	61.8	60.5	61.8	60.5	61.1	63.9	61.4			63.1	59.0	60.7	63.5	60.7	63.5	61.2	
+ AAC Wildfire		58.1	59.9				59.5	60.7	62.5	58.5	60.7	58.5	61.4	63.2	62.4			63.6	60.0	59.9	64.0	59.9	64.0	61.1	
+ Byrd CL Plus		59.7	61.4				59.5	61.7	62.8	59.6	61.7	59.6	61.1	62.7	61.9			62.9	57.7	59.4	64.1	59.4	64.1	61.1	
Decade		58.9	61.0				59.7	60.8	62.2	59.7	60.8	59.7	61.4	63.2	61.4			63.7	58.7	59.9	63.9	59.9	63.9	61.1	
FourOsix		58.6	60.5				60.3	60.8	62.5	59.0	60.8	59.0	61.2	62.8	61.6			63.7	57.7	58.9	63.8	58.9	63.8	60.9	
MT1642		58.5	60.6				59.3	61.5	61.9	58.3	61.5	58.3	60.7	62.7	61.9			62.6	60.1	59.7	63.2	59.7	63.2	60.8	
+ MT1683		59.3	60.1				58.1	60.7	61.6	58.1	60.7	60.6	60.8	62.3	61.0			62.8	59.0	59.2	63.0	59.2	63.0	60.7	
Yellowstone		59.3	59.2				60.0	59.8	61.2	60.2	59.8	60.2	60.9	62.6	61.4			62.8	58.8	59.3	63.3	59.3	63.3	60.7	
SY Clearstone 2Cl		59.1	59.4				59.6	60.1	61.5	59.2	60.1	59.2	60.3	62.2	61.1			62.4	58.8	58.9	62.8	58.9	62.8	60.4	
SY Monument		58.8	60.4				59.2	59.7	61.9	59.6	59.7	59.6	60.3	62.1	60.9			62.6	57.3	58.6	62.9	58.6	62.9	60.3	
+ MTCL1732		58.6	60.6				57.8	60.2	62.2	58.3	60.2	58.3	60.4	62.7	60.6			62.3	57.7	58.3	63.3	58.3	63.3	60.2	
Ray		57.6	59.6				60.3	59.9	60.6	58.8	59.9	58.8	60.1	62.4	60.5			61.8	59.2	58.8	61.7	58.8	61.7	60.1	
LCS Jet		56.4	57.8				57.8	58.4	60.3	57.1	58.4	57.1	58.3	59.6	59.4			61.0	56.3	58.1	61.0	58.1	61.0	58.6	
Average		59.2	60.7				59.8	61.2	62.4	60.1	61.2	60.1	61.3	63.0	61.5			63.3	58.9	59.8	63.6	59.8	63.6	61.1	
LSD (0.05)		0.5	0.7				1.3	1.3	0.9	1.3	1.3	1.3	0.7	1.0	1.2			0.7	0.4	0.4	0.5	0.4	0.5	0.4	
C.V. (%)		0.5	0.7				1.4	1.3	0.9	1.4	1.3	1.2	0.6	0.9	1.2			0.7	0.4	0.4	0.5	0.4	0.5	0.9	

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 53. 2019 Off-Station Winter Wheat Test (Exp. 38): Multi-Location Plant height (in)

Cultivar/Line			Turner		Loma		Knees	Cut		Shelby		Chateau		Denton		Gerald-		Belt		High-		Huntley				Rapelje				Hysham				Hardin				Molt				Ft Smith				15 Loc. Average																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
			NARC	RCB	NARC	RCB	WTARC	sprayed	Bank	RCB	WTARC	RCB	WTARC	CARC	LAT	CARC	LAT	CARC	LAT	wood	SARC	RCB	SARC	RCB	SARC	RCB	SARC	RCB	SARC	RCB	SARC	RCB	SARC	RCB	SARC	RCB	SARC	LAT	LAT																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
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Table 54. 2019 Off-Station Winter Wheat Test (Exp. 38): Multi-Location Protein (%)

Cultivar/Line		Turner		Devon/		Knees		Cut		Shelby Choteau		Denton		Gerald-		Belt		High-		Fly Cr/				13 Loc. Average	
		NARC	Loma	WTARC	sprayed	Bank	RCB	LAT	LAT	WTARC	LAT	CARC	LAT	CARC	ine	LAT	CARC	wood	SARC	hailed	SARC	LAT	hailed		
+ = new for 2019		110%	120%	out	14.6	12.6	14.1	107%	115%	12.6	14.1	12.4	12.9	142%	205%	268%	out	123%	107%	out	114%				
Brawl CLP Warhorse Judee + MT1782 Decade MT1564 (Flathead) Loma MT1642 MTC51601 Northern + AAC Wildfire FourOsix Keldin + MT1750 MTS1588 (Bobcat) + MT1683 + MT1747 + MTC1732 Ray SY Clearstone 2Cl Yellowstone LCS Jet MTW1491 SY Monument + Byrd CL Plus	15.2	13.3	14.6	13.2	13.9	12.4	12.9	13.2	13.8	11.3	11.3	11.9	11.9	11.4	9.8	11.0	12.1	7.5	13.1	11.6	11.9	11.9	11.9		
	14.4	14.1	14.0	13.2	13.9	11.9	11.9	10.7	12.4	12.8	13.1	11.9	11.4	10.8	11.6	12.5	7.1	12.5	12.0	11.9	11.9	11.9	11.9		
	14.6	12.1	14.1	13.7	13.9	12.6	11.6	9.8	11.7	12.9	13.4	12.4	11.2	10.5	11.7	12.3	7.5	11.8	11.6	11.9	11.9	11.9	11.9		
	14.6	12.5	13.4	13.0	13.7	12.3	12.0	10.9	11.5	13.0	13.7	12.3	12.0	10.6	11.0	12.1	7.6	12.8	12.5	12.1	12.1	12.1	12.1		
	14.7	11.8	14.1	13.0	13.8	12.3	11.6	10.3	11.3	13.2	13.8	12.3	11.6	10.2	11.6	13.1	7.3	13.7	13.1	12.5	12.5	12.5	12.5		
	14.7	13.3	13.2	12.9	13.2	12.0	11.6	10.2	11.8	13.2	13.8	12.0	11.6	9.8	12.1	11.8	8.3	13.4	13.1	11.7	12.0	12.0	12.0		
	14.7	13.3	13.2	13.2	13.2	13.0	12.9	12.9	12.9	13.0	13.8	11.3	11.3	10.6	11.8	12.4	8.3	13.4	13.1	11.7	12.0	12.0	12.1		
	14.0	12.8	13.1	12.5	13.2	13.1	11.8	10.2	12.6	11.9	12.5	13.2	11.9	11.8	10.2	12.6	7.6	12.8	12.5	12.5	12.5	12.5	12.5	12.1	
	14.3	13.1	12.7	12.7	13.3	12.7	11.5	10.1	11.6	11.9	13.3	11.9	11.5	10.1	11.6	7.7	13.4	12.1	12.0	12.0	12.0	12.0	12.0	12.0	
	13.8	12.9	12.7	12.8	13.2	12.7	11.4	9.8	11.0	12.9	13.2	10.8	11.3	9.6	11.4	12.0	8.1	12.5	12.0	11.6	11.9	11.9	11.9	11.9	
+ MT1683 + MT1747 + MTC1732 Ray SY Clearstone 2Cl Yellowstone LCS Jet MTW1491 SY Monument + Byrd CL Plus	14.2	12.2	13.0	13.0	13.4	10.8	11.3	9.6	11.4	13.4	10.8	11.3	9.6	11.4	12.6	7.6	12.6	11.5	11.5	11.5	11.5	11.5	11.5		
	13.9	11.8	13.1	12.2	12.7	11.7	11.6	10.1	10.9	12.7	11.7	11.6	10.1	10.9	12.5	7.9	12.3	12.3	12.3	12.3	12.3	12.3	12.3		
	14.0	12.6	13.0	12.4	12.9	11.8	11.4	10.1	11.1	12.9	11.8	11.4	10.1	11.1	12.2	7.4	12.2	12.4	12.4	12.4	12.4	12.4	12.4		
	13.8	11.9	12.0	12.4	13.0	11.9	11.7	9.9	11.8	13.0	11.9	11.7	9.9	11.8	12.5	7.7	13.1	12.0	12.0	12.0	12.0	12.0	12.0		
	14.4	12.4	12.1	13.1	13.3	11.6	11.4	9.7	10.9	13.3	11.6	11.4	9.7	10.9	12.0	7.2	12.9	11.9	11.9	11.9	11.9	11.9	11.9		
	14.1	13.3	12.7	12.8	13.1	11.3	11.1	9.6	11.0	13.1	11.3	11.1	9.6	11.0	12.4	7.2	12.8	12.0	12.0	12.0	12.0	12.0	12.0		
	13.7	11.6	12.2	12.4	13.3	11.4	11.0	9.7	11.1	13.3	11.4	11.0	9.7	11.1	11.6	7.5	12.4	11.5	11.5	11.5	11.5	11.5	11.5		
	13.5	11.6	12.1	12.6	13.1	11.4	10.9	9.6	10.8	13.1	11.4	10.9	9.6	10.8	12.0	7.1	12.4	12.2	12.2	12.2	12.2	12.2	12.2		
	13.4	12.0	12.5	11.9	12.7	11.3	10.8	9.5	10.4	12.7	11.3	10.8	9.5	10.4	12.0	7.2	11.8	12.1	12.1	12.1	12.1	12.1	12.1		
	13.2	11.8	12.1	11.7	12.1	11.2	10.8	9.1	10.3	12.1	11.2	10.8	9.1	10.3	11.4	6.8	11.5	11.5	11.5	11.5	11.5	11.5	11.5		
Average		14.1	12.5	13.0	12.7	13.3	11.8	11.5	10.2	11.5	12.5	7.6	12.7	12.2	12.0										
LSD (0.05)		0.2	0.5	1.0	0.5	0.4	0.9	0.4	0.8	0.7	0.5	0.5	0.5	0.9	0.5	0.5	0.5	0.5	0.9	0.9	0.9	0.9	0.9		
C.V. (%)		1.0	2.5	4.5	2.3	1.6	4.3	2.0	4.2	3.5	4.3	2.0	4.2	3.5	2.2	3.9	2.4	4.2	4.2	4.2	4.2	4.2	4.2		

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 55. 2019 Off-Station Winter Wheat Test (Exp. 38): Multi-Location Sawfly Cutting (%)

Cultivar/Line		Origin/Pedigree	NARC	CARC		WTARC		4 Loc
			Loma	Belt	Shelby/ Devon	Choteau	RCB	Average
+ = new for 2019			LAT	RCB				
lattice efficiency relative to RCB								
MTS1588 (Bobcat)		Montana, 2019	6	0	12	27	11	
Warhorse		Montana, 2013	17	0	17	33	17	
+ MT1750		MT08185//YLL(L)/NX05M4391	21	0	30	20	18	
+ MTCL1732		AP035-8-1/5/MT08134/4/YLL*4/3/MT	19	7	23	43	23	
Loma		Montana, 2016	22	3	47	43	29	
+ MT1747		MT06103//MTW0881/SD06W166	20	0	72	30	31	
MTCS1601		MTS0531/7/MTS0532/6/96X17E69/3	45	7	50	25	32	
Decade		Montana/North Dakota, 2010	35	3	50	40	32	
+ AAC Wildfire		Alberta: SECAN, 2015	20	3	70	37	33	
+ MT1782		MT0859//MT0860/MT0885	26	13	40	53	33	
Brawl CLP		Colorado Research Foundation, 2011	39	10	70	33	38	
MT1642		Yellowstone/Madsen//Yellowstone	46	17	59	37	40	
+ Byrd CL Plus		Plainsgold/Col. Wheat Res Fdn, 2018	39	13	70	45	42	
Judee		Montana, 2011	41	3	73	60	44	
SY Monument		Syngenta, 2015	38	10	76	57	45	
Keldin		Westbred, 2011	49	20	67	53	47	
Northern		Montana, 2015	51	20	60	63	49	
Ray		Montana, 2018 (MTF1432)	32	33	70	70	51	
MT1564 (Flathead)		Yellowstone*2/PI640431	56	20	83	53	53	
LCS Jet		Limagrain Cereal Seeds, 2015	53	17	92	80	60	
MTW1491		MT08189//MT08187//MTW08166, W	62	27	72	83	61	
FourOsix		Montana, 2018 (MT1465)	66	20	92	67	61	
Yellowstone		Montana 2005	53	27	85	79	61	
SY Clearstone 2CL		Montana/Syngenta, 2012	62	30	88	73	64	
+ MT1683		Yellowstone(L)*2/CDC Buteo	88	30	80	82	70	
Average			40.2	13.3	61.9	51.5	41.7	
LSD (0.05)			20.6	9.0	32.3	32.9	15.1	
C.V. (%)			29.2	41.2	31.8	38.9	25.7	

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 56. 2019 Off-Station Winter Wheat Test (Exp. 38): Falling Number

			Target ≥ 300		
Entry	Cultivar/Line	Origin/Pedigree	Turner	Loma	2 Loc
			NARC	NARC	Average
+ = new for 2019			RCB	LAT	
lattice efficiency relative to RCB			100%	116%	
3	Warhorse	Montana, 2013	449	497	473
7	SY Clearstone 2CL	Montana/Syngenta, 2012	404	496	450
1	Yellowstone	Montana 2005	397	484	441
13	Ray	Montana, 2018 (MTF1432)	426	453	439
22	+ MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/MT	404	452	428
17	MT1642	Yellowstone/Madsen//Yellowstone	379	469	424
12	MTW1491	MT08189//MT08187/(MTW08166, W	380	467	424
19	+ MT1683	Yellowstone(L)*2/CDC Buteo	377	467	422
8	Northern	Montana, 2015	331	510	421
16	MTCS1601	MTS0531/7/MTS0532/6/96X17E69/3	406	434	420
11	FourOsix	Montana, 2018 (MT1465)	393	441	417
25	+ MT1782	MT0859//MT0860/MT0885	377	438	408
24	+ MT1750	MT08185//YLL(L)/NX05M4391	387	424	405
21	+ AAC Wildfire	Alberta: SECAN, 2015	393	413	403
14	MTS1588 (Bobcat)	Montana, 2019	392	414	403
15	MT1564 (Flathead)	Montana, 2019	350	451	401
6	Keldin	Westbred, 2011	381	416	398
23	+ MT1747	MT06103//MTW0881/SD06W166	363	425	394
5	Decade	Montana/North Dakota, 2010	359	421	390
2	Judee	Montana, 2011	360	415	388
18	LCS Jet	Limagrain Cereal Seeds, 2015	360	404	382
10	SY Monument	Syngenta, 2015	362	396	379
4	Brawl CLP	Colorado Research Foundation, 2011	322	429	375
9	Loma	Montana, 2016	340	408	374
20	+ Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2018	341	406	374
Average			377.3	441.3	409.3
LSD (0.05)			19.3	25.5	51.6
C.V. (%)			3.1	3.3	6.1
P-value (Varieties)			<.0001	<.0001	0.0401

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 57. 2016-2019 Off-Station Winter Wheat Test (Exp. 3851): Turner (NARC) Yield, Test Weight and Protein

Cultivar/Line	Grain Yield (bu/a)				Test Weight (lb/bu)				Protein (%)			
	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19
	1y	2y	3y	4y	1y	2y	3y	4y	1y	2y	3y	4y
+ AAC Wildfire	58.3				58.1				13.8			
Brawl CLP	46.6	34.3	28.3		59.8	61.3	60.5		15.2	15.7	14.8	
+ Byrd CL Plus	56.4				59.7				13.2			
Decade	59.4	47.6	38.7	42.9	58.9	60.4	59.1	58.9	14.7	15.5	15.2	14.3
FourOsix	61.7	48.0	38.4		58.6	60.2	59.0		14.3	14.9	14.7	
Judee	59.0	45.3	36.2	44.7	60.2	61.4	60.2	60.2	14.6	15.6	15.4	14.4
Keldin	63.9	48.7	39.4	43.7	59.7	60.8	59.7	59.6	13.9	14.6	14.1	13.3
LCS Jet	55.4	44.0			56.4	57.6			13.7	14.2		
Loma	70.9	53.2	42.5	47.2	58.9	60.4	59.3	59.5	14.7	15.4	15.2	14.2
MT1564 (Flathead)	52.2	40.2			59.3	60.5			14.7	15.4		
MT1642	62.0	50.3			58.5	59.6			14.3	15.0		
+ MT1683	73.3				59.3				14.2			
+ MT1747	60.3				60.2				13.9			
+ MT1750	60.9				60.4				14.1			
+ MT1782	60.1				60.4				14.6			
+ MTCL1732	62.4				58.6				14.0			
MTCS1601	55.9	45.7			60.3	61.2			14.0	14.9		
MTS1588 (Bobcat)	73.4	54.0	43.6		59.8	60.9	59.8		13.8	14.6	14.4	
MTW1491	61.2	49.4	40.6		60.2	61.1	59.8		13.5	14.4	13.9	
Northern	65.4	51.9	41.7	48.0	59.7	60.8	59.6	59.8	14.3	15.1	14.8	14.1
Ray	61.7	48.3	38.3		57.6	58.9	57.5		13.8	14.5	14.2	
SY Clearstone 2CL	61.8	47.5	38.0	43.6	59.1	60.1	58.9	59.1	14.4	15.2	14.9	14.0
SY Monument	55.2	41.2	33.7		58.8	60.0	59.0		13.4	14.1	13.4	
Warhorse	51.9	41.7	33.4	40.7	58.7	59.6	57.9	58.4	14.4	15.1	14.8	14.1
Yellowstone	74.7	55.4	43.3	50.6	59.3	60.4	58.7	59.0	14.1	14.7	14.4	13.5
Average	61.0	47.0	38.3	45.2	59.2	60.3	59.2	59.3	14.1	14.9	14.6	14.0
LSD (0.05)	7.8	8.2	6.3	ns	0.5	0.6	0.8	0.8	0.2	0.4	0.6	0.4
C.V. (%)	7.1	8.3	9.8	9.6	0.5	0.5	0.8	0.9	1.0	1.3	2.5	1.8

+ = new for 2019

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 58. 2016-2019 Off-Station Winter Wheat Test (Exp. 3853): Loma (NARC) Yield, Test Weight and Protein

Cultivar/Line	Grain Yield (bu/a)				Test Weight (lb/bu)				Protein (%)			
	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19
	1y	2y	3y	4y	1y	2y	3y	4y	1y	2y	3y	4y
+ AAC Wildfire	60.0				59.9				12.9			
Brawl CLP	61.0	61.2	57.1		61.6	61.9	61.8		13.3	14.1	14.3	
+ Byrd CL Plus	60.4				61.4				11.8			
Decade	61.3	61.4	54.4	49.8	61.0	60.5	60.3	58.7	11.8	13.2	13.9	14.7
FourOsix	61.3	60.5	54.8		60.5	60.1	60.3		12.1	13.0	13.7	
Judee	62.0	59.4	53.3	50.3	62.4	61.3	61.2	59.4	12.1	13.0	14.0	15.1
Keldin	63.6	63.2	55.0	53.6	60.7	60.5	60.4	59.5	12.5	13.2	13.8	14.5
LCS Jet	58.3	54.9			57.8	57.3			11.6	12.8		
Loma	60.0	58.9	53.1	47.6	60.7	59.6	59.9	58.2	13.3	13.9	14.2	15.1
MT1564 (Flathead)	54.5	54.6			60.9	61.1			13.3	13.5		
MT1642	70.3	62.7			60.6	59.6			12.7	13.9		
+ MT1683	60.2				60.1				12.2			
+ MT1747	61.8				62.0				11.8			
+ MT1750	66.1				62.0				12.4			
+ MT1782	58.6				62.0				12.5			
+ MTCL1732	63.5				60.6				12.6			
MTCS1601	50.5	52.5			60.9	60.9			12.8	13.4		
MTS1588 (Bobcat)	73.9	70.2	63.4		61.8	61.4	61.3		11.8	12.7	13.5	
MTW1491	58.6	58.9	53.5		60.6	60.4	60.6		11.6	12.7	13.4	
Northern	60.7	62.0	56.0	52.1	60.3	60.2	60.2	58.2	13.1	13.7	14.3	15.3
Ray	61.6	60.4	54.1		59.6	58.6	58.5		11.9	13.3	13.9	
SY Clearstone 2CL	55.4	57.7	51.2	49.0	59.4	59.0	59.4	58.1	12.4	13.5	14.2	14.9
SY Monument	74.2	68.8	59.2		60.4	60.4	60.3		12.0	12.4	12.8	
Warhorse	44.5	44.0	42.9	41.4	61.4	60.5	60.6	59.4	14.1	14.4	14.9	15.4
Yellowstone	53.2	56.1	51.5	49.8	59.2	59.1	59.3	58.1	13.3	13.7	14.2	14.9
Average	60.6	59.3	54.2	49.2	60.7	60.1	60.3	58.7	12.5	13.3	13.9	15.0
LSD (0.05)	8.3	8.1	6.8	6.6	0.7	1.3	0.9	ns	0.5	ns	0.8	ns
C.V. (%)	8.4	6.5	7.4	9.2	0.7	1.0	0.9	1.5	2.5	3.8	3.5	3.5

+ = new for 2019

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 59. 2016-2018 Off-Station Winter Wheat Test (Exp. 3865): The Knees (WTARC) Yield, Test Weight and Protein

Cultivar/Line	Grain Yield (bu/a)				Test Weight (lb/bu)				Protein (%)			
	2018	2017-18	2016-18	2019, plots sprayed out	2018	2017-18	2016-18	2018	2017-18	2016-18	2018	2017-18
	1y	2y	3y		1y	2y	3y		1y	2y		3y
+ AAC Wildfire												
+ Brawl CLP												
+ Byrd CL Plus												
Decade					60.1	62.1			14.1	12.8		
FourOsix					57.4	59.4	58.9	14.6	13.6			13.2
Judee					55.5	58.2		13.6	12.9			
Keldin					56.8	59.4	60.0	14.3	13.4			13.2
LCS Jet					57.7	59.8	59.7	14.3	13.1			11.6
					53.6			13.4				
Loma					58.2	59.6	58.3	13.7	13.0			12.4
MT1564 (Flathead)					57.0			13.2				
MT1642					55.4			13.8				
+ MT1683												
+ MT1747												
+ MT1750												
+ MT1782												
+ MTCL1732												
MTCS1601					58.5			13.5				
MTS1588 (Bobcat)					57.0	59.5		13.5	13.0			
MTW1491					56.2	58.3		13.5	12.7			
Northern					56.3	58.4	57.8	13.9	13.2			12.9
Ray					54.3	56.6		13.3	12.7			
SY Clearstone 2CL					55.1	57.4	57.8	13.4	12.7			12.5
SY Monument					55.8	57.8		12.8	12.1			
Warhorse					57.4	59.2	58.9	14.3	13.5			13.4
Yellowstone					55.1	57.9	57.6	13.7	12.8			12.5
Average					56.6	58.8	58.7	13.7	12.9			12.8
LSD (0.05)					1.8	1.0	1.7	0.5	0.6			ns
C.V. (%)					1.8	0.8	1.7	1.9	2.3			6.2

+ = new for 2019

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 60. 2016-2019 Off-Station Winter Wheat Test (Exp. 3864): Cut Bank (WTARC) Yield, Test Weight and Protein

Cultivar/Line	Grain Yield (bu/a)				Test Weight (lb/bu)				Protein (%)			
	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19
	1y	2y	3y	4y	1y	2y	3y	4y	1y	2y	3y	4y
+ AAC Wildfire	70.2				59.5				12.7			
Brawl CLP	63.9	63.1	68.6		61.2	62.3	62.8		14.6	14.4	13.2	
+ Byrd CL Plus	67.5				59.5				12.1			
Decade	64.1	66.7	70.5	71.4	59.7	60.8	61.4	60.5	14.1	14.0	12.7	13.0
FourOsix	68.6	67.2	75.3		60.3	61.1	61.5		12.8	12.9	11.8	
Judee	64.9	71.1	74.0	74.3	61.0	61.5	62.3	61.5	14.1	13.8	12.6	13.0
Keldin	70.1	77.7	84.4	87.1	60.3	61.3	61.9	61.3	12.9	12.3	11.4	11.9
LCS Jet	74.4	76.9			57.8	58.2			12.2	12.2		
Loma	70.9	79.0	79.6	80.8	60.1	60.7	61.2	60.7	13.2	13.0	11.9	12.4
MT1564 (Flathead)	66.4	64.4			60.5	60.8			13.2	13.1		
MT1642	68.8	78.0			59.3	60.3			13.0	13.0		
+ MT1683	70.1				58.1				13.0			
+ MT1747	67.0				60.6				13.1			
+ MT1750	67.6				60.7				12.7			
+ MT1782	68.1				61.3				13.4			
+ MTCL1732	61.8				57.8				13.0			
MTCS1601	67.9	71.5			60.2	61.2			13.1	13.0		
MTS1588 (Bobcat)	73.7	78.1	81.0		59.4	60.6	61.4		13.5	12.9	11.9	
MTW1491	62.1	69.0	74.1		60.5	61.4	61.7		12.1	12.4	11.5	
Northern	71.5	73.4	78.0	78.7	60.0	60.9	61.2	60.7	12.7	12.6	11.7	12.4
Ray	71.7	75.2	77.7		60.3	59.8	60.0		12.0	12.4	11.4	
SY Clearstone 2CL	69.6	76.5	79.5	79.0	59.6	59.7	60.1	59.7	12.1	12.6	11.7	12.3
SY Monument	72.3	68.0	76.7		59.2	60.4	60.6		12.5	12.4	11.4	
Warhorse	60.9	64.9	69.8	68.5	58.2	59.4	60.4	59.9	14.0	13.8	12.6	13.2
Yellowstone	70.1	78.7	80.7	80.7	60.0	60.3	60.7	60.4	12.7	12.6	11.6	12.3
Average	68.2	72.2	76.4	77.6	59.8	60.6	61.2	60.6	13.0	12.9	11.9	12.6
LSD (0.05)	ns	ns	ns	6.1	1.3	1.4	1.1	0.9	1.0	0.9	0.7	0.6
C.V. (%)	8.6	7.7	7.3	5.3	1.4	1.1	1.1	1.0	4.5	3.2	3.5	3.4

+ = new for 2019

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 61. 2016-2019 Off-Station Winter Wheat Test (Exp. 3865): Shelby area - Devon (WTARC) Yield, Test Weight and Protein

Cultivar/Line	Grain Yield (bu/a)				Test Weight (lb/bu)				Protein (%)		
	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19
	1y	2y	3y	4y	1y	2y	3y	4y	1y	2y	3y
+ AAC Wildfire	46.7				60.7				12.8		
Brawl CLP	42.1	37.3	46.2		63.1	62.3	62.6		12.6	13.0	13.1
+ Byrd CL Plus	47.9				61.7				11.7		
Decade	58.1	48.0	52.8	60.6	60.8	59.9	60.1	60.4	13.0	12.9	12.8
FourOsix	46.0	43.7	50.5		60.8	59.6	60.3		12.7	12.5	12.6
Judee	43.9	42.8	49.3	56.7	62.3	61.2	61.2	61.4	13.7	13.3	13.1
Keldin	45.9	42.9	50.4	60.7	61.1	60.3	60.6	61.2	12.5	12.2	12.4
LCS Jet	37.9	40.5			58.4	56.9			12.4	12.2	
Loma	52.9	49.0	55.2	62.5	61.9	60.2	60.6	60.6	13.2	13.0	12.9
MT1564 (Flathead)	38.9	38.9			61.6	60.2			12.9	13.1	
MT1642	55.0	52.6			61.5	59.7			12.9	12.8	
+ MT1683	48.0				60.7				13.0		
+ MT1747	48.7				62.2				12.2		
+ MT1750	49.7				62.5				12.3		
+ MT1782	40.7				61.7				13.0		
+ MTCL1732	52.5				60.2				12.4		
MTCS1601	52.8	47.0			62.5	61.2			12.5	12.6	
MTS1588 (Bobcat)	64.8	57.0	60.6		61.5	60.9	61.1		12.7	12.5	12.5
MTW1491	45.8	45.2	55.2		61.7	60.0	60.5		12.6	12.6	12.6
Northern	59.1	52.9	56.8	64.4	61.9	60.4	60.6	60.7	12.7	12.7	12.9
Ray	49.8	43.7	50.9		59.9	58.0	58.2		12.4	12.5	12.6
SY Clearstone 2CL	44.7	42.8	51.1	58.4	60.1	58.9	59.4	59.8	13.1	12.8	12.7
SY Monument	42.2	38.1	48.5		59.7	58.4	58.7		11.9	12.3	12.3
Warhorse	54.6	47.8	52.5	57.9	61.8	60.6	60.9	61.1	13.2	13.3	13.3
Yellowstone	53.7	49.0	54.8	63.7	59.8	58.9	59.5	59.9	12.8	12.7	12.8
Average	48.9	45.5	52.5	60.6	61.2	59.9	60.3	60.6	12.7	12.7	12.8
LSD (0.05)	11.8	9.3	ns	ns	1.3	1.1	0.8	0.8	0.5	ns	0.5
C.V. (%)	13.9	9.6	8.7	6.9	1.3	0.9	0.8	0.9	2.3	2.5	2.5

+ = new for 2019

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 62. 2016-2019 Off-Station Winter Wheat Test (Exp. 3863): Chateau area (WTARC) Yield, Test Weight and Protein

Cultivar/Line	Grain Yield (bu/a)				Test Weight (lb/bu)				Protein (%)			
	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19
	1y	2y	3y	4y	1y	2y	3y	4y	1y	2y	3y	4y
+ AAC Wildfire	88.0				62.5				13.2			
Brawl CLP	69.7	75.0	69.8		63.8	63.2	62.7		14.1	14.2	13.7	
+ Byrd CL Plus	86.8				62.8				12.1			
Decade	67.7	70.8	63.4	65.4	62.2	60.8	60.3	60.5	13.8	14.5	14.2	14.4
FourOsix	77.6	74.8	68.8		62.5	60.0	59.3		13.1	14.0	13.9	
Judee	73.3	72.0	64.2	67.2	63.8	61.3	60.3	60.8	13.9	14.9	14.8	14.8
Keldin	88.5	79.7	72.3	74.9	62.8	61.7	61.0	61.2	13.4	14.3	14.1	14.0
LCS Jet	74.8	73.3			60.3	58.0			13.3	14.0		
Loma	88.5	81.3	70.6	72.2	62.1	59.7	58.8	59.1	13.8	14.6	14.3	14.4
MT1564 (Flathead)	69.6	71.5			62.6	61.5			13.2	13.8		
MT1642	86.2	75.9			61.9	59.3			12.9	14.2		
+ MT1683	75.0				61.6				13.4			
+ MT1747	81.2				64.2				12.7			
+ MT1750	80.6				64.6				12.9			
+ MT1782	78.5				64.0				13.7			
+ MTCL1732	81.2				62.2				12.9			
MTCS1601	79.0	77.5			63.4	62.0			13.2	13.9		
MTS1588 (Bobcat)	86.9	84.4	73.8		62.6	60.9	60.0		13.3	14.3	14.2	
MTW1491	88.5	78.5	73.3		62.3	60.6	60.0		13.1	13.8	13.7	
Northern	77.7	75.0	67.4	69.5	62.2	60.8	59.7	59.9	13.3	14.0	14.0	14.0
Ray	76.8	69.7	64.2		60.6	58.7	58.0		13.0	13.7	13.7	
SY Clearstone 2CL	73.9	70.7	65.8	68.3	61.5	59.5	58.4	58.7	13.3	14.1	13.8	14.1
SY Monument	73.1	73.7	67.6		61.9	60.4	58.8		12.7	13.4	13.3	
Warhorse	75.8	71.1	64.7	66.4	61.8	60.0	59.1	59.5	13.9	14.4	14.3	14.4
Yellowstone	81.8	76.2	67.7	70.3	61.2	59.4	58.3	58.8	13.1	14.0	14.1	14.1
Average	79.2	75.0	68.1	69.3	62.4	60.4	59.6	59.8	13.3	14.1	14.0	14.3
LSD (0.05)	12.1	ns	ns	5.8	0.9	1.7	1.2	0.8	0.4	0.7	0.6	ns
C.V. (%)	8.7	8.3	8.0	5.7	0.9	1.3	1.2	1.0	1.6	2.4	2.5	2.5

+ = new for 2019

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 63. 2017//2019 Off-Station Winter Wheat Test (Exp. 3871): Denton (CARC) Yield, Test Weight and Protein

Cultivar/Line	Grain Yield (bu/a)		Test Weight (lb/bu)		Protein (%)	
	2019	2017//19 2y	2019	2017//19 2y	2019	2017//19 2y
+ AAC Wildfire	59.4	2018, spring wheat contamination data not used	58.5	2016, no harvest hailed out	12.9	12.6
+ Brawl CLP	56.1		61.8		12.4	
+ Byrd CL Plus	65.9	52.0	59.6	60.1	11.2	12.6
Decade	67.4	54.5	59.7	56.5	12.3	12.8
FourOsix	69.1	54.6	59.0	55.2	11.9	12.6
Judee	56.5	46.3	60.1	56.8	12.6	13.2
Keldin	70.1	57.9	60.4	57.1	12.4	12.9
LCS Jet	66.5		57.1		11.4	
Loma	61.6	42.7	60.0	55.0	11.3	12.9
MT1564 (Flathead)	54.2		60.6		12.0	
MT1642	59.7		58.3		12.2	
+ MT1683	60.2		60.6		10.8	
+ MT1747	64.3		62.4		11.7	
+ MT1750	65.1		61.6		12.2	
+ MT1782	67.5		61.7		12.3	
+ MTCL1732	63.8		58.3		11.8	
MTCS1601	62.2		61.0		11.9	
MTS1588 (Bobcat)	60.8	45.5	60.9	57.0	11.4	12.6
MTW1491	60.4	53.2	60.7	56.1	11.4	12.2
Northern	67.2	52.4	61.0	55.8	11.9	13.1
Ray	58.2	49.6	58.8	52.8	11.9	12.9
SY Clearstone 2CL	59.7	50.7	59.2	54.7	11.6	12.4
SY Monument	60.1	49.9	59.6	55.2	11.3	12.0
Warhorse	61.8	48.9	60.5	56.0	11.9	13.0
Yellowstone	59.4	51.6	60.2	55.2	11.3	12.6
Average	62.3	50.7	60.1	55.9	11.8	12.7
LSD (0.05)	7.5	ns	1.3	ns	0.9	ns
C.V. (%)	6.6	10.8	1.2	2.7	4.3	4.3

+ = new for 2019

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 64. 2016-2019 Off-Station Winter Wheat Test (Exp. 3872): Geraldine (CARC) Yield, Test Weight and Protein

Cultivar/Line	Grain Yield (bu/a)				Test Weight (lb/bu)				Protein (%)			
	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19
	1y	2y	3y	4y	1y	2y	3y	4y	1y	2y	3y	4y
+ AAC Wildfire	79.5				61.4				11.4			
Brawl CLP	80.9	78.2	78.8		62.3	63.7	64.1		12.9	13.2	12.8	
+ Byrd CL Plus	85.4				61.1				10.8			
Decade	78.1	78.9	79.6	77.7	61.4	62.7	62.9	63.0	11.6	12.2	12.1	11.3
FourOsix	69.9	70.0	74.4		61.2	62.4	62.7		11.4	11.7	11.5	
Judee	72.4	75.7	73.8	73.3	62.4	63.6	63.1	63.4	11.6	12.0	11.8	11.3
Keldin	82.8	84.3	86.6	90.3	61.6	62.9	63.1	63.3	11.2	11.7	11.2	10.7
LCS Jet	73.4	78.2			58.3	59.6			11.0	11.5		
Loma	77.6	78.8	77.0	77.1	61.4	62.2	62.2	62.1	11.3	11.5	11.4	11.0
MT1564 (Flathead)	71.5	73.3			61.9	62.9			11.6	11.7		
MT1642	76.5	78.5			60.7	61.8			11.2	11.5		
+ MT1683	73.8				60.8				11.3			
+ MT1747	81.1				63.1				11.6			
+ MT1750	76.8				62.6				11.6			
+ MT1782	77.5				62.1				12.0			
+ MTCL1732	80.0				60.4				11.4			
MTCS1601	76.9	79.7			61.8	63.0			11.8	12.0		
MTS1588 (Bobcat)	70.5	73.6	75.2		61.2	62.7	62.9		11.7	11.8	11.7	
MTW1491	78.7	77.1	79.9		61.4	62.3	62.3		10.9	11.2	11.1	
Northern	85.0	81.9	81.2	83.4	61.6	62.5	62.5	62.4	11.5	11.9	12.0	11.4
Ray	61.7	69.0	74.3		60.1	61.0	60.8		11.7	11.9	11.7	
SY Clearstone 2CL	84.1	82.6	82.2	84.9	60.3	61.6	61.5	61.7	11.4	11.6	11.4	10.8
SY Monument	84.8	81.6	83.4		60.3	61.8	61.8		10.8	11.3	11.0	
Warhorse	73.1	73.7	72.4	74.5	61.1	62.4	62.5	62.5	11.9	12.4	12.4	11.9
Yellowstone	77.7	76.0	77.8	80.8	60.9	61.9	61.9	62.1	11.1	11.4	11.4	10.8
Average	77.2	77.3	78.3		61.3	62.3	62.5		11.5	11.8	11.7	
LSD (0.05)	8.5	ns	8.1		0.7	0.6	0.7		0.4	0.4	0.5	
C.V. (%)	6.7	5.2	6.2		0.6	0.5	0.7		2.0	1.8	2.4	

+ = new for 2019

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 65. 2017-2019 Off-Station Winter Wheat Test (Exp. 3875): Belt (CARC) Yield, Test Weight and Protein

Cultivar/Line	Grain Yield (bu/a)			Test Weight (lb/bu)			Protein (%)		
	2019	2018-19	2017-19	2019	2018-19	2017-19	2019	2018-19	2017-19
	1y	2y	3y	1y	2y	3y	1y	2y	3y
+ AAC Wildfire	72.9			63.2			9.8		
Brawl CLP	62.2	59.8	57.9	62.5	62.3	63.1	12.8	13.2	11.8
+ Byrd CL Plus	89.6			62.7			9.1		
Decade	68.2	70.9	62.9	63.2	62.6	62.5	10.3	11.4	10.7
FourOsix	64.0	67.7	61.6	62.8	62.3	62.2	10.8	11.4	10.5
Judee	70.9	70.6	61.8	64.0	63.1	63.1	9.8	11.3	10.5
Keldin	57.7	65.2	60.2	62.6	61.7	62.1	10.5	11.9	10.7
LCS Jet	68.7	69.2		59.6	58.9		9.7	10.8	
Loma	74.3	77.3	66.7	63.8	62.7	62.4	9.8	10.8	10.2
MT1564 (Flathead)	62.2	66.4		63.0	62.7		10.2	11.2	
MT1642	78.4	78.1		62.7	61.7		10.6	11.3	
+ MT1683	71.5			62.3			9.6		
+ MT1747	85.5			64.6			10.1		
+ MT1750	73.2			64.9			10.6		
+ MT1782	59.0			64.1			10.9		
+ MTCL1732	73.5			62.7			10.1		
MTCS1601	77.4	74.9		63.8	63.2		10.2	11.4	
MTS1588 (Bobcat)	75.3	75.3	65.5	63.6	62.9	62.8	10.3	11.3	10.7
MTW1491	77.5	73.6	66.1	62.8	61.9	62.1	9.6	10.7	10.1
Northern	73.1	71.7	64.8	63.8	62.5	62.1	10.1	11.5	10.6
Ray	62.6	64.1	60.1	62.4	61.0	60.5	9.9	10.9	10.1
SY Clearstone 2CL	64.5	69.0	64.2	62.2	61.5	61.4	9.7	10.6	9.9
SY Monument	76.2	77.7	68.3	62.1	61.3	61.2	9.5	10.7	10.0
Warhorse	61.8	67.8	60.7	63.9	62.7	62.6	10.7	11.8	10.9
Yellowstone	68.8	68.8	63.1	62.6	61.8	61.7	9.6	10.7	10.0
Average	70.8	70.4	63.1	63.0	62.0	62.1	10.2	11.2	10.5
LSD (0.05)	15.3	9.2	ns	1.0	1.0	1.1	0.8	0.8	0.8
C.V. (%)	12.3	6.2	8.4	0.9	0.7	1.0	4.2	3.4	4.6

+ = new for 2019

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 66. 2016-2019 Off-Station Winter Wheat Test (Exp. 3876): Highwood (CARC) Yield, Test Weight and Protein

Cultivar/Line	Grain Yield (bu/a)				Test Weight (lb/bu)				Protein (%)			
	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19
	1y	2y	3y	4y	1y	2y	3y	4y	1y	2y	3y	4y
+ AAC Wildfire	61.9				62.4				11.0			
Brawl CLP	38.5	30.0	31.9		62.4	63.1	63.2		12.6	14.0	14.1	
+ Byrd CL Plus	58.8				61.9				10.3			
Decade	57.5	51.4	55.6	55.5	61.4	62.5	62.7	62.1	11.3	12.7	12.5	12.1
FourOsix	53.3	46.1	51.2		61.6	62.6	62.6		11.6	12.6	12.4	
Judee	49.7	50.3	52.3	55.8	63.0	63.7	63.3	63.3	11.7	12.8	12.8	12.6
Keldin	44.4	38.5	44.1	47.7	60.9	62.0	61.9	61.9	11.7	13.3	13.0	12.7
LCS Jet	49.0	44.2			59.4	60.4			11.1	12.3		
Loma	55.2	45.9	50.9	52.0	61.5	62.3	62.2	62.0	12.1	13.4	13.0	12.7
MT1564 (Flathead)	42.1	34.5			62.0	62.9			11.8	13.2		
MT1642	54.8	44.7			61.9	62.5			11.8	13.2		
+ MT1683	54.5				61.0				11.4			
+ MT1747	50.1				62.6				10.9			
+ MT1750	51.7				63.2				11.0			
+ MT1782	53.3				62.0				11.5			
+ MTCL1732	56.0				60.6				11.1			
MTCS1601	43.0	37.2			61.3	62.2			12.6	13.6		
MTS1588 (Bobcat)	44.7	40.7	43.2		59.4	61.2	61.5		12.0	13.1	13.0	
MTW1491	51.4	43.7	50.8		61.8	62.6	62.5		10.8	12.1	11.9	
Northern	58.3	46.1	50.9	52.8	61.7	62.6	62.5	62.4	11.6	13.2	13.0	12.9
Ray	42.1	36.6	44.4		60.5	61.5	61.0		11.8	12.9	12.6	
SY Clearstone 2CL	55.7	50.8	56.4	59.4	61.1	62.1	61.8	61.7	10.9	11.9	11.8	
SY Monument	60.6	53.5	57.3		60.9	62.3	62.2		10.4	11.6	11.5	
Warhorse	47.9	45.6	47.5	52.7	61.4	62.3	61.7	61.5	12.4	13.3	13.4	13.1
Yellowstone	54.2	44.7	47.5	48.5	61.4	62.3	62.1	62.0	11.0	12.7	12.8	12.4
Average	51.5	43.6	48.9	53.0	61.5	62.3	62.2	62.1	11.5	12.9	12.7	12.5
LSD (0.05)	8.6	8.9	7.7	ns	1.2	0.8	0.9	0.8	0.7	0.7	0.6	0.7
C.V. (%)	9.1	9.7	9.4	10.0	1.2	0.6	0.9	0.9	3.5	2.6	3.0	3.6

+ = new for 2019

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 67. 2016-2018 Off-Station Winter Wheat Test (Exp. 3880): Huntley Irrigated (SARC) Yield, Test Weight and Protein

Cultivar/Line	Grain Yield (bu/a)			Test Weight (lb/bu)			Protein (%)		
	2018	2017-18	2016-18	2018	2017-18	2016-18	2018	2017-18	2016-18
	1y	2y	3y	1y	2y	3y	1y	2y	3y
+ AAC Wildfire									
Brawl CLP									
+ Byrd CL Plus									
Decade	117.6	108.8	99.3	61.7	63.2		13.5	13.1	
FourOsix	105.5	98.1	99.3	59.7	60.5	60.6	13.8	12.8	12.3
Judee	83.0	108.1		59.0	61.8		14.2	12.8	
Keldin	86.3	90.7	87.4	60.6	62.4	62.2	13.5	12.9	12.4
LCS Jet	127.0	119.3	119.7	61.8	61.8	62.0	13.0	12.8	12.1
	135.3			58.3			13.5		
Loma	87.8	97.0	100.0	57.0	59.8	60.2	13.8	12.9	12.6
MT1564 (Flathead)	101.6			58.8			13.6		
MT1642	99.9			56.6			14.8		
+ MT1683									
+ MT1747									
+ MT1750									
+ MT1782									
+ MTCL1732									
MTCS1601	104.5			60.7			13.9		
MTS1588 (Bobcat)	92.5	105.2		59.5	61.9		14.4	13.0	
MTW1491	93.4	103.5		58.9	61.2		13.5	12.4	
Northern	104.9	104.8	106.9	59.5	60.8	60.7	13.2	12.5	12.3
Ray	107.2	102.2		58.6	60.0		13.7	12.8	
SY Clearstone 2CL	100.1	101.3	101.0	58.3	60.4	60.2	13.8	12.7	12.4
SY Monument	115.5	110.9		60.4	61.7		13.3	12.4	
Warhorse	103.8	102.3	99.5	60.7	62.0	61.9	14.4	13.7	13.4
Yellowstone	96.0	106.5	108.5	58.5	60.8	60.9	13.3	12.4	12.2
Average	99.9	102.7	103.1	59.2	61.3	61.1	13.9	12.8	12.5
LSD (0.05)	16.7	ns	14.1	1.4	ns	1.5	0.5	ns	0.7
C.V. (%)	10.2	12.5	7.9	1.4	1.7	1.5	2.4	3.7	3.2

+ = new for 2019

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 68. 2016-2019 Off-Station Winter Wheat Test (Exp. 3881): Rapelje (SARC) Yield, Test Weight and Protein

Cultivar/Line	Grain Yield (bu/a)				Test Weight (lb/bu)				Protein (%)			
	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19
	1y	2y	3y	4y	1y	2y	3y	4y	1y	2y	3y	4y
+ AAC Wildfire	69.0				63.6				12.1			
Brawl CLP	66.6	91.0	79.1		64.4	64.4	65.0		14.6	14.6	12.9	
+ Byrd CL Plus	78.2				62.9				11.4			
Decade	81.0	95.3	83.3	75.4	63.7	62.8	63.3	63.1	13.0	13.5	12.0	11.6
FourOsix	78.4	98.9	85.5		63.7	63.3	63.1		12.5	13.0	11.3	
Judee	71.6	88.5	78.5	71.9	64.2	63.6	64.0	63.6	13.0	13.3	11.7	11.5
Keldin	85.9	104.5	90.8	82.4	63.8	62.9	63.3	63.1	12.3	13.0	11.3	10.8
LCS Jet	78.2	102.3			61.0	60.2			11.6	12.2		
Loma	78.0	98.3	83.8	77.3	63.0	61.7	62.3	62.3	12.1	12.3	11.0	10.8
MT1564 (Flathead)	74.6	101.3			63.9	63.8			13.1	13.3		
MT1642	78.6	100.7			62.6	60.1			12.4	12.9		
+ MT1683	79.1				62.8				12.6			
+ MT1747	74.8				65.2				12.5			
+ MT1750	80.5				65.4				12.1			
+ MT1782	71.5				64.4				13.3			
+ MTCL1732	77.1				62.3				12.2			
MTCS1601	75.2	99.3			63.9	63.6			12.6	13.2		
MTS1588 (Bobcat)	77.6	98.8	84.7		63.6	63.5	63.9		12.1	12.5	11.2	
MTW1491	76.1	94.7	83.7		63.5	62.6	62.6		12.0	12.5	11.0	
Northern	87.3	109.1	94.1	84.6	63.1	62.5	62.8	62.6	12.1	12.6	11.2	11.1
Ray	76.2	97.2	84.5		61.8	59.9	60.2		12.5	12.7	11.1	
SY Clearstone 2CL	81.1	100.2	87.1	80.4	62.4	61.4	61.6	61.5	12.0	12.6	10.9	10.7
SY Monument	66.4	102.7	87.2		62.6	62.6	62.4		12.0	12.4	10.8	
Warhorse	76.2	98.3	83.4	76.1	63.1	62.3	62.7	62.4	13.4	14.0	12.2	11.8
Yellowstone	84.1	101.5	87.2	80.5	62.8	62.0	62.2	62.0	12.4	12.9	11.2	11.0
Average	76.9	99.0	85.2	78.6	63.3	62.4	62.8	62.6	12.5	13.0	11.4	11.2
LSD (0.05)	10.1	ns	ns	5.7	0.7	1.9	1.1	0.6	0.5	0.5	0.5	0.6
C.V. (%)	7.3	6.8	6.8	4.9	0.7	1.5	1.1	0.6	2.2	2.0	2.9	3.5

+ = new for 2019

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 69. 2016//2019 Off-Station Winter Wheat Test (Exp. 3882): Hysham [SARC] Yield, Test Weight and Protein

Cultivar/Line	Grain Yield (bu/a)			Test Weight (lb/bu)			Protein (%)		
	2019	2017//19	2016//19	2019	2017//19	2016//19	2019	2017//19	2016//19
	1y	2y	3y	1y	2y	3y	1y	2y	3y
+ AAC Wildfire	51.6	2018, no harvest hailed out		60.0			7.5		
Brawl CLP	44.0		49.9	59.1	61.4		8.6	10.4	
+ Byrd CL Plus	55.4			57.7			6.8		
Decade	49.1	49.0	47.1	58.7	59.9	58.6	7.7	10.3	11.1
FourOsix	48.7	51.3		57.7	60.3		7.1	9.8	
Judee	49.1	49.0	40.3	60.3	61.2	58.4	7.9	10.3	11.8
Keldin	50.3	52.6	48.6	59.0	60.9	58.6	7.5	9.7	10.8
LCS Jet	49.0			56.3			7.5		
Loma	48.5	51.6	45.7	60.3	60.9	58.3	8.3	10.2	11.8
MT1564 (Flathead)	47.5			58.8			7.3		
MT1642	54.0			60.1			8.3		
+ MT1683	49.2			59.0			7.6		
+ MT1747	46.7			59.6			7.9		
+ MT1750	46.3			59.7			7.6		
+ MT1782	45.1			59.6			8.1		
+ MTCL1732	57.2			57.7			7.4		
MTCS1601	43.7			58.8			7.6		
MTS1588 (Bobcat)	48.5	50.8		59.5	61.0		8.1	10.4	
MTW1491	46.6	54.8		57.8	60.2		7.1	9.4	
Northern	51.7	52.7	46.0	59.8	60.7	58.2	7.7	10.5	11.8
Ray	46.3	47.4		59.2	60.3		7.7	10.4	
SY Clearstone 2CL	59.7	58.2	53.2	58.8	60.4	58.1	7.2	9.7	11.0
SY Monument	43.2	51.6		57.3	59.1		7.2	9.1	
Warhorse	49.0	51.7	46.2	59.0	60.6	58.5	7.8	10.8	12.0
Yellowstone	54.7	59.3	54.2	58.8	60.8	58.7	7.2	9.4	10.8
Average	49.4	52.1	47.6	58.9	60.5	58.4	7.6	10.0	11.4
LSD (0.05)	6.1	ns	7.0	0.4	ns	ns	0.5	ns	ns
C.V. (%)	6.9	8.1	8.3	0.4	1.4	1.6	3.9	4.9	5.0

+ = new for 2019

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 70. 2016-2019 Off-Station Winter Wheat Test (Exp. 3884): Fly Creek (Hardin area - SARC) Yield, Test Weight and Protein

Cultivar/Line	Grain Yield (bu/a)				Test Weight (lb/bu)				Protein (%)			
	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19	2019	2018-19	2017-19	2016-19
	1y	2y	3y	4y	1y	2y	3y	4y	1y	2y	3y	4y
+ AAC Wildfire	80.9				59.9				13.1			
Brawl CLP	75.7	86.4	70.5		60.1	62.3	62.3		12.0	12.4	12.8	
+ Byrd CL Plus	77.8				59.4				11.5			
Decade	83.9	95.9	75.4	67.4	59.9	61.4	61.2	59.8	13.7	13.4	13.5	13.5
FourOsix	77.4	89.9	74.7		58.9	61.1	61.1		12.5	12.4	12.9	
Judee	73.5	89.5	70.4	61.1	61.2	61.8	61.5	59.8	13.0	13.0	13.6	13.7
Keldin	95.9	104.9	84.8	76.6	60.2	61.5	61.5	60.5	11.8	12.0	12.2	12.5
LCS Jet	76.0	92.8			58.1	58.2			12.4	12.4		
Loma	77.3	90.7	72.9	66.6	59.3	59.8	60.0	58.9	13.1	12.6	13.3	13.5
MT1564 (Flathead)	74.8	86.6			59.4	60.9			12.6	12.6		
MT1642	74.4	87.8			59.7	58.5			13.4	12.9		
+ MT1683	81.4				59.2				12.6			
+ MT1747	87.1				60.7				12.3			
+ MT1750	88.7				61.3				12.8			
+ MT1782	91.3				60.5				12.7			
+ MTCL1732	81.7				58.3				12.2			
MTCS1601	68.7	82.3			60.8	62.1			12.8	12.5		
MTS1588 (Bobcat)	73.8	84.7	67.9		60.4	61.3	61.0		12.5	12.5	13.1	
MTW1491	78.3	87.2	69.3		60.5	61.6	61.5		12.4	12.1	12.6	
Northern	72.4	88.6	70.0	62.1	60.4	60.6	60.6	59.5	13.4	13.0	13.6	13.7
Ray	79.5	87.0	70.0		58.8	57.2	58.3		13.1	12.9	13.4	
SY Clearstone 2CL	80.3	88.0	72.4	66.7	58.9	59.8	60.0	58.9	12.9	12.5	13.2	13.2
SY Monument	81.1	92.5	76.0		58.6	59.9	60.2		11.8	12.0	11.9	
Warhorse	81.5	92.0	73.6	63.3	60.7	61.1	61.1	59.3	13.3	13.4	13.8	14.0
Yellowstone	76.2	86.0	70.8	65.3	59.3	59.0	59.6	58.6	12.8	12.5	13.0	13.1
Average	79.6	89.6	72.8	66.1	59.8	60.4	60.7	59.4	12.7	12.6	13.1	13.1
LSD (0.05)	8.5	8.3	6.8	7.4	0.4	ns	2.0	ns	0.5	0.8	0.8	0.8
C.V. (%)	6.1	4.4	5.6	7.7	0.4	2.4	1.9	1.5	2.4	3.0	3.7	3.7

+ = new for 2019

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 71. 2016-2018 Off-Station Winter Wheat Test (Exp. 3885): Molt (SARC) Yield, Test Weight and Protein

Cultivar/Line	Grain Yield (bu/a)			Test Weight (lb/bu)			Protein (%)		
	2018	2017-18	2016-18	2018	2017-18	2016-18	2018	2017-18	2016-18
	1y	2y	3y	1y	2y	3y	1y	2y	3y
+ AAC Wildfire									
Brawl CLP									
+ Byrd CL Plus									
Decade	43.7	53.3		63.5	64.2		11.6	11.1	
FourOsix	70.5	62.9	59.3	62.1	62.5	62.0	12.1	10.8	10.3
Judee	53.4	59.6		60.5	61.6		11.3	10.1	
Keldin	51.1	52.3	50.7	61.9	62.7	61.7	10.3	9.8	9.9
LCS Jet	63.4	60.6	60.0	61.4	62.1	61.8	11.7	10.5	9.9
	72.9			59.2			11.5		
Loma	54.8	54.0	55.5	60.4	60.9	60.7	10.9	10.5	10.3
MT1564 (Flathead)	48.1			61.6			11.3		
MT1642	51.0			59.8			11.2		
+ MT1683									
+ MT1747									
+ MT1750									
+ MT1782									
+ MTCL1732									
MTCS1601	51.2			63.2			11.2		
MTS1588 (Bobcat)	47.3	53.5		62.3	63.0		11.2	10.4	
MTW1491	57.6	58.7		61.3	61.9		11.3	10.2	
Northern	69.1	63.0	59.0	62.6	62.4	62.1	11.2	10.4	10.2
Ray	56.9	55.6		60.5	60.2		10.7	10.2	
SY Clearstone 2CL	52.6	56.0	55.4	61.0	61.4	60.7	10.9	10.0	10.0
SY Monument	59.7	61.7		61.0	61.2		10.1	9.4	
Warhorse	60.8	56.4	53.8	61.7	62.0	61.4	11.1	10.7	10.6
Yellowstone	53.2	59.3	58.8	61.7	61.9	60.9	10.7	10.1	10.1
Average	55.5	57.8	57.5	61.1	61.9	61.4	11.2	10.2	10.1
LSD (0.05)	9.0	ns	ns	1.8	1.4	1.1	1.1	ns	ns
C.V. (%)	9.8	13.4	11.9	1.8	1.0	1.1	6.1	4.5	5.4

+ = new for 2019

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 72. 2016//2019 Off-Station Winter Wheat Test (Exp. 3886): Fort Smith (SARC) Yield, Test Weight and Protein

Cultivar/Line	Grain Yield (bu/a)			Test Weight (lb/bu)			Protein (%)		
	2019	2018-19	2016//19	2019	2018-19	2016//19	2019	2018-19	2016//19
	1y	2y	3y	1y	2y	3y	1y	2y	3y
+ AAC Wildfire	84.7			64.0			11.6		
Brawl CLP	60.9	58.4		64.4	63.0		14.2	14.8	
+ Byrd CL Plus	89.0			64.1			11.5		
Decade	78.4	81.1	71.0	63.9	61.9	59.9	12.5	13.4	13.3
FourOsix	84.1	80.7		63.8	61.7		12.0	12.5	
Judee	80.5	79.6	68.0	64.6	63.0	61.3	12.8	13.4	13.0
Keldin	83.4	90.1	81.8	64.3	62.6	61.2	11.6	12.3	12.1
LCS Jet	81.4	87.5		61.0	59.5		11.5	12.0	
Loma	85.4	89.1	73.2	63.5	61.0	58.6	11.7	12.2	12.6
MT1564 (Flathead)	78.0	73.9		63.5	62.2		13.1	13.2	
MT1642	94.4	93.7		63.2	59.0		12.0	12.4	
+ MT1683	81.2			63.0			11.5		
+ MT1747	75.1			64.9			12.3		
+ MT1750	84.6			65.2			11.8		
+ MT1782	78.3			64.5			13.1		
+ MTCL1732	83.1			63.3			12.4		
MTCS1601	73.9	83.1		64.3	62.9		12.5	12.8	
MTS1588 (Bobcat)	78.5	86.1		64.3	62.9		12.0	12.4	
MTW1491	83.3	82.8		63.3	61.5		12.2	12.2	
Northern	91.5	90.5	73.6	63.7	61.2	58.3	12.0	12.6	13.1
Ray	74.6	81.4		61.7	59.2		12.0	12.4	
SY Clearstone 2CL	81.2	86.8	72.8	62.8	59.6	58.2	11.9	12.3	12.4
SY Monument	66.2	65.9		62.9	62.0		12.1	12.5	
Warhorse	81.0	81.8	70.2	63.5	61.2	59.6	12.5	13.4	13.2
Yellowstone	79.5	83.3	71.3	63.3	61.4	59.5	12.0	12.4	12.4
Average	80.5	82.0	72.7	63.6	61.4	59.6	12.2	12.7	12.8
LSD (0.05)	8.9	12.3	ns	0.5	2.3	1.8	0.9	0.7	ns
C.V. (%)	6.0	7.1	7.9	0.5	1.8	1.7	4.2	2.6	4.6

+ = new for 2019

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 73. 2016-2019 Off-Station Winter Wheat Test (Exp. 38): Combined Locations - Yield, Test Weight and Protein

Cultivar/Line	Grain Yield (bu/a)					Test Weight (lb/bu)					Protein (%)				
	2019	2018-19	2017-19	2016-19		2019	2018-19	2017-19	2016-19		2019	2018-19	2017-19	2016-19	
	13	27	43	59		13	27	43	59		13	27	43	58	
+ AAC Wildfire	67.9					61.1					11.9				
Brawl CLP	59.1	61.9	61.0			62.0	62.4	62.6			13.1	13.6	13.1		
+ Byrd CL Plus	70.7					61.1					11.0				
Decade	67.2	69.6	64.7	63.9		61.1	61.1	61.0	60.4		12.3	13.1	12.8	12.6	
FourOsix	66.2	66.8	65.3			60.9	60.7	60.7			11.9	12.6	12.4		
Judee	63.6	66.5	62.1	62.2		62.3	61.9	61.7	61.2		12.4	13.0	12.8	12.8	
Keldin	69.4	73.0	69.5	71.0		61.3	61.3	61.3	61.0		11.9	12.6	12.3	12.1	
LCS Jet	64.8	70.6				58.6	58.3				11.5	12.2			
Loma	69.3	71.2	66.1	65.6		61.3	60.6	60.4	60.0		12.1	12.7	12.5	12.6	
MT1564 (Flathead)	60.5	63.8				61.4	61.3				12.2	12.8			
MT1642	70.2	71.6				60.8	59.8				12.1	12.8			
+ MT1683	67.5					60.7					11.8				
+ MT1747	68.0					62.5					11.8				
+ MT1750	68.6					62.6					11.9				
+ MT1782	65.3					62.2					12.4				
+ MTCL1732	68.8					60.2					11.8				
MTCS1601	63.6	67.7				61.8	61.8				12.1	12.8			
MTS1588 (Bobcat)	69.4	71.0	66.5			61.4	61.4	61.3			11.9	12.6	12.5		
MTW1491	66.8	67.9	66.3			61.3	61.0	60.9			11.5	12.2	12.0		
Northern	70.8	72.5	67.6	67.1		61.5	61.1	60.7	60.2		12.0	12.7	12.6	12.7	
Ray	63.3	66.5	63.5			60.1	59.2	58.9			11.8	12.5	12.3		
SY Clearstone 2CL	67.1	69.4	66.3	66.9		60.4	59.9	59.8	59.5		11.8	12.4	12.2	12.3	
SY Monument	65.8	68.9	66.5			60.3	60.5	60.2			11.4	12.0	11.7		
Warhorse	63.1	66.4	62.3	62.0		61.2	60.8	60.7	60.2		12.6	13.2	13.1	13.0	
Yellowstone	68.3	69.3	66.4	67.2		60.7	60.2	60.1	59.8		11.8	12.5	12.3	12.3	
Average	66.6	68.6	65.3	65.7		61.1	60.7	60.7	60.3		12.0	12.7	12.5	12.6	
LSD (0.05)	4.2	3.4	2.6	2.1		0.4	0.4	0.3	0.3		0.3	0.2	0.2	0.2	
C.V. (%)	8.1	9.2	9.2	8.8		0.9	1.3	1.3	1.3		3.3	3.3	3.7	3.7	

+ = new for 2019

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 74. 2014-2019 Intrastate (Exp. 35) and Off-Station (Exp. 38) Winter Wheat Tests: Combined Locations Yield

Cultivar/Line	Grain Yield (bu/a)											
	2019		2018-19		2017-19		2016-19		2015-19		2014-19	
	+ = new for 2019 in Off Sta.											
	no Yll	w/Yll	no Yll	w/Yll	no Yll	w/Yll	no Yll	w/Yll	no Yll	w/Yll	no Yll	w/Yll
Location-years	22		45		68	61	93	86	114	107	134	127
+ AAC Wildfire	73.2				65.0	65.6						
Brawl CLP	66.5		67.3									
+ Byrd CL Plus	74.6											
Decade	72.2		71.9		67.1	67.9	65.9	66.6	64.1	64.4	64.9	65.2
FourOsix	72.7		72.0		69.7	69.8						
Judee	70.1		70.6		66.4	66.7	66.5	66.8	64.0	64.0	64.9	64.8
Keldin	77.1		78.7		74.7	74.9	76.1	76.7				
LCS Jet	75.4		76.9									
Loma	74.1		74.6		69.9	70.3	70.1	70.7	68.7	68.7		
MT1564 (Flathead)	69.4		70.2									
MT1642	77.4		76.8									
+ MT1683	74.5											
+ MT1747	73.6											
+ MT1750	72.4											
+ MT1782	72.5											
+ MTCL1732	72.7											
MTCS1601	71.3		72.3									
MTS1588 (Bobcat)	73.9		74.3		70.3	70.7						
MTW1491	76.6		74.9		72.3	72.1						
Northern	78.1		77.0		71.8	72.4	72.2	73.1	70.6	70.8	71.2	71.4
Ray	69.6		71.4		68.2	68.2						
SY Clearstone 2CL	74.7		74.6		71.0	71.3	72.0	72.4	69.7	69.6	70.4	70.3
SY Monument	72.1		74.0		71.3	71.1						
Warhorse	67.7		69.7		66.0	66.1	66.2	66.5	64.3	64.2	64.8	64.6
Yellowstone	74.0		73.7			70.8		72.3		70.5		71.4
Average	73.1		74.4		69.5	69.6	69.9	70.3	66.9	67.5	67.2	68.0
LSD (0.05)	4.0		3.0		2.4	2.4	2.3	2.2	2.0	2.0	1.9	1.8
C.V. (%)	9.3		9.8		10.1	9.6	11.3	10.6	11.7	11.0	11.8	10.9

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

1/ = Yellowstone misplanted in 2017 Intrastate Tests

Table 75. 2014-2019 Intrastate (Exp. 35) and Off-Station (Exp. 38) Winter Wheat Tests: Combined Locations Test Weight

Cultivar/Line	Grain Yield (bu/a)											
	2019	2018-19	2017-19		2016-19		2015-19		2014-19			
			no Yll	w/Yll	no Yll	w/Yll	no Yll	w/Yll	no Yll	w/Yll		
Location-years	22	45	68	61	93	86	114	107	134	127		
+ AAC Wildfire	61.1		62.6	62.6								
Brawl CLP	62.1	62.5										
+ Byrd CL Plus	60.7											
Decade	61.0	61.0	60.9	60.9	60.3	60.3	60.0	60.0	60.1	60.1		
FourOsix	60.8	61.0	61.0	60.9								
Judee	62.2	62.0	61.8	61.8	61.4	61.4	61.0	61.0	61.0	61.1		
Keldin	61.3	61.6	61.4	61.5	61.1	61.1						
LCS Jet	58.6	58.6										
Loma	61.1	60.7	60.6	60.6	60.2	60.1	59.9	59.8				
MT1564 (Flathead)	61.4	61.6										
MT1642	60.8	60.0										
+ MT1683	60.6											
+ MT1747	62.5											
+ MT1750	62.5											
+ MT1782	62.3											
+ MTCL1732	60.2											
MTCS1601	61.8	61.9										
MTS1588 (Bobcat)	61.5	61.6	61.5	61.5								
MTW1491	61.2	61.1	61.0	61.0								
Northern	61.4	61.2	60.8	60.9	60.4	60.4	60.1	60.1	60.1	60.2		
Ray	59.8	59.2	59.1	59.0								
SY Clearstone 2CL	60.3	60.2	60.0	60.0	59.8	59.7	59.5	59.4	59.6	59.5		
SY Monument	60.3	60.6	60.3	60.3								
Warhorse	61.1	61.1	60.8	60.9	60.5	60.5	60.1	60.1	60.2	60.2		
Yellowstone	60.6	60.4		60.2	60.0	60.0		59.8		59.9		
Average	61.1	60.9	60.9	60.9	60.5	60.5	60.1	60.0	60.2	60.1		
LSD (0.05)	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2		
C.V. (%)	1.0	1.4	1.4	1.3	1.6	1.6	1.7	1.6	1.7	1.6		

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

1/ = Yellowstone misplanted in 2017 Intrastate Tests

Table 76. 2014-2019 Intrastate (Exp. 35) and Off-Station (Exp. 38) Winter Wheat Tests: Combined Locations Protein

Cultivar/Line	Grain Yield (bu/a)											
	2019		2018-19		2017-19		2016-19		2015-19		2014-19	
	+ = new for 2019 in Off Sta.											
Location-years	22	45	68	61	91	84	112	105	130	123		
+ AAC Wildfire	12.3											
Brawl CLP	13.2	13.5	13.1	13.2								
+ Byrd CL Plus	11.4											
Decade	12.7	13.1	12.9	12.9	12.6	12.6	12.6	12.6	12.7	12.7		
FourOsix	12.2	12.6	12.5	12.5								
Judee	12.8	13.1	13.0	13.0	12.8	12.8	12.8	12.7	12.9	12.9		
Keldin	12.1	12.5	12.3	12.3	12.1	12.0						
LCS Jet	11.8	12.2										
Loma	12.4	12.8	12.7	12.7	12.5	12.5	12.5	12.5				
MT1564 (Flathead)	12.5	12.7										
MT1642	12.4	12.8										
+ MT1683	12.2											
+ MT1747	12.1											
+ MT1750	12.3											
+ MT1782	12.7											
+ MTCL1732	12.1											
MTCS1601	12.6	12.9	12.6	12.6								
MTS1588 (Bobcat)	12.3	12.7	12.1	12.1								
MTW1491	11.8	12.2	12.7	12.7	12.6	12.5	12.6	12.5	12.7	12.7		
Northern	12.4	12.7	12.5	12.5								
Ray	12.2	12.6	12.4	12.4	12.2	12.2	12.2	12.2	12.4	12.4		
SY Clearstone 2CL	12.2	12.5	12.0	11.8								
SY Monument	11.7	12.0	11.8	11.8								
Warhorse	13.0	13.3	13.2	13.2	13.0	13.0	12.9	12.9	13.1	13.1		
Yellowstone	12.1	12.5	12.4	12.4								
Average	12.3	12.7	12.6	12.6	12.6	12.5	66.9	12.5	12.8	12.7		
LSD (0.05)	0.3	0.2	0.2	0.2	0.1	0.1	2.0	0.1	0.1	0.1		
C.V. (%)	3.5	3.5	3.8	3.7	4.1	3.9	11.7	4.2	4.2	4.0		

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

1/ = Yellowstone misplanted in 2017 Intrastate Tests

Table 77. 2015-2019 Combined Locations Yield under Sawfly Pressure and % Sawfly Cutting
(Note: Sawfly cutting in each location-year $\geq 10\%$, see table on next page for locations)

Cultivar/Line + = new for 2019 in Off Sta.	Grain Yield (bu/a)					Sawfly Cutting (%)				
	2019 7	2018-19 13	2017-19 16	2016-19 18	2015-19 19	2019 7	2018-19 13	2017-19 16	2016-19 18	2015-19 19
+ AAC Wildfire	59.6					38				
Brawl CLP	61.1	60.9	57.9			41	35	39		
+ Byrd CL Plus	64.0					40				
Decade	60.5	59.1	56.0	58.4	57.8	39	41	42	41	39
FourOsix	61.1	59.1	56.8			60	61	60		
Judee	58.9	58.8	55.8	59.6	58.7	41	43	39	38	36
Keldin	62.4	60.9	58.3	62.6		54	53	53	53	
LCS Jet	60.6	58.9				52	55			
Loma	64.4	63.6	60.2	62.4	61.6	30	31	31	29	28
MT1564 (Flathead)	56.6	56.7				53	54			
MT1642	66.3	63.5				45	47			
+ MT1683	59.7					67				
+ MT1747	65.0					32				
+ MT1750	61.5					22				
+ MT1782	58.7					36				
+ MTCL1732	61.8					19				
MTCs1601	63.2	61.7				36	37			
MTS1588 (Bobcat)	70.5	68.5	64.5			12	8	8		
MTW1491	64.1	61.2	57.8			55	60	58		
Northern	64.8	63.0	58.7	61.1	60.8	46	51	50	47	45
Ray	59.1	58.0	54.4			51	54	53		
SY Clearstone 2CL	59.2	59.5	56.0	60.1	59.6	63	65	63	61	59
SY Monument	64.5	63.0	59.2			51	53	53		
Warhorse	55.8	55.7	53.4	55.4	54.9	16	11	10	9	9
Yellowstone	60.2	59.9	57.0	60.3	59.5	59	62	59	58	56
Average	61.7	60.7	57.6	60.0	59.0	42.3	45.6	44.1	41.9	38.7
LSD (0.05)	6.3	4.2	3.6	4.1	3.8	11.5	9.7	9.3	8.3	7.9
C.V. (%)	9.7	9.0	9.1	10.3	10.0	25.8	27.6	30.3	30.0	31.9

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 78. 2003-2019 All Locations with % Sawfly Cutting data (incl. selected variety cutting)

Location	Year	Cutting	Rampart	Genou	Judee	Bearpaw	Warhorse	Loma	Bobcat	MTC51601	Yellowstone
V = locations used in analysis in Table. 72			% cutting								
V Havre	2019	24	-	-	12	-	3	15	1	12	30
Havre	2018	6	-	-	5	2	0	4	2	4	8
Havre	2017	<1									
Havre	2016	none recorded									
Havre	2015	5	1	1	1	2	2	2			2
Havre	2014	2	1	1	1	1	1	2			2
Havre	2013	10	4	7	5	6	2				10
Havre	2012	8	0	6	2	3	2				9
Havre (no harv.)	2011	6	0	1	4	1	1				4
Havre	2010	12	6	16	5	2	1				9
Havre	2009	22	0	1	4	1					21
Havre	2008	23	13	9	8						18
Havre	2007	27	0	8							40
Havre	2006	25	3	8							23
Havre	2005	32	8	18							43
Turner	2017	<1									
Turner	2014	hail - no harvest									
Turner	2013	3	2	1	1	1	1				7
Turner	2012	18	12	18	8	20	2				18
Turner	2011	13	1	7	1	4	1				20
North Havre	2010	6	1	4	4	1					10
North Havre	2009	poor stand - no harv.									
North Havre	2008	40	22	30							50
North Havre	2007	53	12	20							82
North Havre	2006	34	4	4							73
North Havre	2005	54	7	8							70
North Havre	2004	winterkill - no harv.									
North Havre	2003	46	3	8							43
V Loma	2019	40	-	-	41	-	17	22	6	45	53
V Loma	2018	64	-	-	65	-	17	32	7	48	85
V Loma	2017	43	-	-	41	11	13	38	24		31
Loma	2016	2	0	-	1	0	0	4			2
V Loma	2015	12	2	9	1	7	0	12			15
Loma	2014	4	1	4	4	1	1				5
Loma	2013	20	17	23	30	20	8				15

Table 78. 2003-2019 All Locations with % Sawfly Cutting data (incl. selected variety cutting)

Location	Year	Cutting	Rampart	Genou	Judee	Bearpaw	Warhorse	Loma	Bobcat	MTC51601	Yellowstone
V = locations used in analysis in Table. 72			% cutting								
Loma	2012	65	17	27	32	13	5				98
Loma	2011	19	10	22	10	10	5				22
Loma	2010	72	10	52	53	8					99
Loma	2009	60	17	50	32						85
Loma	2008	7	4	4							10
Loma	2007	4	0	2							2
Loma	2006	none recorded									
Loma	2005	2	0	0							0
V Conrad	2019		-	-	9	8	4	11	1		20
V Conrad	2018	18									
V Carter/Ft. Benton	2019		-	-	30	25	1	18	2		92
V Carter/Ft. Benton	2018	53	-	-	22	18	2	27	2		-
V Carter/Ft. Benton	2017	54	-	-	6	8	1	8			20
V Carter/Ft. Benton	2016	27	5	-							
V Shelby/Devon	2019	62	-	-	73	-	17	47	12	50	85
V Choteau	2019	52	-	-	60	-	33	43	27	25	79
V Belt	2019	13	-	-	3	-	0	3	0	7	27
V The Knees	2018	52	-	-	67	-	2	36	0	43	74
V Shelby/Devon	2018	23	-	-	12	-	1	10	1	13	23
V Choteau	2018	82	-	-	87	-	12	90	4	78	98
V Fly Creek (SARC)	2017	34	-	-	10	10	3	17	7		33
V The Knees	2016	65	36	-	46	12	0	24			81
Willow Creek	2012	10	1	2	2	2	1				12
Denton	2010	7	2	2	2	1					25
Geraldine	2008	4	2	1							5

Table 79. 2019 Advanced Yield Nursery: All location Summary

Entry	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date 1-Jan	Plant height in	Sawfly cutting %	Protein %
w = white-seeded								
		locations	7	7	6	6	3	7
36	WS563	Manitoba/Northern Seeds	79.1	59.7	172.0	31.7	31	12.6
28 i	MT1872	MT0859//MT0840/MT0873	77.9	60.7	170.6	29.1	16	13.2
5	SY Monumer	check	76.4	59.2	168.4	27.4	45	12.7
23 i	MT1848	Northern//MT08184/MT0887	75.6	58.8	172.6	29.0	42	14.0
20	MTCS18211	MTS1597//MTCS1301/MTS1412	75.2	61.4	172.7	29.5	25	13.3
22 i	MT1845	Yellowstone/493-22(Reeder/6*Paul)	74.9	59.7	169.4	28.8	44	13.6
27 i	MT1867	MT0859//00X83cE45/MT0698	74.9	59.3	170.2	28.6	44	12.9
1	Yellowstone	check	74.8	59.1	172.2	31.0	48	13.3
13 i	MTS18116	Loma*2/Warhorse	74.7	60.3	174.8	28.0	7	12.7
16 i	MTS18149	Loma*2/AAC Gateway	74.7	59.6	174.9	26.5	13	13.5
25 i	MT1855	05X438-aC71(MT0097*2//Jagalene/Choteau)	74.4	60.1	173.4	28.7	21	13.8
34	WS520	Manitoba/Northern Seeds	74.0	60.1	171.2	29.8	45	13.1
3	Decade	check	73.8	60.0	169.5	29.7	40	13.7
12 i	MTS1831	MTS0907/MTS0827	73.2	60.4	174.9	27.2	8	12.5
26 i	MT1866	MT0859//00X83cE45/MT0698	73.2	58.9	170.8	26.9	39	13.5
30	MT1889	Decade*2/MT0849	72.7	59.6	167.4	27.4	42	14.0
10 i	MTS1810	08X350-A6/Warhorse	72.6	61.1	174.2	29.8	0	13.9
11	MTS1830	MTS0907/MTS0827	72.5	60.2	174.7	28.1	9	12.8
33 w	MT18109	MTS0531*3//PI640431/MTS04114	72.0	59.8	171.4	29.1	33	14.0
24	MT1854	08X350-A2/MT0890	71.7	58.8	172.6	28.0	52	13.2
6	MTS1801	Judee//MTS0907/MTS0827	71.5	59.6	171.2	29.7	24	13.8
29	MT1882	Decade//YLL (L)/TX05V071040	71.3	59.2	168.1	26.3	54	14.0
17	MTS18167	Loma*2/AAC Gateway	71.0	58.8	174.7	27.5	17	13.9
7	MTS1802	Warhorse*2/Accipiter	70.6	59.9	174.0	29.4	11	14.2
14	MTS18117	Loma*2/Warhorse	70.4	60.2	172.7	27.9	23	13.7
8	MTS1804	Warhorse*2/Accipiter	70.3	59.3	171.8	28.3	9	14.4
35	WS522	Manitoba/Northern Seeds	69.7	59.0	169.2	26.2	45	13.4
21	MTCS18222	Judee//Warhorse/MTCS1204	69.6	61.3	169.8	28.7	31	13.6
19	MTCS18195	MTCS1204*4/MT1138	69.5	59.9	171.8	28.7	52	13.0
2	Judee	check	69.4	60.1	171.3	30.0	33	14.2
18	MTS18169	Loma*2/AAC Gateway	69.4	59.3	174.1	27.8	30	13.8
9	MTS1809	08X350-A6/Warhorse	69.2	61.0	171.2	28.2	18	14.1
15	MTS18143	Loma*2/Warhorse	68.8	57.2	172.9	28.2	34	13.7
31	MT1895	MT08185//YLL*2//PI640431/3/PROM/3*YLL//	68.7	58.5	170.0	25.8	40	13.6
4	Warhorse	check	68.3	59.6	171.2	28.8	11	14.0
32	MT1897	MT08185//YLL*2//PI640431/3/PROM/3*YLL//	67.5	58.1	169.9	26.4	42	13.6
Average			72.3	59.7	171.7	28.4	30.0	13.5
LSD (0.05)			6.4	0.8	1.3	1.2	15.0	0.6
C.V. (%)			8.5	1.2	0.7	3.6	30.7	4.1

i = in 2020 Intrastate Test (all other MT lines dropped from testing)

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD ($p = 0.05$)

Table 80. 2019 Advanced Yield Nursery (Exp. 1401): Bozeman

Entry	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Protein %
w = white			RCB	LAT	RCB	RCB	bulk
		lattice efficiency relative to RCB	96%	366%	103%		
27 i	MT1867	MT0859//00X83cE45/MT0698	145.0	62.8	175.7	34.0	11.1
25 i	MT1855	05X438-aC71(MT0097*2//Jagalene/Choteau)	136.8	62.9	177.3	33.6	12.1
26 i	MT1866	MT0859//00X83cE45/MT0698	136.2	62.4	176.0	31.8	12.1
23 i	MT1848	Northern//MT08184/MT0887	135.7	61.2	178.7	35.4	12.8
16 i	MTS18149	Loma*2/AAC Gateway	131.4	62.0	181.3	30.7	11.9
30	MT1889	Decade*2/MT0849	131.1	62.2	170.3	31.1	12.8
24	MT1854	08X350-A2/MT0890	129.2	61.2	175.3	34.0	11.7
28 i	MT1872	MT0859//MT0840/MT0873	128.7	63.1	176.0	34.1	12.1
34	WS520	Manitoba/Northern Seeds	128.1	62.7	177.0	35.3	11.3
22 i	MT1845	Yellowstone/493-22(Reeder/6*Paul)	127.8	62.3	175.3	34.9	12.4
36	WS563	Manitoba/Northern Seeds	127.2	62.5	179.3	35.4	11.9
10 i	MTS1810	08X350-A6/Warhorse	127.2	64.3	180.3	34.9	12.6
1	Yellowstone	check	126.8	62.7	178.3	37.5	11.8
20	MTCS18211	MTS1597//MTCS1301/MTS1412	126.5	63.9	178.0	35.2	12.5
12 i	MTS1831	MTS0907/MTS0827	125.8	63.2	180.0	32.0	11.1
7	MTS1802	Warhorse*2/Accipiter	125.6	62.9	179.0	34.3	12.8
3	Decade	check	125.2	62.3	174.0	34.4	12.3
6	MTS1801	Judee//MTS0907/MTS0827	124.8	62.5	176.7	35.7	12.3
29	MT1882	Decade//YLL (L)/TX05V071040	121.4	61.8	170.7	31.1	12.4
2	Judee	check	121.3	62.9	176.0	36.9	12.9
13 i	MTS18116	Loma*2/Warhorse	120.3	62.8	180.0	31.0	11.7
11	MTS1830	MTS0907/MTS0827	120.3	63.4	180.0	33.1	11.4
15	MTS18143	Loma*2/Warhorse	120.2	59.8	178.3	32.5	12.2
8	MTS1804	Warhorse*2/Accipiter	119.9	61.8	176.7	34.0	13.1
9	MTS1809	08X350-A6/Warhorse	119.6	64.0	175.7	34.6	12.2
21	MTCS18222	Judee//Warhorse/MTCS1204	119.3	64.2	175.3	34.4	11.7
4	Warhorse	check	117.6	62.2	177.0	34.8	12.5
32	MT1897	MT08185//YLL*2//PI640431/3/PROM/3*YLL//	117.0	60.2	175.7	31.5	11.9
33 w	MT18109	MTS0531*3//PI640431/MTS04114	116.9	62.4	177.3	34.8	12.2
18	MTS18169	Loma*2/AAC Gateway	116.9	61.7	179.7	31.9	12.0
5	SY Monument	check	116.6	61.5	173.0	32.4	11.8
31	MT1895	MT08185//YLL*2//PI640431/3/PROM/3*YLL//	114.8	60.7	175.3	29.5	11.9
14	MTS18117	Loma*2/Warhorse	114.6	62.6	178.7	33.2	12.1
17	MTS18167	Loma*2/AAC Gateway	114.3	61.1	182.0	32.3	12.4
35	WS522	Manitoba/Northern Seeds	112.8	61.6	174.0	30.4	11.4
19	MTCS18195	MTCS1204*4/MT1138	108.6	63.1	176.7	35.3	11.7
Average			123.7	62.4	177.0	33.6	12.1
LSD (0.05)			10.7	0.6	1.3	1.3	
C.V. (%)			5.3	0.5	0.5	2.3	
P-value (Varieties)			<.0001	<.0001	<.0001	<.0001	

i = in 2020 Intrastate Test (all other MT lines dropped from testing)

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 81. 2019 Advanced Yield Nursery (Exp. 1402): Havre

Entry	ID	Pedigree	Yield	Test	Stand	Heading	Plant	Sawfly		Protein
			bu/ac	weight	%	date	height	cutting %		%
			LAT	lb/bu	LAT	Julian	in	30-Jul	harvest	LAT
			LAT	LAT	LAT	LAT	RCB	LAT	RCB	LAT
		lattice efficiency over RCB	110%	153%	111%	126%	100%	105%	98%	145%
29	MT1882	Decade//YLL (L)/TX05V071040	65.9	60.3	96	166.6	24.4	24	25	15.2
25 i	MT1855	05X438-aC71(MT0097*2//Jagalene/Chote	65.3	60.9	98	171.6	26.8	6	5	15.2
13 i	MTS18116	Loma*2/Warhorse	65.1	61.1	99	173.7	28.2	2	1	14.0
19	MTCS18195	MTCS1204*4/MT1138	64.6	60.4	98	169.9	25.8	12	23	14.2
21	MTCS18222	Judee//Warhorse/MTCS1204	63.7	62.6	98	169.3	27.3	6	7	14.5
34	WS520	Manitoba/Northern Seeds	63.3	60.6	98	170.1	28.7	19	25	14.2
36	WS563	Manitoba/Northern Seeds	63.2	59.5	99	169.6	32.0	12	10	14.2
6	MTS1801	Judee//MTS0907/MTS0827	62.1	60.1	97	169.9	29.0	4	10	14.7
23 i	MT1848	Northern//MT08184/MT0887	61.5	59.7	98	171.3	25.8	14	18	15.5
16 i	MTS18149	Loma*2/AAC Gateway	61.4	59.8	99	174.5	23.7	3	2	14.9
5	SY Monumer	check	61.3	59.9	97	166.5	25.5	25	25	13.9
17	MTS18167	Loma*2/AAC Gateway	60.6	59.2	99	173.3	25.2	3	1	15.0
28 i	MT1872	MT0859//MT0840/MT0873	60.5	60.9	99	169.7	28.9	5	10	14.4
24	MT1854	08X350-A2/MT0890	60.3	59.5	100	173.1	26.2	20	27	14.1
15	MTS18143	Loma*2/Warhorse	60.1	58.6	97	173.7	28.6	7	5	15.2
10 i	MTS1810	08X350-A6/Warhorse	59.6	60.1	98	172.1	27.8	0	0	15.3
1	Yellowstone	check	59.3	59.6	98	171.6	28.3	26	27	14.5
33 w	MT18109	MTS0531*3//PI640431/MTS04114	59.1	59.6	98	169.5	28.6	5	10	15.3
11	MTS1830	MTS0907/MTS0827	58.0	60.0	99	174.6	25.7	1	2	14.2
22 i	MT1845	Yellowstone/493-22(Reeder/6*Paul)	57.9	60.5	99	167.3	26.1	16	20	15.0
27 i	MT1867	MT0859//00X83cE45/MT0698	57.7	60.5	99	169.0	25.6	15	20	14.3
32	MT1897	MT08185//YLL*2/PI640431/3/PROM/3*YL	56.7	60.0	99	167.0	25.1	27	25	14.9
12 i	MTS1831	MTS0907/MTS0827	56.6	60.5	98	174.3	26.3	0	2	14.0
7	MTS1802	Warhorse*2/Accipiter	56.2	60.4	97	172.9	27.1	2	2	15.4
35	WS522	Manitoba/Northern Seeds	56.0	59.1	100	167.5	24.3	19	18	14.6
3	Decade	check	55.5	59.9	100	168.5	28.3	16	23	15.4
18	MTS18169	Loma*2/AAC Gateway	55.3	59.8	100	174.5	27.7	1	1	15.2
2	Judee	check	54.4	61.4	100	170.6	27.7	12	18	15.4
9	MTS1809	08X350-A6/Warhorse	54.0	60.3	95	170.7	24.2	3	4	15.8
31	MT1895	MT08185//YLL*2/PI640431/3/PROM/3*YL	53.4	59.8	100	167.8	24.3	18	22	15.1
26 i	MT1866	MT0859//00X83cE45/MT0698	53.0	59.8	98	169.4	24.0	21	23	15.1
30	MT1889	Decade*2/MT0849	53.0	60.0	100	165.6	26.8	16	17	16.1
8	MTS1804	Warhorse*2/Accipiter	52.1	60.1	99	170.9	26.0	2	2	16.0
14	MTS18117	Loma*2/Warhorse	51.9	59.9	99	171.7	25.8	4	5	15.3
20	MTCS18211	MTS1597//MTCS1301/MTS1412	50.7	60.9	100	171.2	28.6	9	15	14.4
4	Warhorse	check	47.2	60.4	97	169.3	26.2	1	2	15.6
Average			58.2	60.2	98.6	170.5	26.7	10.4	12.6	14.9
LSD (0.05)			6.7	0.6	ns	1.7	2.1	7.9	8.2	0.3
C.V. (%)			6.7	0.5	1.9	0.6	4.8	44.1	40.2	1.3
P-value (Varieties)			<.0001	<.0001	0.4710	<.0001	<.0001	<.0001	<.0001	<.0001

i = in 2020 Intrastate Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 82. 2019 Advanced Yield Nursery (Exp. 1404): Williston

Entry	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Winter survival %		Heading date Julian	Plant height in	Protein %
					PLB	NDSU			
w = white			LAT	RCB	3-Jun		RCB	RCB	LAT
		lattice efficiency over RCB	185%	103%	107%	114%	96%	100%	158%
36	WS563	Manitoba/Northern Seeds	70.8	55.0	97.5	79.4	163.7	16.7	13.5
13 i	MTS18116	Loma*2/Warhorse	66.7	56.4	80.5	65.9	166.7	13.9	14.8
20	MTCS18211	MTS1597//MTCS1301/MTS1412	65.3	56.9	99.9	73.7	164.0	14.6	14.7
25 i	MT1855	05X438-aC71(MT0097*2//Jagalene/Choteau	61.8	55.9	88.6	70.8	164.7	14.3	17.0
16 i	MTS18149	Loma*2/AAC Gateway	61.7	55.1	82.4	61.5	166.0	12.9	16.7
11	MTS1830	MTS0907/MTS0827	61.1	56.5	84.9	68.3	165.0	14.4	14.9
15	MTS18143	Loma*2/Warhorse	60.0	54.6	86.1	67.2	162.7	13.4	16.2
12 i	MTS1831	MTS0907/MTS0827	59.9	56.2	89.4	69.2	164.7	13.4	14.7
1	Yellowstone	check	59.5	55.2	98.7	79.2	162.7	15.3	17.3
23 i	MT1848	Northern//MT08184/MT0887	59.3	54.8	87.1	70.3	163.0	14.8	16.9
24	MT1854	08X350-A2/MT0890	58.0	55.2	95.2	73.0	162.7	13.4	16.2
10 i	MTS1810	08X350-A6/Warhorse	58.0	56.7	89.2	74.8	167.3	15.3	17.2
14	MTS18117	Loma*2/Warhorse	56.8	55.9	83.0	67.5	163.0	12.6	17.3
18	MTS18169	Loma*2/AAC Gateway	55.9	55.9	73.6	67.0	164.0	13.5	17.5
17	MTS18167	Loma*2/AAC Gateway	54.6	55.9	81.6	70.6	165.0	13.1	17.3
19	MTCS18195	MTCS1204*4/MT1138	53.8	55.6	83.2	68.2	164.7	13.2	16.9
31	MT1895	MT08185//YLL*2/PI640431/3/PROM/3*YLL//	52.8	54.2	86.0	71.0	161.0	13.7	17.7
22 i	MT1845	Yellowstone/493-22(Reeder/6*Paul)	52.5	55.4	87.9	71.8	161.3	14.0	17.9
2	Judee	check	51.2	56.1	58.6	54.9	164.0	15.3	18.2
5	SY Monumer	check	51.2	55.3	79.7	69.1	161.0	13.3	16.9
7	MTS1802	Warhorse*2/Accipiter	50.8	56.5	91.0	73.4	166.0	14.0	18.6
34	WS520	Manitoba/Northern Seeds	50.2	56.1	85.4	65.9	163.0	12.6	16.9
33 w	MT18109	MTS0531*3//PI640431/MTS04114	50.1	54.5	92.9	74.4	162.3	13.3	19.0
27 i	MT1867	MT0859//00X83cE45/MT0698	50.0	55.6	89.6	71.0	161.3	13.8	16.1
26 i	MT1866	MT0859//00X83cE45/MT0698	49.7	54.9	93.9	79.0	162.0	12.1	17.6
28 i	MT1872	MT0859//MT0840/MT0873	49.6	56.0	84.5	61.3	162.3	14.1	16.5
3	Decade	check	49.4	55.8	93.5	66.8	161.0	12.6	18.5
4	Warhorse	check	47.4	56.0	96.8	73.4	164.0	13.1	17.9
8	MTS1804	Warhorse*2/Accipiter	46.7	55.3	56.4	61.8	164.7	13.6	18.6
32	MT1897	MT08185//YLL*2/PI640431/3/PROM/3*YLL//	45.8	54.5	94.0	71.9	161.3	13.3	18.1
6	MTS1801	Judee//MTS0907/MTS0827	45.7	56.1	94.7	72.0	163.0	12.9	17.9
35	WS522	Manitoba/Northern Seeds	45.2	55.7	96.4	73.3	161.3	12.0	18.0
9	MTS1809	08X350-A6/Warhorse	44.4	56.2	92.0	75.6	162.7	14.0	18.5
30	MT1889	Decade*2/MT0849	42.8	54.8	85.5	74.4	160.0	12.8	19.3
29	MT1882	Decade//YLL (L)/TX05V071040	41.9	55.2	72.1	63.3	161.3	12.8	19.3
21	MTCS18222	Judee//Warhorse/MTCS1204	40.6	56.8	96.5	80.8	161.7	13.1	18.8
Average			53.4	55.6	84.6	70.3	163.2	13.6	17.2
LSD (0.05)			9.5	0.5	ns	ns	2.5	2.1	1.5
C.V. (%)			10.0	0.6	15.8	12.7	0.7	9.1	4.8
P-value (Varieties)			<.0001	<.0001	0.0947	0.4232	<.0001	0.0309	<.0001

i = in 2020 Intrastate Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 83. 2019 Advanced Yield Nursery (Exp. 1407): Moccasin

Entry	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Protein %
w = white			LAT	LAT	RCB	LAT	LAT
		lattice efficiency relative to RCB	160%	153%	100%	139%	182%
6	MTS1801	Judee//MTS0907/MTS0827	61.7	60.9	181.3	31.4	11.9
23 i	MT1848	Northern//MT08184/MT0887	61.4	59.9	182.7	29.5	12.2
21	MTCS18222	Judee//Warhorse/MTCS1204	61.2	63.1	181.0	29.4	12.0
8	MTS1804	Warhorse*2/Accipiter	61.0	60.4	181.7	30.1	12.3
34	WS520	Manitoba/Northern Seeds	59.2	61.7	180.0	31.3	10.9
26 i	MT1866	MT0859//00X83cE45/MT0698	58.4	59.9	183.3	28.5	11.5
14	MTS18117	Loma*2/Warhorse	58.0	61.5	181.3	28.7	11.5
3	Decade	check	57.9	60.8	180.7	31.5	12.1
19	MTCS18195	MTCS1204*4/MT1138	57.0	61.5	182.7	30.9	11.5
28 i	MT1872	MT0859//MT0840/MT0873	56.9	61.0	180.3	30.2	11.6
5	SY Monumer	check	56.3	59.8	180.3	27.6	10.7
16 i	MTS18149	Loma*2/AAC Gateway	56.2	60.3	184.0	26.7	11.5
36	WS563	Manitoba/Northern Seeds	56.0	59.9	181.3	32.8	11.2
27 i	MT1867	MT0859//00X83cE45/MT0698	55.9	59.9	181.0	29.4	11.6
15	MTS18143	Loma*2/Warhorse	55.9	58.8	184.3	28.1	11.8
13 i	MTS18116	Loma*2/Warhorse	55.8	61.0	184.0	27.9	11.3
24	MT1854	08X350-A2/MT0890	55.6	59.0	182.7	28.2	11.1
29	MT1882	Decade//YLL (L)/TX05V071040	55.5	60.2	180.3	25.5	11.9
22 i	MT1845	Yellowstone/493-22(Reeder/6*Paul)	55.3	60.7	181.3	29.2	11.1
33 w	MT18109	MTS0531*3//PI640431/MTS04114	55.2	60.8	182.7	30.3	12.1
30	MT1889	Decade*2/MT0849	55.0	60.5	180.0	28.1	12.5
12 i	MTS1831	MTS0907/MTS0827	54.8	61.4	184.7	28.0	11.1
20	MTCS18211	MTS1597//MTCS1301/MTS1412	54.7	61.2	185.7	29.0	12.1
17	MTS18167	Loma*2/AAC Gateway	54.4	58.9	184.0	27.4	12.0
18	MTS18169	Loma*2/AAC Gateway	54.3	60.2	182.7	27.8	11.5
9	MTS1809	08X350-A6/Warhorse	53.8	62.3	182.0	29.6	12.7
11	MTS1830	MTS0907/MTS0827	53.2	59.9	184.3	28.7	11.7
35	WS522	Manitoba/Northern Seeds	52.9	59.7	181.7	26.7	11.9
4	Warhorse	check	52.9	59.8	182.0	30.0	12.1
1	Yellowstone	check	52.3	59.1	184.0	31.9	11.3
10 i	MTS1810	08X350-A6/Warhorse	51.8	61.6	183.3	30.7	12.3
32	MT1897	MT08185//YLL*2//PI640431/3/PROM/3*YLL//	51.5	59.7	181.7	26.4	11.7
2	Judee	check	51.1	60.6	181.7	30.5	12.3
31	MT1895	MT08185//YLL*2//PI640431/3/PROM/3*YLL//	50.8	60.4	182.7	26.1	11.6
25 i	MT1855	05X438-aC71(MT0097*2//Jagalene/Choteau)	50.0	59.8	184.3	29.2	12.0
7	MTS1802	Warhorse*2/Accipiter	49.7	60.2	182.7	30.2	12.0
Average			55.4	60.4	182.3	29.1	11.7
LSD (0.05)			ns	1.1	1.7	1.8	0.7
C.V. (%)			8.1	1.0	0.6	3.4	3.6
P-value (Varieties)			0.1670	<.0001	<.0001	<.0001	<.0001

i = in 2020 Intrastate Test (all other MT lines dropped from testing)

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 84. 2019 Advanced Yield Nursery (Exp. 1408): Huntley

Entry	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Lodging score (0-9)	Grain moisture %	Protein %
w = white			RCB	RCB	RCB	RCB	RCB	LAT	LAT
		lattice efficiency relative to RCB	91%	100%	101%	94%	94%	115%	106%
28 i	MT1872	MT0859//MT0840/MT0873	119.3	63.3	169.7	37.8	0.4	8.6	11.7
26 i	MT1866	MT0859//00X83cE45/MT0698	114.3	60.8	170.0	37.1	0.0	8.0	11.7
3	Decade	check	114.0	62.0	167.7	41.6	0.3	8.5	11.4
5	SY Monumer	check	111.7	59.8	165.0	36.5	0.0	8.0	11.5
36	WS563	Manitoba/Northern Seeds	110.3	62.6	170.3	43.7	0.0	8.5	11.5
30	MT1889	Decade*2/MT0849	110.0	61.2	166.0	37.7	0.0	8.4	11.3
1	Yellowstone	check	109.3	60.7	168.7	41.8	0.0	8.3	12.0
27 i	MT1867	MT0859//00X83cE45/MT0698	108.8	60.4	168.0	38.8	0.8	8.2	11.9
8	MTS1804	Warhorse*2/Accipiter	106.6	61.6	169.0	37.9	1.0	8.2	12.9
29	MT1882	Decade//YLL (L)/TX05V071040	106.4	61.1	166.3	36.7	0.0	8.4	12.2
34	WS520	Manitoba/Northern Seeds	106.1	61.2	169.7	40.0	0.6	8.4	12.1
20	MTCS18211	MTS1597//MTCS1301/MTS1412	105.7	64.3	168.7	39.2	0.6	8.7	12.4
35	WS522	Manitoba/Northern Seeds	104.7	61.0	166.0	36.0	0.4	8.4	11.6
4	Warhorse	check	104.2	62.1	168.0	38.8	0.0	8.1	12.5
9	MTS1809	08X350-A6/Warhorse	103.9	63.4	168.7	38.3	0.0	8.6	12.2
22 i	MT1845	Yellowstone/493-22(Reeder/6*Paul)	103.4	60.7	166.0	39.0	0.0	8.1	12.7
13 i	MTS18116	Loma*2/Warhorse	101.5	62.3	174.0	38.1	0.0	8.4	11.1
21	MTCS18222	Judee//Warhorse/MTCS1204	99.7	62.4	166.3	39.4	0.0	8.6	11.9
33 w	MT18109	MTS0531*3//PI640431/MTS04114	99.2	60.9	169.0	38.0	1.6	8.3	12.6
23 i	MT1848	Northern//MT08184/MT0887	98.7	59.8	172.3	37.4	1.1	7.7	12.7
25 i	MT1855	05X438-aC71(MT0097*2//Jagalene/Chotez	98.7	61.3	173.7	38.2	3.7	8.1	12.7
6	MTS1801	Judee//MTS0907/MTS0827	98.5	60.4	169.7	39.2	0.3	7.9	12.4
19	MTCS18195	MTCS1204*4/MT1138	98.0	60.3	170.0	38.7	0.3	8.1	12.2
7	MTS1802	Warhorse*2/Accipiter	97.1	62.1	173.7	39.8	0.3	8.4	12.8
10 i	MTS1810	08X350-A6/Warhorse	97.0	63.2	172.3	40.1	0.3	8.4	12.3
11	MTS1830	MTS0907/MTS0827	97.0	62.2	173.7	37.2	0.0	8.4	11.5
12 i	MTS1831	MTS0907/MTS0827	96.2	61.9	174.7	35.7	0.0	8.4	11.3
17	MTS18167	Loma*2/AAC Gateway	95.8	59.6	173.0	38.6	0.0	8.2	12.8
31	MT1895	MT08185//YLL*2/PI640431/3/PROM/3*YLL	95.0	57.7	167.7	34.1	0.0	7.7	13.0
32	MT1897	MT08185//YLL*2/PI640431/3/PROM/3*YLL	94.8	57.5	168.3	35.3	0.0	7.7	12.9
2	Judee	check	93.2	61.0	170.3	37.4	1.3	8.3	12.7
14	MTS18117	Loma*2/Warhorse	93.2	61.9	173.3	37.5	1.3	8.3	12.4
16 i	MTS18149	Loma*2/AAC Gateway	92.3	60.7	173.0	37.3	1.3	8.5	12.7
24	MT1854	08X350-A2/MT0890	88.4	58.5	173.3	37.8	0.3	8.0	12.3
18	MTS18169	Loma*2/AAC Gateway	86.3	59.7	175.0	38.1	4.0	8.2	13.2
15	MTS18143	Loma*2/Warhorse	85.1	57.9	170.3	39.5	3.6	7.4	12.8
Average			101.3	61.0	170.0	38.3	0.6	8.2	12.2
LSD (0.05)			8.1	0.9	2.8	2.9	0.8	0.2	0.6
C.V. (%)			4.9	0.9	1.0	4.7	105.6	1.5	3.1
P-value (Varieties)									

i = in 2020 Intrastate Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 85. 2019 Advanced Yield Nursery (Exp. 1418): Conrad

Entry	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Lodging/Sawfly cutting %		Protein %
			LAT	LAT	LAT	LAT	30-Jul RCB	harvest LAT	LAT
w = white									
		lattice efficiency relative to RCB	191%	205%	135%	107%		124%	195%
5	SY Monument	check	83.2	59.3	164.4	29.2	20	50	12.1
28 i	MT1872	MT0859//MT0840/MT0873	82.0	61.0	165.4	29.6	4	5	13.2
22 i	MT1845	Yellowstone/493-22(Reeder/6*Paul)	81.9	59.2	164.9	29.7	18	45	13.3
20	MTCS18211	MTS1597//MTCS1301/MTS1412	77.3	62.1	168.7	30.6	12	18	13.6
18	MTS18169	Loma*2/AAC Gateway	70.0	59.1	168.5	27.9	11	42	14.1
1	Yellowstone	check	70.0	58.6	167.6	31.1	17	40	13.4
11	MTS1830	MTS0907/MTS0827	69.3	60.2	170.8	29.5	7	6	12.7
14	MTS18117	Loma*2/Warhorse	69.2	59.6	168.1	29.8	10	21	13.9
33	w MT18109	MTS0531*3//PI640431/MTS04114	69.0	60.6	167.5	29.5	8	39	13.7
16 i	MTS18149	Loma*2/AAC Gateway	68.9	60.1	170.3	27.7	6	8	13.2
36	WS563	Manitoba/Northern Seeds	68.4	59.5	167.5	29.7	20	41	12.9
2	Judee	check	68.3	60.0	165.4	32.0	13	24	13.9
23 i	MT1848	Northern//MT08184/MT0887	68.1	58.9	167.3	30.8	17	40	14.2
10 i	MTS1810	08X350-A6/Warhorse	67.8	62.1	170.1	30.2	1	0	13.9
31	MT1895	MT08185//YLL*2/PI640431/3/PROM/3*YLL	66.0	58.5	165.4	27.0	10	39	12.7
34	WS520	Manitoba/Northern Seeds	65.7	59.3	167.6	30.7	8	43	13.3
30	MT1889	Decade*2/MT0849	65.6	58.6	162.5	28.0	15	50	12.8
17	MTS18167	Loma*2/AAC Gateway	65.3	57.7	170.8	28.6	12	23	14.1
3	Decade	check	64.8	59.3	165.3	30.0	15	37	13.1
35	WS522	Manitoba/Northern Seeds	64.8	57.5	164.4	27.5	15	45	13.4
24	MT1854	08X350-A2/MT0890	63.4	59.1	168.3	28.4	15	54	13.6
13 i	MTS18116	Loma*2/Warhorse	62.9	59.1	170.3	28.6	3	4	13.3
25 i	MT1855	05X438-aC71(MT0097*2//Jagalene/Chotea	62.1	59.5	168.6	30.2	6	27	14.1
27 i	MT1867	MT0859//00X83cE45/MT0698	61.7	57.1	165.9	30.1	12	48	13.3
7	MTS1802	Warhorse*2/Accipiter	61.6	57.5	169.9	31.2	9	16	13.8
12 i	MTS1831	MTS0907/MTS0827	60.9	59.2	170.9	27.7	2	14	12.8
29	MT1882	Decade//YLL (L)/TX05V071040	60.9	58.1	163.6	27.0	23	59	13.7
32	MT1897	MT08185//YLL*2/PI640431/3/PROM/3*YLL	60.7	57.2	165.1	26.9	4	40	12.8
19	MTCS18195	MTCS1204*4/MT1138	59.5	59.7	166.7	28.0	27	77	12.3
4	Warhorse	check	58.3	57.6	166.7	29.6	5	11	13.8
6	MTS1801	Judee//MTS0907/MTS0827	56.9	58.4	166.8	30.0	6	27	14.2
26 i	MT1866	MT0859//00X83cE45/MT0698	55.4	57.0	164.1	27.8	11	34	13.5
15	MTS18143	Loma*2/Warhorse	54.8	54.8	168.3	27.1	28	42	14.3
9	MTS1809	08X350-A6/Warhorse	54.7	60.4	167.2	28.6	6	8	13.7
8	MTS1804	Warhorse*2/Accipiter	52.9	56.0	167.5	28.3	2	3	14.6
21	MTCS18222	Judee//Warhorse/MTCS1204	51.7	59.7	165.2	28.3	6	28	13.3
Average			65.1	58.9	167.1	29.1	11.2	30.8	13.5
LSD (0.05)			10.6	1.3	1.2	2.2	12.8	25.7	0.6
C.V. (%)			9.1	1.2	0.4	4.3	70.3	47.8	2.5
P-value (Varieties)			<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001

i = in 2019 Intrastate Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 86. 2019 Advanced Yield Nursery (Exp. 14FB): Fort Benton (Northern Seeds)

Entry	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Sawfly cutting/ Lodging %		Protein %
					29-Jul	4-Aug	
			RCB	RCB	RCB	RCB	RCB
w = white							
12 i	MTS1831	MTS0907/MTS0827	58.0	60.1	3	8	12.4
36	WS563	Manitoba/Northern Seeds	57.7	58.7	17	43	13.0
5	SY Monumer	check	54.8	59.1	65	60	12.0
33 w	MT18109	MTS0531*3//PI640431/MTS04114	54.6	59.6	6	50	12.9
9	MTS1809	08X350-A6/Warhorse	53.8	60.2	4	43	13.5
7	MTS1802	Warhorse*2/Accipiter	53.5	59.9	2	15	13.9
8	MTS1804	Warhorse*2/Accipiter	52.8	59.9	4	22	13.6
17	MTS18167	Loma*2/AAC Gateway	51.8	59.2	4	27	13.4
30	MT1889	Decade*2/MT0849	51.7	60.2	53	58	13.2
35	WS522	Manitoba/Northern Seeds	51.3	58.3	57	73	13.1
21	MTCS18222	Judee//Warhorse/MTCS1204	51.1	60.1	22	60	12.7
6	MTS1801	Judee//MTS0907/MTS0827	50.9	58.9	8	35	13.4
4	Warhorse	check	50.8	59.4	1	22	13.3
16 i	MTS18149	Loma*2/AAC Gateway	50.8	59.1	4	28	13.3
13 i	MTS18116	Loma*2/Warhorse	50.6	59.7	4	17	12.6
3	Decade	check	49.9	59.7	52	60	13.0
14	MTS18117	Loma*2/Warhorse	49.3	60.1	7	42	13.3
28 i	MT1872	MT0859//MT0840/MT0873	48.5	59.4	22	33	12.8
31	MT1895	MT08185//YLL*2//PI640431/3/PROM/3*YLL//	48.4	58.1	33	60	12.9
11	MTS1830	MTS0907/MTS0827	48.3	59.3	4	18	12.9
29	MT1882	Decade//YLL (L)/TX05V071040	47.3	57.7	55	77	13.2
24	MT1854	08X350-A2/MT0890	47.3	58.9	73	73	13.2
18	MTS18169	Loma*2/AAC Gateway	47.0	58.6	12	47	13.4
10 i	MTS1810	08X350-A6/Warhorse	46.8	59.8	2	1	13.5
20	MTCS18211	MTS1597//MTCS1301/MTS1412	46.5	60.6	10	43	13.1
2	Judee	check	46.5	58.9	25	57	13.9
1	Yellowstone	check	46.2	58.0	78	77	12.9
25 i	MT1855	05X438-aC71(MT0097*2//Jagalene/Choteau)	46.1	60.1	10	32	13.7
32	MT1897	MT08185//YLL*2//PI640431/3/PROM/3*YLL//	46.0	57.9	33	60	12.9
15	MTS18143	Loma*2/Warhorse	45.8	56.1	35	53	13.4
26 i	MT1866	MT0859//00X83cE45/MT0698	45.6	57.8	28	60	12.9
34	WS520	Manitoba/Northern Seeds	45.5	58.9	53	67	13.2
27 i	MT1867	MT0859//00X83cE45/MT0698	45.5	58.8	42	63	12.3
22 i	MT1845	Yellowstone/493-22(Reeder/6*Paul)	45.4	59.2	52	67	13.1
19	MTCS18195	MTCS1204*4/MT1138	45.0	58.7	15	55	12.3
23 i	MT1848	Northern//MT08184/MT0887	44.5	57.6	58	67	13.9
Average			49.3	59.1	26.5	46.5	13.1
LSD (0.05)			ns	1.4	19.0	14.6	0.4
C.V. (%)			10.9	1.5	44.1	19.3	2.0
P-value (Varieties)			0.1223	<.0001	<.0001	<.0001	<.0001

i = in 2020 Intrastate Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 87. 2019 Advanced Yield Nursery (Exp. 14WW): Limagrain - Walla Walla, WA

Entry	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date 1-Jan	Plant height in	Stripe rust (0-9, 0 = best)	Lodging score (0-9, 0 = best)
	w = white		RCB	RCB	RCB	RCB		
	LCS Jet	Limagrain check	150.6	61.8	144.0	35.5	0.0	3.0
	LCS Zoom	Limagrain check	141.4	60.7	142.5	35.0	0.0	0.0
	Norwest 553	Limagrain check	140.4	63.0	147.0	32.5	0.0	0.0
31	MT1895	MT08185/YLL*2/PI640431/3/PROM/3*YLL	134.2	63.5	143.5	32.0	0.0	0.0
32	MT1897	MT08185/YLL*2/PI640431/3/PROM/3*YLL	134.1	64.2	143.5	32.0	0.0	0.5
19	MTCS18195	MTCS1204*4/MT1138	132.9	63.0	148.0	36.5	0.0	3.5
	Keldin	Limagrain check	130.4	64.0	146.5	37.0	0.0	5.5
34	WS520	Manitoba/Northern Seeds	130.1	65.0	147.0	38.5	0.0	0.0
5	SY Monument	check	129.6	63.6	141.5	35.0	0.0	4.0
28 i	MT1872	MT0859//MT0840/MT0873	129.5	65.0	146.0	36.0	0.0	1.5
27 i	MT1867	MT0859//00X83cE45/MT0698	128.9	64.4	146.0	34.5	0.0	0.0
17	MTS18167	Loma*2/AAC Gateway	128.3	63.7	150.5	35.5	0.0	0.0
13 i	MTS18116	Loma*2/Warhorse	128.3	63.6	149.5	33.0	0.0	0.0
12 i	MTS1831	MTS0907/MTS0827	127.6	64.7	149.0	33.0	0.0	0.0
24	MT1854	08X350-A2/MT0890	126.8	64.0	148.5	36.0	0.5	0.0
25 i	MT1855	05X438-aC71(MT0097*2//Jagalene/Chotea	126.4	64.4	148.5	34.0	0.0	0.0
33 w	MT18109	MTS0531*3//PI640431/MTS04114	126.2	64.3	147.5	36.0	0.0	0.0
22 i	MT1845	Yellowstone/493-22(Reeder/6*Paul)	125.9	63.5	142.5	36.0	0.0	0.0
16 i	MTS18149	Loma*2/AAC Gateway	124.4	64.0	149.5	34.5	0.0	0.0
36	WS563	Manitoba/Northern Seeds	123.0	64.2	149.0	38.5	0.0	5.0
11	MTS1830	MTS0907/MTS0827	122.4	65.4	149.5	35.0	0.0	0.0
35	WS522	Manitoba/Northern Seeds	122.4	63.8	144.0	34.5	0.5	7.0
7	MTS1802	Warhorse*2/Accipiter	122.1	63.2	149.5	35.5	0.0	0.0
6	MTS1801	Judee//MTS0907/MTS0827	121.6	63.4	147.0	37.0	0.0	0.0
30	MT1889	Decade*2/MT0849	120.9	64.2	142.5	35.0	0.0	0.0
3	Decade	check	120.6	63.0	146.5	39.0	0.0	8.5
18	MTS18169	Loma*2/AAC Gateway	120.2	63.6	149.5	34.5	1.0	0.0
26 i	MT1866	MT0859//00X83cE45/MT0698	119.5	62.8	146.5	35.0	0.0	1.5
8	MTS1804	Warhorse*2/Accipiter	119.2	62.4	148.5	35.5	0.0	0.0
23 i	MT1848	Northern//MT08184/MT0887	118.1	63.8	148.0	36.0	0.0	0.0
29	MT1882	Decade//YLL (L)/TX05V071040	118.0	64.5	144.0	33.0	0.0	0.0
15	MTS18143	Loma*2/Warhorse	117.5	61.7	147.0	32.5	3.0	0.0
21	MTCS18222	Judee//Warhorse/MTCS1204	116.9	64.3	147.0	36.0	0.0	0.0
2	Judee	check	116.8	64.7	146.5	36.0	0.0	1.5
9	MTS1809	08X350-A6/Warhorse	114.1	64.3	147.0	36.5	0.0	0.0
20	MTCS18211	MTS1597//MTCS1301/MTS1412	113.7	64.9	148.0	36.0	0.0	0.0
10 i	MTS1810	08X350-A6/Warhorse	113.7	64.7	150.5	35.5	0.0	0.0
4	Warhorse	check	113.2	63.5	148.5	36.5	0.0	2.5
1	Yellowstone	check	112.8	62.9	147.0	38.0	0.0	0.0
14	MTS18117	Loma*2/Warhorse	111.1	64.0	148.0	34.0	0.5	2.0
LSD (0.05)			124.3	63.7	146.9	35.3	0.1	1.2
C.V. (%)			11.8	1.2	1.9	2.2	0.6	3.1
P-value (Varieties)			7.0	0.7	0.6	1.2	215.1	131.9

i = in 2020 Intrastate Test (all other MT lines dropped from testing)

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 88. 2019 Advanced Yield Nursery (Exp. 14): All Location Yield (bu/a)

Entry #	ID w = white	Pedigree	Bozeman RCB	Havre LAT	Williston LAT	Moccasin LAT	Huntley RCB	Conrad LAT	Ft Benton RCB	7 LOC Avg
		lattice efficiency	96%	110%	185%	160%	91%	191%		
36	WS563	Manitoba/Northern Seeds	127.2	63.2	70.8	56.0	110.3	68.4	57.7	79.1
28 i	MT1872	MT0859//MT0840/MT0873	128.7	60.5	49.6	56.9	119.3	82.0	48.5	77.9
5	SY Monument	check	116.6	61.3	51.2	56.3	111.7	83.2	54.8	76.4
23 i	MT1848	Northern//MT08184/MT0887	135.7	61.5	59.3	61.4	98.7	68.1	44.5	75.6
20	MTCS18211	MTS1597//MTCS1301/MTS1412	126.5	50.7	65.3	54.7	105.7	77.3	46.5	75.2
22 i	MT1845	Yellowstone/493-22(Reeder/6*Paul)	127.8	57.9	52.5	55.3	103.4	81.9	45.4	74.9
27 i	MT1867	MT0859//00X83cE45/MT0698	145.0	57.7	50.0	55.9	108.8	61.7	45.5	74.9
1	Yellowstone	check	126.8	59.3	59.5	52.3	109.3	70.0	46.2	74.8
13 i	MTS18116	Loma*2/Warhorse	120.3	65.1	66.7	55.8	101.5	62.9	50.6	74.7
16 i	MTS18149	Loma*2/AAC Gateway	131.4	61.4	61.7	56.2	92.3	68.9	50.8	74.7
25 i	MT1855	05X438-aC71(MT0097*2//Jagalene/Chote	136.8	65.3	61.8	50.0	98.7	62.1	46.1	74.4
34	WS520	Manitoba/Northern Seeds	128.1	63.3	50.2	59.2	106.1	65.7	45.5	74.0
3	Decade	check	125.2	55.5	49.4	57.9	114.0	64.8	49.9	73.8
12 i	MTS1831	MTS0907/MTS0827	125.8	56.6	59.9	54.8	96.2	60.9	58.0	73.2
26 i	MT1866	MT0859//00X83cE45/MT0698	136.2	53.0	49.7	58.4	114.3	55.4	45.6	73.2
30	MT1889	Decade*2/MT0849	131.1	53.0	42.8	55.0	110.0	65.6	51.7	72.7
10 i	MTS1810	08X350-A6/Warhorse	127.2	59.6	58.0	51.8	97.0	67.8	46.8	72.6
11	MTS1830	MTS0907/MTS0827	120.3	58.0	61.1	53.2	97.0	69.3	48.3	72.5
33 w	MT18109	MTS0531*3//PI640431/MTS04114	116.9	59.1	50.1	55.2	99.2	69.0	54.6	72.0
24	MT1854	08X350-A2/MT0890	129.2	60.3	58.0	55.6	88.4	63.4	47.3	71.7
6	MTS1801	Judee//MTS0907/MTS0827	124.8	62.1	45.7	61.7	98.5	56.9	50.9	71.5
29	MT1882	Decade//YLL (L)/TX05V071040	121.4	65.9	41.9	55.5	106.4	60.9	47.3	71.3
17	MTS18167	Loma*2/AAC Gateway	114.3	60.6	54.6	54.4	95.8	65.3	51.8	71.0
7	MTS1802	Warhorse*2/Accipiter	125.6	56.2	50.8	49.7	97.1	61.6	53.5	70.6
14	MTS18117	Loma*2/Warhorse	114.6	51.9	56.8	58.0	93.2	69.2	49.3	70.4
8	MTS1804	Warhorse*2/Accipiter	119.9	52.1	46.7	61.0	106.6	52.9	52.8	70.3
35	WS522	Manitoba/Northern Seeds	112.8	56.0	45.2	52.9	104.7	64.8	51.3	69.7
21	MTCS18222	Judee//Warhorse/MTCS1204	119.3	63.7	40.6	61.2	99.7	51.7	51.1	69.6
19	MTCS18195	MTCS1204*4/MT1138	108.6	64.6	53.8	57.0	98.0	59.5	45.0	69.5
2	Judee	check	121.3	54.4	51.2	51.1	93.2	68.3	46.5	69.4
18	MTS18169	Loma*2/AAC Gateway	116.9	55.3	55.9	54.3	86.3	70.0	47.0	69.4
9	MTS1809	08X350-A6/Warhorse	119.6	54.0	44.4	53.8	103.9	54.7	53.8	69.2
15	MTS18143	Loma*2/Warhorse	120.2	60.1	60.0	55.9	85.1	54.8	45.8	68.8
31	MT1895	MT08185//YLL*2//PI640431/3/PROM/3*YLI	114.8	53.4	52.8	50.8	95.0	66.0	48.4	68.7
4	Warhorse	check	117.6	47.2	47.4	52.9	104.2	58.3	50.8	68.3
32	MT1897	MT08185//YLL*2//PI640431/3/PROM/3*YLI	117.0	56.7	45.8	51.5	94.8	60.7	46.0	67.5
Average			123.7	58.2	53.4	55.4	101.3	65.1	49.3	72.3
LSD (0.05)			10.7	6.7	9.5	ns	8.1	10.6	ns	6.4
C.V. (%)			5.3	6.7	10.0	8.1	4.9	9.1	10.9	8.5
P-value (Varieties)			<.0001	<.0001	<.0001	0.1670		<.0001	0.1223	0.0431

i = in 2020 Intrastate Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 89. 2019 Advanced Yield Nursery (Exp. 14): All Location Test weight (lb/bu)

Entry #	ID w = white	Pedigree	Bozeman LAT	Havre LAT	Williston RCB	Moccasin LAT	Huntley RCB	Conrad LAT	Ft Benton RCB	7 LOC Avg
		lattice efficiency	366%	153%	103%	153%	100%	205%		
20	MTCS18211	MTS1597//MTCS1301/MTS1412	63.9	60.9	56.9	61.2	64.3	62.1	60.6	61.4
21	MTCS18222	Judee//Warhorse/MTCS1204	64.2	62.6	56.8	63.1	62.4	59.7	60.1	61.3
10 i	MTS1810	08X350-A6/Warhorse	64.3	60.1	56.7	61.6	63.2	62.1	59.8	61.1
9	MTS1809	08X350-A6/Warhorse	64.0	60.3	56.2	62.3	63.4	60.4	60.2	61.0
28 i	MT1872	MT0859//MT0840/MT0873	63.1	60.9	56.0	61.0	63.3	61.0	59.4	60.7
12 i	MTS1831	MTS0907/MTS0827	63.2	60.5	56.2	61.4	61.9	59.2	60.1	60.4
13 i	MTS18116	Loma*2/Warhorse	62.8	61.1	56.4	61.0	62.3	59.1	59.7	60.3
11	MTS1830	MTS0907/MTS0827	63.4	60.0	56.5	59.9	62.2	60.2	59.3	60.2
14	MTS18117	Loma*2/Warhorse	62.6	59.9	55.9	61.5	61.9	59.6	60.1	60.2
2	Judee	check	62.9	61.4	56.1	60.6	61.0	60.0	58.9	60.1
25 i	MT1855	05X438-aC71(MT0097*2//Jagalene/Chote	62.9	60.9	55.9	59.8	61.3	59.5	60.1	60.1
34	WS520	Manitoba/Northern Seeds	62.7	60.6	56.1	61.7	61.2	59.3	58.9	60.1
3	Decade	check	62.3	59.9	55.8	60.8	62.0	59.3	59.7	60.0
7	MTS1802	Warhorse*2/Accipiter	62.9	60.4	56.5	60.2	62.1	57.5	59.9	59.9
19	MTCS18195	MTCS1204*4/MT1138	63.1	60.4	55.6	61.5	60.3	59.7	58.7	59.9
33 w	MT18109	MTS0531*3//PI640431/MTS04114	62.4	59.6	54.5	60.8	60.9	60.6	59.6	59.8
22 i	MT1845	Yellowstone/493-22(Reeder/6*Paul)	62.3	60.5	55.4	60.7	60.7	59.2	59.2	59.7
36	WS563	Manitoba/Northern Seeds	62.5	59.5	55.0	59.9	62.6	59.5	58.7	59.7
4	Warhorse	check	62.2	60.4	56.0	59.8	62.1	57.6	59.4	59.6
6	MTS1801	Judee//MTS0907/MTS0827	62.5	60.1	56.1	60.9	60.4	58.4	58.9	59.6
16 i	MTS18149	Loma*2/AAC Gateway	62.0	59.8	55.1	60.3	60.7	60.1	59.1	59.6
30	MT1889	Decade*2/MT0849	62.2	60.0	54.8	60.5	61.2	58.6	60.2	59.6
8	MTS1804	Warhorse*2/Accipiter	61.8	60.1	55.3	60.4	61.6	56.0	59.9	59.3
18	MTS18169	Loma*2/AAC Gateway	61.7	59.8	55.9	60.2	59.7	59.1	58.6	59.3
27 i	MT1867	MT0859//00X83cE45/MT0698	62.8	60.5	55.6	59.9	60.4	57.1	58.8	59.3
5	SY Monument	check	61.5	59.9	55.3	59.8	59.8	59.3	59.1	59.2
29	MT1882	Decade//YLL (L)/TX05V071040	61.8	60.3	55.2	60.2	61.1	58.1	57.7	59.2
1	Yellowstone	check	62.7	59.6	55.2	59.1	60.7	58.6	58.0	59.1
35	WS522	Manitoba/Northern Seeds	61.6	59.1	55.7	59.7	61.0	57.5	58.3	59.0
26 i	MT1866	MT0859//00X83cE45/MT0698	62.4	59.8	54.9	59.9	60.8	57.0	57.8	58.9
17	MTS18167	Loma*2/AAC Gateway	61.1	59.2	55.9	58.9	59.6	57.7	59.2	58.8
23 i	MT1848	Northern//MT08184/MT0887	61.2	59.7	54.8	59.9	59.8	58.9	57.6	58.8
24	MT1854	08X350-A2/MT0890	61.2	59.5	55.2	59.0	58.5	59.1	58.9	58.8
31	MT1895	MT08185//YLL*2//PI640431/3/PROM/3*YLI	60.7	59.8	54.2	60.4	57.7	58.5	58.1	58.5
32	MT1897	MT08185//YLL*2//PI640431/3/PROM/3*YLI	60.2	60.0	54.5	59.7	57.5	57.2	57.9	58.1
15	MTS18143	Loma*2/Warhorse	59.8	58.6	54.6	58.8	57.9	54.8	56.1	57.2
Average			62.4	60.2	55.6	60.4	61.0	58.9	59.1	59.7
LSD (0.05)			0.6	0.6	0.5	1.1	0.9	1.3	1.4	0.8
C.V. (%)			0.5	0.5	0.6	1.0	0.9	1.2	1.5	1.2
P-value (Varieties)			<.0001	<.0001	<.0001	<.0001		<.0001	<.0001	<.0001

i = in 2020 Intrastate Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 90. 2019 Advanced Yield Nursery (Exp. 14): All Location Heading date (days from Jan 1)

Entry #	ID w = white	Pedigree	Bozeman RCB	Havre LAT	Williston RCB	Moccasin RCB	Huntley RCB	Conrad LAT	Ft Benton	6 Loc Avg
		lattice efficiency	103%	126%	96%	100%	101%	135%		
30	MT1889	Decade*2/MT0849	170.3	165.6	160.0	180.0	166.0	162.5		167.4
29	MT1882	Decade//YLL (L)/TX05V071040	170.7	166.6	161.3	180.3	166.3	163.6		168.1
5	SY Monument	check	173.0	166.5	161.0	180.3	165.0	164.4		168.4
35	WS522	Manitoba/Northern Seeds	174.0	167.5	161.3	181.7	166.0	164.4		169.2
22 i	MT1845	Yellowstone/493-22(Reeder/6*Paul)	175.3	167.3	161.3	181.3	166.0	164.9		169.4
3	Decade	check	174.0	168.5	161.0	180.7	167.7	165.3		169.5
21	MTCS18222	Judee//Warhorse/MTCS1204	175.3	169.3	161.7	181.0	166.3	165.2		169.8
32	MT1897	MT08185//YLL*2/PI640431/3/PROM/3*YLL	175.7	167.0	161.3	181.7	168.3	165.1		169.9
31	MT1895	MT08185//YLL*2/PI640431/3/PROM/3*YLL	175.3	167.8	161.0	182.7	167.7	165.4		170.0
27 i	MT1867	MT0859//00X83cE45/MT0698	175.7	169.0	161.3	181.0	168.0	165.9		170.2
28 i	MT1872	MT0859//MT0840/MT0873	176.0	169.7	162.3	180.3	169.7	165.4		170.6
26 i	MT1866	MT0859//00X83cE45/MT0698	176.0	169.4	162.0	183.3	170.0	164.1		170.8
4	Warhorse	check	177.0	169.3	164.0	182.0	168.0	166.7		171.2
6	MTS1801	Judee//MTS0907/MTS0827	176.7	169.9	163.0	181.3	169.7	166.8		171.2
9	MTS1809	08X350-A6/Warhorse	175.7	170.7	162.7	182.0	168.7	167.2		171.2
34	WS520	Manitoba/Northern Seeds	177.0	170.1	163.0	180.0	169.7	167.6		171.2
2	Judee	check	176.0	170.6	164.0	181.7	170.3	165.4		171.3
33 w	MT18109	MTS0531*3//PI640431/MTS04114	177.3	169.5	162.3	182.7	169.0	167.5		171.4
8	MTS1804	Warhorse*2/Accipiter	176.7	170.9	164.7	181.7	169.0	167.5		171.8
19	MTCS18195	MTCS1204*4/MT1138	176.7	169.9	164.7	182.7	170.0	166.7		171.8
36	WS563	Manitoba/Northern Seeds	179.3	169.6	163.7	181.3	170.3	167.5		172.0
1	Yellowstone	check	178.3	171.6	162.7	184.0	168.7	167.6		172.2
23 i	MT1848	Northern//MT08184/MT0887	178.7	171.3	163.0	182.7	172.3	167.3		172.6
24	MT1854	08X350-A2/MT0890	175.3	173.1	162.7	182.7	173.3	168.3		172.6
14	MTS18117	Loma*2/Warhorse	178.7	171.7	163.0	181.3	173.3	168.1		172.7
20	MTCS18211	MTS1597//MTCS1301/MTS1412	178.0	171.2	164.0	185.7	168.7	168.7		172.7
15	MTS18143	Loma*2/Warhorse	178.3	173.7	162.7	184.3	170.3	168.3		172.9
25 i	MT1855	05X438-aC71(MT0097*2//Jagalene/Chotei	177.3	171.6	164.7	184.3	173.7	168.6		173.4
7	MTS1802	Warhorse*2/Accipiter	179.0	172.9	166.0	182.7	173.7	169.9		174.0
18	MTS18169	Loma*2/AAC Gateway	179.7	174.5	164.0	182.7	175.0	168.5		174.1
10 i	MTS1810	08X350-A6/Warhorse	180.3	172.1	167.3	183.3	172.3	170.1		174.2
11	MTS1830	MTS0907/MTS0827	180.0	174.6	165.0	184.3	173.7	170.8		174.7
17	MTS18167	Loma*2/AAC Gateway	182.0	173.3	165.0	184.0	173.0	170.8		174.7
13 i	MTS18116	Loma*2/Warhorse	180.0	173.7	166.7	184.0	174.0	170.3		174.8
12 i	MTS1831	MTS0907/MTS0827	180.0	174.3	164.7	184.7	174.7	170.9		174.9
16 i	MTS18149	Loma*2/AAC Gateway	181.3	174.5	166.0	184.0	173.0	170.3		174.9
Average			177.0	170.5	163.2	182.3	170.0	167.1		171.7
LSD (0.05)			1.3	1.7	2.5	1.7	2.8	1.2		1.3
C.V. (%)			0.5	0.6	0.7	0.6	1.0	0.4		0.7
P-value (Varieties)			<.0001	<.0001	<.0001	<.0001		<.0001		<.0001

i = in 2020 Intrastate Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 91. 2019 Advanced Yield Nursery (Exp. 14): All Location Plant Height (in)

Entry #	ID w = white	Pedigree	Bozeman RCB	Havre RCB	Williston RCB	Moccasin LAT	Huntley RCB	Conrad LAT	Ft Benton	6 LOC Avg
		lattice efficiency		100%	100%	139%	94%	107%		
31	MT1895	MT08185//YLL*2/PI640431/3/PROM/3*YLI	29.5	24.3	13.7	26.1	34.1	27.0		25.8
35	WS522	Manitoba/Northern Seeds	30.4	24.3	12.0	26.7	36.0	27.5		26.2
29	MT1882	Decade//YLL (L)/TX05V071040	31.1	24.4	12.8	25.5	36.7	27.0		26.3
32	MT1897	MT08185//YLL*2/PI640431/3/PROM/3*YLI	31.5	25.1	13.3	26.4	35.3	26.9		26.4
16 i	MTS18149	Loma*2/AAC Gateway	30.7	23.7	12.9	26.7	37.3	27.7		26.5
26 i	MT1866	MT0859//00X83cE45/MT0698	31.8	24.0	12.1	28.5	37.1	27.8		26.9
12 i	MTS1831	MTS0907/MTS0827	32.0	26.3	13.4	28.0	35.7	27.7		27.2
5	SY Monument	check	32.4	25.5	13.3	27.6	36.5	29.2		27.4
30	MT1889	Decade*2/MT0849	31.1	26.8	12.8	28.1	37.7	28.0		27.4
17	MTS18167	Loma*2/AAC Gateway	32.3	25.2	13.1	27.4	38.6	28.6		27.5
18	MTS18169	Loma*2/AAC Gateway	31.9	27.7	13.5	27.8	38.1	27.9		27.8
14	MTS18117	Loma*2/Warhorse	33.2	25.8	12.6	28.7	37.5	29.8		27.9
13 i	MTS18116	Loma*2/Warhorse	31.0	28.2	13.9	27.9	38.1	28.6		28.0
24	MT1854	08X350-A2/MT0890	34.0	26.2	13.4	28.2	37.8	28.4		28.0
11	MTS1830	MTS0907/MTS0827	33.1	25.7	14.4	28.7	37.2	29.5		28.1
9	MTS1809	08X350-A6/Warhorse	34.6	24.2	14.0	29.6	38.3	28.6		28.2
15	MTS18143	Loma*2/Warhorse	32.5	28.6	13.4	28.1	39.5	27.1		28.2
8	MTS1804	Warhorse*2/Accipiter	34.0	26.0	13.6	30.1	37.9	28.3		28.3
27 i	MT1867	MT0859//00X83cE45/MT0698	34.0	25.6	13.8	29.4	38.8	30.1		28.6
19	MTCS18195	MTCS1204*4/MT1138	35.3	25.8	13.2	30.9	38.7	28.0		28.7
21	MTCS18222	Judee//Warhorse/MTCS1204	34.4	27.3	13.1	29.4	39.4	28.3		28.7
25 i	MT1855	05X438-aC71(MT0097*2//Jagalene/Chote	33.6	26.8	14.3	29.2	38.2	30.2		28.7
4	Warhorse	check	34.8	26.2	13.1	30.0	38.8	29.6		28.8
22 i	MT1845	Yellowstone/493-22(Reeder/6*Paul)	34.9	26.1	14.0	29.2	39.0	29.7		28.8
23 i	MT1848	Northern//MT08184/MT0887	35.4	25.8	14.8	29.5	37.4	30.8		29.0
28 i	MT1872	MT0859//MT0840/MT0873	34.1	28.9	14.1	30.2	37.8	29.6		29.1
33 w	MT18109	MTS0531*3//PI640431/MTS04114	34.8	28.6	13.3	30.3	38.0	29.5		29.1
7	MTS1802	Warhorse*2/Accipiter	34.3	27.1	14.0	30.2	39.8	31.2		29.4
20	MTCS18211	MTS1597//MTCS1301/MTS1412	35.2	28.6	14.6	29.0	39.2	30.6		29.5
3	Decade	check	34.4	28.3	12.6	31.5	41.6	30.0		29.7
6	MTS1801	Judee//MTS0907/MTS0827	35.7	29.0	12.9	31.4	39.2	30.0		29.7
10 i	MTS1810	08X350-A6/Warhorse	34.9	27.8	15.3	30.7	40.1	30.2		29.8
34	WS520	Manitoba/Northern Seeds	35.3	28.7	12.6	31.3	40.0	30.7		29.8
2	Judee	check	36.9	27.7	15.3	30.5	37.4	32.0		30.0
1	Yellowstone	check	37.5	28.3	15.3	31.9	41.8	31.1		31.0
36	WS563	Manitoba/Northern Seeds	35.4	32.0	16.7	32.8	43.7	29.7		31.7
Average			33.6	26.7	13.6	29.1	38.3	29.1		28.4
LSD (0.05)			1.3	2.1	2.1	1.8	2.9	2.2		1.2
C.V. (%)			2.3	4.8	9.1	3.4	4.7	4.3		3.6
P-value (Varieties)			<.0001	<.0001	0.0309	<.0001		<.0001		<.0001

i = in 2020 Intrastate Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 92. 2019 Advanced Yield Nursery (Exp. 14): All Location Sawfly Cutting (%)

Entry #	ID	Pedigree	Havre RCB	Conrad LAT	Ft Benton LAT	3 Loc Avg
	w = white					
		lattice efficiency	98%	109%	124%	
10	i	MTS1810	0	1	0	0
13	i	MTS18116	1	6	4	7
12	i	MTS1831	2	17	14	8
8		MTS1804	2	6	3	9
11		MTS1830	2	10	6	9
7		MTS1802	2	14	16	11
4		Warhorse	2	13	11	11
16	i	MTS18149	2	17	8	13
28	i	MT1872	10	7	5	16
17		MTS18167	1	13	23	17
9		MTS1809	4	7	8	18
25	i	MT1855	5	42	27	21
14		MTS18117	5	21	21	23
6		MTS1801	10	26	27	24
20		MTCS18211	15	18	18	25
18		MTS18169	1	44	42	30
36		WS563	10	33	41	31
21		MTCS18222	7	29	28	31
33	w	MT18109	10	41	39	33
2		Judee	18	39	24	33
15		MTS18143	5	30	42	34
26	i	MT1866	23	40	34	39
3		Decade	23	36	37	40
31		MT1895	22	51	39	40
23	i	MT1848	18	43	40	42
32		MT1897	25	38	40	42
30		MT1889	17	49	50	42
27	i	MT1867	20	31	48	44
22	i	MT1845	20	47	45	44
34		WS520	25	36	43	45
5		SY Monument	25	50	50	45
35		WS522	18	42	45	45
1		Yellowstone	27	37	40	48
24		MT1854	27	36	54	52
19		MTCS18195	23	78	77	52
29		MT1882	25	60	59	54
Average			12.6	30.7	30.8	30.0
LSD (0.05)			8.2	29.1	25.7	15.0
C.V. (%)			40.2	55.1	47.8	30.7
P-value (Varieties)			<.0001	0.0002	<.0001	<.0001

i = in 2020 Intrastate Test (all other MT lines dropped from testing)

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD ($p = 0.05$)

Table 93. 2019 Advanced Yield Nursery (Exp. 14): All Location Protein (%)

Entry #	ID w = white	Pedigree	Bozeman bulk	Havre LAT	Williston LAT	Moccasin LAT	Huntley LAT	Conrad LAT	Ft Benton RCB	7 Loc Avg
		lattice efficiency		145%	158%	182%	106%	149%		
8	MTS1804	Warhorse*2/Accipiter	13.1	16.0	18.6	12.3	12.9	14.6	13.6	14.4
2	Judee	check	12.9	15.4	18.2	12.3	12.7	13.7	13.9	14.2
7	MTS1802	Warhorse*2/Accipiter	12.8	15.4	18.6	12.0	12.8	13.5	13.9	14.2
9	MTS1809	08X350-A6/Warhorse	12.2	15.8	18.5	12.7	12.2	13.6	13.5	14.1
4	Warhorse	check	12.5	15.6	17.9	12.1	12.5	14.0	13.3	14.0
23 i	MT1848	Northern/MT08184/MT0887	12.8	15.5	16.9	12.2	12.7	14.3	13.9	14.0
29	MT1882	Decade//YLL (L)/TX05V071040	12.4	15.2	19.3	11.9	12.2	13.8	13.2	14.0
30	MT1889	Decade*2/MT0849	12.8	16.1	19.3	12.5	11.3	13.1	13.2	14.0
33 w	MT18109	MTS0531*3//PI640431/MTS04114	12.2	15.3	19.0	12.1	12.6	13.7	12.9	14.0
10 i	MTS1810	08X350-A6/Warhorse	12.6	15.3	17.2	12.3	12.3	13.9	13.5	13.9
17	MTS18167	Loma*2/AAC Gateway	12.4	15.0	17.3	12.0	12.8	13.9	13.4	13.9
6	MTS1801	Judee//MTS0907/MTS0827	12.3	14.7	17.9	11.9	12.4	13.6	13.4	13.8
18	MTS18169	Loma*2/AAC Gateway	12.0	15.2	17.5	11.5	13.2	14.0	13.4	13.8
25 i	MT1855	05X438-aC71(MT0097*2//Jagalene/Chote	12.1	15.2	17.0	12.0	12.7	14.2	13.7	13.8
3	Decade	check	12.3	15.4	18.5	12.1	11.4	13.2	13.0	13.7
14	MTS18117	Loma*2/Warhorse	12.1	15.3	17.3	11.5	12.4	13.8	13.3	13.7
15	MTS18143	Loma*2/Warhorse	12.2	15.2	16.2	11.8	12.8	14.0	13.4	13.7
21	MTCS18222	Judee//Warhorse/MTCS1204	11.7	14.5	18.8	12.0	11.9	13.4	12.7	13.6
22 i	MT1845	Yellowstone/493-22(Reeder/6*Paul)	12.4	15.0	17.9	11.1	12.7	13.2	13.1	13.6
31	MT1895	MT08185//YLL*2//PI640431/3/PROM/3*YLI	11.9	15.1	17.7	11.6	13.0	13.0	12.9	13.6
32	MT1897	MT08185//YLL*2//PI640431/3/PROM/3*YLI	11.9	14.9	18.1	11.7	12.9	12.8	12.9	13.6
16 i	MTS18149	Loma*2/AAC Gateway	11.9	14.9	16.7	11.5	12.7	13.3	13.3	13.5
26 i	MT1866	MT0859//00X83cE45/MT0698	12.1	15.1	17.6	11.5	11.7	13.4	12.9	13.5
35	WS522	Manitoba/Northern Seeds	11.4	14.6	18.0	11.9	11.6	13.1	13.1	13.4
1	Yellowstone	check	11.8	14.5	17.3	11.3	12.0	13.5	12.9	13.3
20	MTCS18211	MTS1597//MTCS1301/MTS1412	12.5	14.4	14.7	12.1	12.4	13.5	13.1	13.3
24	MT1854	08X350-A2/MT0890	11.7	14.1	16.2	11.1	12.3	13.5	13.2	13.2
28 i	MT1872	MT0859//MT0840/MT0873	12.1	14.4	16.5	11.6	11.7	13.3	12.8	13.2
34	WS520	Manitoba/Northern Seeds	11.3	14.2	16.9	10.9	12.1	13.7	13.2	13.1
19	MTCS18195	MTCS1204*4/MT1138	11.7	14.2	16.9	11.5	12.2	12.3	12.3	13.0
27 i	MT1867	MT0859//00X83cE45/MT0698	11.1	14.3	16.1	11.6	11.9	13.8	12.3	12.9
11	MTS1830	MTS0907/MTS0827	11.4	14.2	14.9	11.7	11.5	12.7	12.9	12.8
5	SY Monument	check	11.8	13.9	16.9	10.7	11.5	12.2	12.0	12.7
13 i	MTS18116	Loma*2/Warhorse	11.7	14.0	14.8	11.3	11.1	13.5	12.6	12.7
36	WS563	Manitoba/Northern Seeds	11.9	14.2	13.5	11.2	11.5	12.7	13.0	12.6
12 i	MTS1831	MTS0907/MTS0827	11.1	14.0	14.7	11.1	11.3	12.7	12.4	12.5
Average			12.1	14.9	17.2	11.7	12.2	13.5	13.1	13.5
LSD (0.05)				0.3	1.5	0.7	0.6	0.8	0.4	0.6
C.V. (%)				1.3	4.8	3.6	3.1	3.2	2.0	4.1
P-value (Varieties)				<.0001	<.0001	<.0001		<.0001	<.0001	<.0001

i = in 2020 Intrastate Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 94. 2019 Advanced Winter Wheat Test (Exp. 14): Plant Disease Assessment

Cultivar/Line		Stripe Rust						Stem Rust		Aluminum tolerance	
		Pullman, WA		MT. Vernon, WA		Montana		St. Paul, MN		Rockford, WA	
		Flowering		Stem elong.		Milk		Sr	Winter	'Early'	'Later'
		IT ^{1/}	%	IT ^{1/}	%	IT ^{1/}	%				
								Ft Ellis			
								Sr Nursery	Sr Field	Survival	higher # is better
								%	%-R/S	%	
1	Yellowstone	2	5	2	10	2	10	5	70S	100	1 1
2	Judee	2	2	3	20	2	10		50MR	10	2 2
3	Decade	8	60	8	30	5	50	50	20MR	5	2 2
4	Warhorse	2	5	3	20	2	10		30MR	10	2 2
5	SY Monument	8	10	2	10	2	5		TS	75	2 2
6	MTS1801	2	5	2	10	2	5		60S	1	2 1
7	MTS1802	2	5	3	20	2	10		80S	100	3 3
8	MTS1804	2	5	3	20	2	10		20MR	100	3 3
9	MTS1809	2	5	3	20	2	10		5R	75	1 2
10 i	MTS1810	2	2	3	20	2	10		70S	25	1 1
11	MTS1830	2	2	2	10	2	10		60MS	10	1 1
12 i	MTS1831	2	5	2	10	2	5		70S	100	1 1
13 i	MTS18116	2	2	5	30	2	5		80S	10	1 1
14	MTS18117	2	2	5	30	2	10		0/40MR	25	1 1
15	MTS18143	2	2	5	30	2	10		80S	25	1 1
16 i	MTS18149	2	2	3	15	2	5		10MS	25	3 3
17	MTS18167	2	2	2	10	2	10		0.0	10	1 1
18	MTS18169	2	2	5	30	2	10		0.0	2	1 1
19	MTCS18195	5	20	5	30	2	5	5	10MS	10	1 1
20	MTCS18211	2	5	2	10	2	5		5MS	75	3 3
21	MTCS18222	2	2	3	20	2	10		0.0	5	4 4
22 i	MT1845	2	2	2	10	2	10		0.0	25	1 1
23 i	MT1848	2	5	2	10	2	10		0.0	50	1 1
24	MT1854	2	2	3	20	2	10		0.0	25	1 1
25 i	MT1855	2	2	2	10	2	10		-	0	2 2
26 i	MT1866	2	2	2	10	2	5		70S	10	1 1
27 i	MT1867	2	2	5	30	2	5		5MR	100	1 1
28 i	MT1872	2	2	2	10	2	10		TMR	50	1 1
29	MT1882	2	2	3	20	2	10		40MS	50	1 1
30	MT1889	2	2	2	10	2	15		10S	2	2 3
31	MT1895	2	2	2	2	2	10		TMS	50	2 2
32	MT1897	2	2	2	2	2	10		TMS	75	1 1
33 w	MT18109	2	2	2	2	2	5		30MR	1	1 1
34	WS520	2	2	2	10	2	5		90S	10	2 2
35	WS522	8	10	2	10	3	30		90S	100	2 2
36	WS563	2	2	2	10	2	5		10MS	100	2 2
Average		5		16		10				40	1.6 1.6

i = in 2020 Intrastate Test (all other MT lines dropped from testing)

1/ Infection Type (IT) was recorded based on the 0-9 scale with ITs 8 and 9 combined as 8 (the most susceptible reaction) in field data. Generally IT 0-3 are considered resistant, 4-6 intermediate, and 7-9 susceptible. Heterogenous reactions of an entry were indicated by two or more ITs separated by "," for most plants with the first IT and few plants with the second IT or connected with "-" for entries containing plants with

Table 95. 2019 Sawfly Yield Test: All Location Summary

Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Stem solid (5-25)	Stems infested (0-5)	Sawfly cutting %	Protein %
	w = white									
		Locations	4	4	2	3	5	4	3	4
38 a	MTS1914	MTS1585//Loma/AAC Gateway	83.3	58.7	173.5	26.0	22.4	3.1	25	13.1
8 w	MTS1731	MTS0531*2//PI640431/MTS04114	82.5	61.1	171.4	29.7	22.8	2.5	32	13.5
16 i	MTS18116	Loma*2/Warhorse	81.0	60.8	178.1	28.6	23.4	1.8	8	12.8
27 a	MTS1903	(Judee sib, MTS0819)//08X350-A6/Warhorse	79.9	60.0	176.4	30.7	23.1	2.0	17	13.1
31 w1	MTS1907	Judee//16FAWWON-Irr-87/(MT0977, MT0978)	79.6	61.1	170.3	30.0	21.0	3.1	34	13.0
44 a	MTS1920	Warhorse*2/Accipiter	78.8	60.5	176.7	30.6	22.9	0.9	23	13.9
26	MTS1902	(Judee sib, MTS0819)//08X350-A6/Warhorse	78.4	58.9	177.5	30.7	22.5	2.4	27	13.1
19 i	MTS18149	Loma*2/AAC Gateway	78.0	60.2	178.7	28.8	21.0	2.4	22	13.5
20	MTS18167	Loma*2/AAC Gateway	77.9	59.5	178.0	29.2	20.3	0.9	19	13.6
6	Bobcat	Montana, 2019	77.7	61.3	173.4	29.1	23.7	1.9	9	13.3
18	MTS18143	Loma*2/Warhorse	77.7	58.0	176.2	29.9	23.3	3.3	38	14.0
21	MTS18169	Loma*2/AAC Gateway	77.7	59.6	176.9	28.8	22.5	1.2	27	13.7
39 a	MTS1915	MTS1596//Emerson/Spur	77.5	60.7	176.6	29.4	23.2	2.3	4	13.4
32 a	MTS1908	(Judee sib, MTS0819)//08X350-A6/Warhorse	77.3	60.1	177.2	31.6	23.4	2.0	11	13.1
33	MTS1909	(Judee sib, MTS0819)//08X350-A6/Warhorse	77.3	58.9	175.9	31.3	23.1	2.7	23	13.4
40 a	MTS1916	MTS1596//Emerson/Spur	77.1	60.5	174.8	29.3	23.4	1.4	3	13.5
42 a	MTS1918	Judee//MTS0907/MTS0827	77.1	59.8	174.7	31.5	23.2	1.6	20	13.7
15 i	MTS1831	MTS0907/MTS0827	76.7	61.5	177.6	28.7	23.0	1.7	7	12.7
7 i	MTCS1601R	MTS0531/7/MTS0532/6/96X17E69/3/1	76.4	61.2	173.6	32.0	20.9	1.9	43	13.2
9	MTS1801	Judee//MTS0907/MTS0827	76.3	60.0	174.1	31.8	22.3	1.8	32	13.6
14	MTS1830	MTS0907/MTS0827	76.3	60.9	177.5	29.4	23.6	1.6	12	12.9
36	MTS1912	MT10105/Warhorse//MTS1011	76.1	59.8	175.7	29.1	23.4	2.8	21	13.3
43 a	MTS1919	Warhorse*2/Accipiter	76.0	60.9	176.4	30.1	23.5	1.8	14	14.2
10	MTS1802	Warhorse*2/Accipiter	75.9	60.8	176.3	30.2	23.9	1.4	12	14.1
46 a	MTS1922	08X350-A6/Warhorse	75.9	61.0	177.7	31.3	23.3	1.2	7	13.6
34	MTS1910	MTS1054//Warhorse/MTS1008	75.8	60.0	174.6	31.0	19.7	3.1	47	13.5
12	MTS1809	08X350-A6/Warhorse	75.7	61.3	172.2	31.0	22.5	1.6	21	14.0
2	Judee	check	75.3	61.4	173.1	31.7	21.5	3.1	39	14.0
25	MTCS1901	Judee*2/MTCS1301	75.2	60.9	173.9	28.9	23.0	1.7	25	14.1
13 i	MTS1810	08X350-A6/Warhorse	75.1	61.6	176.6	32.0	24.0	1.1	0	13.9
24	MTCS18222	Judee//Warhorse/MTCS1204	74.8	61.9	172.5	29.1	22.7	2.8	32	13.3
22	MTCS18195	MTCS1204*4/MT1138	74.6	61.0	174.0	31.5	21.5	3.1	51	12.9
1	Yellowstone	check	74.2	59.6	175.5	32.2	8.5	2.2	71	13.3
11	MTS1804	Warhorse*2/Accipiter	74.2	60.4	174.2	29.8	23.1	2.4	8	14.0
29	MTS1905	MT10105/Warhorse//MTS1011	73.9	61.4	173.9	31.0	23.5	2.0	12	13.1
30	MTS1906	MT10105/Warhorse//MTS1011	73.8	58.9	175.7	28.5	23.3	2.4	17	13.7
5	Loma	check	73.6	60.0	176.2	29.6	21.4	2.9	42	13.6
28	MTS1904	MTS1054//Warhorse/MTS1008	72.9	59.3	174.8	32.0	20.6	3.2	31	13.8
49	MTS1925	03X139cE98/MT0866	72.7	58.5	178.1	30.1	21.3	1.8	30	13.7
23	MTCS18211	MTS1597//MTCS1301/MTS1412	72.6	61.7	175.7	32.4	20.3	2.3	37	13.6
45	MTS1921	Warhorse//MTS0910/DH01-29-125	72.1	59.6	173.0	29.4	23.5	1.9	29	13.7
17	MTS18117	Loma*2/Warhorse	72.0	60.9	176.0	28.9	22.3	2.7	29	13.8
47	MTS1923	08X350-A6/Warhorse	71.8	61.7	176.3	31.6	24.3	1.0	0	13.8
41	MTS1917	Judee//MTS0907/MTS0827	71.6	59.9	175.8	30.5	22.6	2.5	20	13.5
4	Warhorse	check	71.5	60.9	174.2	29.5	22.9	1.2	11	13.9
37	MTS1913	Loma*2/AAC Gateway	71.5	60.4	176.1	28.5	21.8	1.7	29	14.0
3	Decade	check	70.9	60.2	171.4	30.7	9.6	1.5	44	13.8
35	MTS1911	(Colter sib, MT08177)/MTS0916//MTS0917	66.1	59.6	178.0	28.4	23.8	0.9	3	13.7
48	MTS1924	03X273cE8/MTS0826	65.1	59.5	176.7	29.9	22.5	3.0	12	14.6
Average			75.4	60.3	175.4	30.1	22.0	2.1	23.1	13.6
LSD (0.05)			ns	1.0	2.1	1.5	1.3	1.4	17.0	0.4
C.V. (%)			8.1	1.2	0.6	3.1	4.6	49.1	45.6	2.0

i = in 2020 Intrastate and Sawfly tests, a = lines in 2020 Advanced and Sawfly tests (all other MT lines dropped from testing)

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p=0.05)

Table 96. 2019 Sawfly Yield Test (Exp. 5801): Bozeman

Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Stem solid (5-25) RCB	Protein %
	w = white		LAT	LAT	LAT	LAT		bulk
		Lattice efficiency over RCB (%)	150%	230%	182%	106%		
28	MTS1904	MTS1054//Warhorse/MTS1008	138.8	63.6	179.3	35.4	18.6	12.3
32 a	MTS1908	(Judee sib, MTS0819)//08X350-A6/Wε	137.4	63.2	180.3	35.0	22.4	11.6
26	MTS1902	(Judee sib, MTS0819)//08X350-A6/Wε	137.0	62.3	180.7	34.8	21.4	11.8
31 w1	MTS1907	Judee//16FAWWON-Irr-87/(MT0977, f	135.9	63.5	171.7	33.5	18.6	11.5
34	MTS1910	MTS1054//Warhorse/MTS1008	132.1	62.6	178.5	34.5	17.7	11.9
27 a	MTS1903	(Judee sib, MTS0819)//08X350-A6/Wε	129.6	62.7	179.6	33.7	21.3	11.7
8 w	MTS1731	MTS0531*2//PI640431/MTS04114	129.5	62.8	174.9	32.6	21.2	12.9
7 i	MTCS1601R	MTS0531/7/MTS0532/6/96X17E69/3/f	129.0	64.5	177.3	35.2	19.3	11.9
15 i	MTS1831	MTS0907/MTS0827	128.6	63.2	180.7	31.5	23.0	11.2
19 i	MTS18149	Loma*2/AAC Gateway	128.3	62.6	181.6	32.7	19.1	11.9
18	MTS18143	Loma*2/Warhorse	127.5	60.1	178.3	33.0	22.4	12.5
39 a	MTS1915	MTS1596//Emerson/Spur	126.5	62.8	179.7	32.1	23.6	12.6
1	Yellowstone	check	126.1	62.9	179.2	36.5	10.0	11.7
20	MTS18167	Loma*2/AAC Gateway	125.2	61.9	181.1	33.2	19.0	11.9
3	Decade	check	125.0	62.7	174.8	33.8	10.9	12.1
9	MTS1801	Judee//MTS0907/MTS0827	125.0	62.6	176.0	35.7	21.4	12.2
29	MTS1905	MT10105/Warhorse//MTS1011	124.0	63.5	176.7	35.0	21.3	11.8
38 a	MTS1914	MTS1585//Loma/AAC Gateway	123.9	60.0	176.5	29.6	21.4	11.7
30	MTS1906	MT10105/Warhorse//MTS1011	123.3	61.1	178.2	32.5	22.3	12.5
42 a	MTS1918	Judee//MTS0907/MTS0827	123.1	62.3	177.4	34.4	21.7	12.3
13 i	MTS1810	08X350-A6/Warhorse	122.9	64.8	180.6	35.2	23.8	12.2
33	MTS1909	(Judee sib, MTS0819)//08X350-A6/Wε	122.2	61.3	180.4	33.2	21.3	11.9
5	Loma	check	121.9	61.6	180.6	32.7	19.6	12.1
2	Judee	check	121.6	63.9	176.5	35.1	19.3	12.1
46 a	MTS1922	08X350-A6/Warhorse	121.3	63.9	180.3	33.9	22.7	12.1
22	MTCS18195	MTCS1204*4/MT1138	121.1	63.5	176.8	35.5	18.4	11.9
12	MTS1809	08X350-A6/Warhorse	121.1	63.6	175.2	34.3	21.9	12.5
16 i	MTS18116	Loma*2/Warhorse	120.8	62.6	181.3	31.7	22.3	11.4
23	MTCS18211	MTS1597//MTCS1301/MTS1412	120.1	64.1	178.6	35.7	18.2	12.7
24	MTCS18222	Judee//Warhorse/MTCS1204	119.6	64.8	176.3	33.0	21.1	11.8
14	MTS1830	MTS0907/MTS0827	119.5	63.4	181.4	32.5	22.4	11.5
21	MTS18169	Loma*2/AAC Gateway	119.4	61.1	179.1	32.3	21.0	12.4
41	MTS1917	Judee//MTS0907/MTS0827	118.2	62.0	177.1	33.0	19.8	12.3
17	MTS18117	Loma*2/Warhorse	118.2	63.0	179.4	32.5	21.9	12.3
10	MTS1802	Warhorse*2/Accipiter	118.1	63.0	179.5	34.6	23.0	12.9
25	MTCS1901	Judee*2/MTCS1301	117.9	63.2	178.2	32.3	21.3	12.8
44 a	MTS1920	Warhorse*2/Accipiter	117.9	62.9	179.9	33.2	22.2	12.8
11	MTS1804	Warhorse*2/Accipiter	117.2	62.4	177.1	34.0	22.5	12.6
4	Warhorse	check	116.8	62.5	176.9	32.9	20.9	12.6
6	Bobcat	Montana, 2019	116.2	63.3	177.5	31.0	23.0	11.7
48	MTS1924	03X273cE8/MTS0826	115.7	62.4	179.4	32.9	19.9	13.2
36	MTS1912	MT10105/Warhorse//MTS1011	115.3	61.8	178.7	32.1	23.5	12.0
49	MTS1925	03X139cE98/MT0866	111.7	60.7	181.2	32.9	16.9	12.4
40 a	MTS1916	MTS1596//Emerson/Spur	111.0	61.8	178.8	32.6	22.8	13.2
45	MTS1921	Warhorse//MTS0910/DH01-29-125	110.8	61.7	177.1	33.1	22.4	12.6
37	MTS1913	Loma*2/AAC Gateway	110.7	62.4	179.6	32.7	20.6	12.3
43 a	MTS1919	Warhorse*2/Accipiter	110.2	63.1	180.6	32.6	23.3	13.1
47	MTS1923	08X350-A6/Warhorse	107.3	64.2	179.1	35.3	23.8	12.3
35	MTS1911	(Colter sib, MT08177)/MTS0916/MTS	103.7	62.4	180.6	29.9	23.1	12.4
Average			121.7	62.7	178.6	33.4	20.8	12.2
LSD (0.05)			12.3	0.6	1.4	1.6	2.3	
C.V. (%)			4.6	0.5	0.3	2.2	5.4	
P-value (Varieties)			0.0002	<.0001	<.0001	<.0001	<.0001	

i = in 2020 Intrastate and Sawfly tests, a = lines in 2020 Advanced and Sawfly tests (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 97. 2019 Sawfly Yield Test (Exp. 5802): Havre

					July 3 = 27% sawly infested stems						
Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Stem solid (5-25) RCB	Stems infested (0-5) RCB	Sawfly cutting %		Protein %
w = white			RCB	LAT	LAT	RCB	RCB	RCB	30-Jul LAT	harvest LAT	RCB
Lattice efficiency over RCB (%)			100%	121%	115%	101%			115%	139%	100%
6	Bobcat	Montana, 2019	65.8	60.3	169.3	27.3	23.7	1.5	7	0	14.9
40 a	MTS1916	MTS1596//Emerson/Spur	65.5	60.5	170.8	26.1	24.0	1.0	4	2	14.6
38 a	MTS1914	MTS1585//Loma/AAC Gateway	63.6	59.3	170.4	21.2	22.4	4.0	6	5	14.3
16 i	MTS18116	Loma*2/Warhorse	63.3	60.0	174.9	24.9	24.7	0.5	1	2	14.1
44 a	MTS1920	Warhorse*2/Accipiter	62.3	60.2	173.4	28.9	23.8	0.0	4	4	15.1
49	MTS1925	03X139cE98/MT0866	61.9	57.3	174.9	25.8	23.1	3.5	9	6	15.1
27 a	MTS1903	(Judee sib, MTS0819)//08X350-A6/Warhor	61.2	59.4	173.2	27.5	24.2	1.5	3	5	14.3
36	MTS1912	MT10105/Warhorse//MTS1011	61.1	59.6	172.6	26.3	23.8	2.0	3	5	14.9
33	MTS1909	(Judee sib, MTS0819)//08X350-A6/Warhor	60.3	58.2	171.4	28.7	24.8	1.0	4	9	14.9
7 i	MTCS1601R	MTS0531/7/MTS0532/6/96X17E69/3/MTCI	59.9	60.6	169.8	30.3	23.2	0.0	5	4	14.7
21	MTS18169	Loma*2/AAC Gateway	58.7	59.3	174.6	25.1	24.6	0.5	2	2	15.1
15 i	MTS1831	MTS0907/MTS0827	58.6	60.5	174.4	26.9	24.0	1.5	2	3	14.0
39 a	MTS1915	MTS1596//Emerson/Spur	58.5	60.0	173.4	27.0	23.8	2.5	3	0	14.4
14	MTS1830	MTS0907/MTS0827	58.3	60.4	173.6	26.9	24.8	0.0	3	2	13.9
46 a	MTS1922	08X350-A6/Warhorse	58.0	59.8	175.1	28.9	24.7	0.5	0	3	14.8
11	MTS1804	Warhorse*2/Accipiter	57.8	59.9	171.3	25.7	23.3	2.0	2	0	15.6
8 w	MTS1731	MTS0531*2//PI640431/MTS04114	57.7	60.6	167.9	26.8	24.3	0.0	5	4	14.8
25	MTCS1901	Judee*2/MTCS1301	57.3	60.5	169.5	26.1	23.6	2.0	6	14	15.3
22	MTCS18195	MTCS1204*4/MT1138	57.2	60.4	171.2	28.0	23.4	2.5	13	22	14.2
19 i	MTS18149	Loma*2/AAC Gateway	57.0	58.9	175.7	24.8	23.5	2.0	1	0	15.1
5	Loma	check	56.9	59.5	171.8	26.4	23.5	1.0	12	19	15.0
24	MTCS18222	Judee//Warhorse/MTCS1204	56.5	62.6	168.7	26.7	23.8	3.5	10	11	14.7
47	MTS1923	08X350-A6/Warhorse	56.4	59.9	173.5	28.2	24.8	0.0	1	0	15.2
9	MTS1801	Judee//MTS0907/MTS0827	56.1	59.2	172.2	30.0	23.8	1.5	4	5	14.8
12	MTS1809	08X350-A6/Warhorse	56.1	60.4	169.2	27.7	23.5	0.5	5	6	15.6
1	Yellowstone	check	55.7	59.1	171.8	27.4	9.3	2.0	38	45	14.7
37	MTS1913	Loma*2/AAC Gateway	55.6	59.7	172.5	24.5	24.4	0.0	4	10	15.4
43 a	MTS1919	Warhorse*2/Accipiter	55.4	60.3	172.2	27.9	23.9	0.0	2	0	15.8
26	MTS1902	(Judee sib, MTS0819)//08X350-A6/Warhor	55.0	59.0	174.3	26.4	23.3	1.0	6	13	14.5
41	MTS1917	Judee//MTS0907/MTS0827	54.6	58.7	174.4	28.7	24.1	2.5	4	6	14.8
34	MTS1910	MTS1054//Warhorse/MTS1008	54.4	59.7	170.6	28.9	20.5	2.5	9	11	15.2
23	MTCS18211	MTS1597//MTCS1301/MTS1412	54.3	60.5	172.8	30.4	21.0	1.0	9	15	14.6
30	MTS1906	MT10105/Warhorse//MTS1011	54.1	58.9	173.2	25.7	24.3	1.5	3	6	15.0
17	MTS18117	Loma*2/Warhorse	53.8	60.0	172.5	25.2	23.2	2.0	5	7	15.1
31 w1	MTS1907	Judee//16FAWWON-Irr-87/(MT0977, North	53.5	60.2	168.8	27.0	22.3	3.0	12	18	14.4
28	MTS1904	MTS1054//Warhorse/MTS1008	53.4	58.8	170.2	29.0	23.5	2.5	6	10	15.5
42 a	MTS1918	Judee//MTS0907/MTS0827	52.9	59.7	172.0	29.2	24.4	1.0	4	7	14.9
20	MTS18167	Loma*2/AAC Gateway	52.7	59.7	174.9	26.0	23.2	1.0	1	7	14.9
10	MTS1802	Warhorse*2/Accipiter	52.6	60.4	173.1	26.2	24.7	0.0	2	3	15.7
35	MTS1911	(Colter sib, MT08177)/MTS0916//MTS0826	52.4	58.9	175.4	27.4	24.1	0.0	2	0	14.9
45	MTS1921	Warhorse//MTS0910/DH01-29-125	52.0	59.8	168.8	25.5	24.1	2.0	7	7	15.1
3	Decade	check	51.7	60.3	167.9	26.3	10.1	0.0	14	16	15.2
18	MTS18143	Loma*2/Warhorse	51.7	58.2	174.1	27.5	24.4	1.5	7	10	15.5
48	MTS1924	03X273cE8/MTS0826	51.3	58.3	173.9	27.5	24.0	2.0	2	2	15.6
2	Judee	check	51.2	61.3	169.7	28.4	23.0	2.0	16	24	15.7
13 i	MTS1810	08X350-A6/Warhorse	50.8	59.2	172.6	29.0	24.0	0.5	1	0	15.8
4	Warhorse	check	47.4	59.9	171.5	26.7	23.8	0.5	4	2	15.6
32 a	MTS1908	(Judee sib, MTS0819)//08X350-A6/Warhor	47.0	59.2	174.1	30.0	23.7	1.0	5	2	14.6
29	MTS1905	MT10105/Warhorse//MTS1011	45.6	60.4	171.1	28.0	24.7	0.5	3	2	14.5
Average			56.0	59.7	172.1	27.2	23.2	1.3	5.7	7.2	14.9
LSD (0.05)			7.7	0.8	3.4	2.1	1.9	2.0	8.1	11.0	0.4
C.V. (%)			6.8	0.6	0.9	3.9	4.1	75.1	65.3	70.0	1.2
P-value (Varieties)			0.0013	<.0001	0.0001	<.0001	<.0001	0.0074	<.0001	<.0001	<.0001

i = in 2020 Intrastate and Sawfly tests, a = lines in 2020 Advanced and Sawfly tests (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 98. 2019 Sawfly Yield Test (Exp. 5852): Big Sandy

				July 2 = 55% sawfly infested stems					
Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Plant height in	Stem solid (5-25) RCB	Stems infested (0-5) LAT	Stem cutting % LAT	Protein % LAT
w = white			LAT	LAT	LAT	RCB	LAT	LAT	LAT
Lattice efficiency over RCB (%)			118%	163%	106%		126%	150%	164%
38 a	MTS1914	MTS1585//Loma/AAC Gateway	87.8	58.0	27.1	21.6	2.0	34	13.1
14	MTS1830	MTS0907/MTS0827	85.8	61.0	28.8	23.4	2.8	15	12.7
16 i	MTS18116	Loma*2/Warhorse	84.1	61.3	29.2	23.4	1.2	8	12.7
43 a	MTS1919	Warhorse*2/Accipiter	83.4	61.1	29.8	23.4	2.5	16	14.0
44 a	MTS1920	Warhorse*2/Accipiter	82.8	60.5	29.7	22.2	2.5	37	13.8
8 w	MTS1731	MTS0531*2//PI640431/MTS04114	82.5	60.1	29.8	22.3	4.0	52	13.1
33	MTS1909	(Judee sib, MTS0819)//08X350-A6/Warhorse	81.1	59.2	32.0	23.4	2.1	24	13.3
6	Bobcat	Montana, 2019	79.2	61.1	29.1	23.8	0.0	9	13.6
40 a	MTS1916	MTS1596//Emerson/Spur	79.1	60.6	29.3	23.5	3.5	0	13.1
11	MTS1804	Warhorse*2/Accipiter	78.7	60.3	29.6	23.4	2.7	10	14.1
27 a	MTS1903	(Judee sib, MTS0819)//08X350-A6/Warhorse	78.2	59.7	30.9	23.3	1.8	21	13.2
42 a	MTS1918	Judee//MTS0907/MTS0827	78.1	59.4	30.9	22.9	2.9	24	13.8
15 i	MTS1831	MTS0907/MTS0827	77.7	61.4	27.8	23.3	1.4	9	12.7
18	MTS18143	Loma*2/Warhorse	77.7	57.6	29.1	23.0	4.0	54	14.0
39 a	MTS1915	MTS1596//Emerson/Spur	77.3	60.7	29.1	22.7	2.3	0	13.2
10	MTS1802	Warhorse*2/Accipiter	75.8	60.8	29.7	23.7	2.9	14	13.8
9	MTS1801	Judee//MTS0907/MTS0827	75.0	60.1	29.8	22.3	3.3	56	13.5
32 a	MTS1908	(Judee sib, MTS0819)//08X350-A6/Warhorse	74.8	59.7	29.8	23.5	1.6	9	13.3
20	MTS18167	Loma*2/AAC Gateway	74.7	59.0	28.5	20.5	2.2	27	13.9
31 w1	MTS1907	Judee//16FAWWON-Irr-87/(MT0977, Northern	74.5	60.6	29.6	20.7	3.8	43	13.3
25	MTCS1901	Judee*2/MTCS1301	74.4	60.9	28.4	23.0	3.2	20	14.3
21	MTS18169	Loma*2/AAC Gateway	74.2	60.3	29.0	22.5	2.1	23	13.6
26	MTS1902	(Judee sib, MTS0819)//08X350-A6/Warhorse	73.6	58.5	30.9	22.7	3.2	32	13.2
45	MTS1921	Warhorse//MTS0910/DH01-29-125	73.2	59.2	29.5	22.8	3.9	25	13.6
49	MTS1925	03X139cE98/MT0866	73.1	58.4	31.5	22.3	2.1	33	13.6
36	MTS1912	MT10105/Warhorse//MTS1011	73.0	58.8	29.0	22.4	4.0	17	13.4
29	MTS1905	MT10105/Warhorse//MTS1011	73.0	60.6	30.0	23.3	3.1	7	13.1
47	MTS1923	08X350-A6/Warhorse	72.9	60.9	31.2	23.0	0.4	0	14.2
1	Yellowstone	check	72.2	59.5	32.8	9.4	3.1	93	13.8
5	Loma	check	72.0	59.5	29.8	21.1	4.5	57	13.7
2	Judee	check	71.3	61.1	31.6	20.9	3.8	43	14.4
13 i	MTS1810	08X350-A6/Warhorse	71.2	61.5	31.7	24.4	1.0	0	14.0
46 a	MTS1922	08X350-A6/Warhorse	71.1	60.3	31.0	24.2	2.6	0	14.0
30	MTS1906	MT10105/Warhorse//MTS1011	70.8	58.2	27.3	24.1	2.4	14	13.8
17	MTS18117	Loma*2/Warhorse	70.2	60.3	29.1	22.5	3.4	29	14.0
19 i	MTS18149	Loma*2/AAC Gateway	69.5	60.6	28.9	20.6	2.4	31	13.6
4	Warhorse	check	69.4	60.5	29.0	22.8	2.1	9	13.7
7 i	MTCS1601R	MTS0531/7/MTS0532/6/96X17E69/3/MTCL03	68.5	61.1	30.6	22.3	3.0	70	13.2
41	MTS1917	Judee//MTS0907/MTS0827	68.4	59.9	29.9	22.6	2.5	15	13.6
22	MTCS18195	MTCS1204*4/MT1138	67.8	60.3	30.9	21.8	3.3	82	13.1
37	MTS1913	Loma*2/AAC Gateway	67.6	60.4	28.2	22.5	3.1	27	14.5
24	MTCS18222	Judee//Warhorse/MTCS1204	66.6	61.9	27.7	22.5	2.0	40	13.6
35	MTS1911	(Colter sib, MT08177)/MTS0916//MTS0826	65.4	58.8	28.0	24.0	0.9	0	14.0
12	MTS1809	08X350-A6/Warhorse	64.7	61.1	30.9	23.1	2.5	18	14.2
3	Decade	check	62.1	59.7	31.9	10.4	2.1	67	14.5
28	MTS1904	MTS1054//Warhorse/MTS1008	61.8	57.1	31.7	20.9	4.1	37	13.8
34	MTS1910	MTS1054//Warhorse/MTS1008	61.1	58.9	29.6	20.7	3.9	74	13.9
23	MTCS18211	MTS1597//MTCS1301/MTS1412	61.1	60.8	31.0	20.3	4.5	45	13.7
48	MTS1924	03X273cE8/MTS0826	57.7	58.5	29.3	23.7	3.3	8	14.8
Average			73.2	60.0	29.8	22.1	2.7	28.0	13.7
LSD (0.05)			9.4	0.9	2.3	2.1	ns	27.4	0.4
C.V. (%)			5.9	0.7	3.6	4.8	47.3	44.2	1.4
P-value (Varieties)			<.0001	<.0001	0.0012	<.0001	0.3725	<.0001	<.0001

i = in 2020 Intrastate and Sawfly tests, a = lines in 2020 Advanced and Sawfly tests (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 99. 2019 Sawfly Yield Test (Exp. 58FB): Fort Benton (Northern Seeds)

July 2 = 33% sawfly infested stems									
Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Stem solid (5-25)	Stems infested (0-5)	Lodging/Sawfly cutting %		Protein %
	w = white		RCB	RCB	RCB	RCB	29-Jul RCB	4-Aug RCB	RCB
Sawfly infestation of clipped stems = 33%									
12	MTS1809	08X350-A6/Warhorse	60.8	60.1	22.4	1.5	3	38	13.6
8	w MTS1731	MTS0531*2//PI640431/MTS04114	60.4	60.7	22.0	2.0	5	40	13.1
20	MTS18167	Loma*2/AAC Gateway	59.0	57.4	15.6	0.5	5	23	13.7
21	MTS18169	Loma*2/AAC Gateway	58.3	57.7	21.6	0.0	13	55	13.7
38	a MTS1914	MTS1585//Loma/AAC Gateway	57.9	57.6	22.6	1.5	5	35	13.1
2	Judee	check	57.1	59.3	21.3	3.5	8	50	13.6
19	i MTS18149	Loma*2/AAC Gateway	57.0	58.8	18.9	3.0	7	35	13.5
10	MTS1802	Warhorse*2/Accipiter	57.0	59.1	23.1	0.5	3	20	13.9
24	MTCS18222	Judee//Warhorse/MTCS1204	56.4	58.3	21.6	3.5	13	45	13.0
34	MTS1910	MTS1054//Warhorse/MTS1008	55.7	58.6	17.8	1.0	4	55	13.1
13	i MTS1810	08X350-A6/Warhorse	55.6	60.8	24.0	0.0	2	1	13.7
16	i MTS18116	Loma*2/Warhorse	55.6	59.2	22.6	2.5	2	15	12.8
43	a MTS1919	Warhorse*2/Accipiter	55.1	59.2	22.5	1.5	3	25	13.7
23	MTCS18211	MTS1597//MTCS1301/MTS1412	55.0	61.5	18.1	1.5	8	50	13.3
36	MTS1912	MT10105/Warhorse//MTS1011	54.9	58.9	22.8	1.0	2	40	13.0
31	w1 MTS1907	Judee//16FAWWON-Irr-87/(MT0977, Northern	54.5	60.0	19.6	1.5	4	40	12.7
42	a MTS1918	Judee//MTS0907/MTS0827	54.3	57.7	21.9	0.5	4	30	13.7
18	MTS18143	Loma*2/Warhorse	53.7	55.9	21.9	2.5	13	50	13.8
29	MTS1905	MT10105/Warhorse//MTS1011	53.1	60.9	23.0	2.5	4	28	12.8
46	a MTS1922	08X350-A6/Warhorse	53.0	60.1	22.6	1.5	2	18	13.3
40	a MTS1916	MTS1596//Emerson/Spur	52.8	59.2	22.6	0.0	1	8	13.2
22	MTCS18195	MTCS1204*4/MT1138	52.4	59.8	22.8	3.5	13	50	12.4
4	Warhorse	check	52.3	60.7	22.2	0.0	3	23	13.5
44	a MTS1920	Warhorse*2/Accipiter	52.2	58.5	22.6	1.0	4	28	14.0
37	MTS1913	Loma*2/AAC Gateway	52.2	58.9	20.3	1.5	8	50	13.9
45	MTS1921	Warhorse//MTS0910/DH01-29-125	52.2	57.8	23.4	0.5	5	55	13.5
25	MTCS1901	Judee*2/MTCS1301	51.1	59.0	22.3	0.5	10	40	13.9
27	a MTS1903	(Judee sib, MTS0819)//08X350-A6/Warhorse	50.7	58.1	21.6	0.5	8	25	13.2
47	MTS1923	08X350-A6/Warhorse	50.5	61.6	24.7	1.5	2	1	13.4
32	a MTS1908	(Judee sib, MTS0819)//08X350-A6/Warhorse	49.8	58.3	23.1	2.5	6	23	13.0
6	Bobcat	Montana, 2019	49.4	60.4	23.7	2.0	4	18	13.0
9	MTS1801	Judee//MTS0907/MTS0827	48.9	58.2	21.9	0.5	5	35	13.7
7	i MTCS1601R	MTS0531/7/MTS0532/6/96X17E69/3/MTCL03	48.3	58.6	18.7	2.5	15	55	12.9
26	MTS1902	(Judee sib, MTS0819)//08X350-A6/Warhorse	48.1	55.7	20.5	2.5	8	35	12.9
39	a MTS1915	MTS1596//Emerson/Spur	47.7	59.1	20.9	1.5	2	13	13.5
30	MTS1906	MT10105/Warhorse//MTS1011	46.9	57.5	22.2	3.5	4	30	13.6
17	MTS18117	Loma*2/Warhorse	45.7	60.1	21.3	3.5	15	50	13.7
33	MTS1909	(Judee sib, MTS0819)//08X350-A6/Warhorse	45.6	56.8	21.8	3.5	10	35	13.6
41	MTS1917	Judee//MTS0907/MTS0827	45.2	58.8	22.0	2.0	8	40	13.4
3	Decade	check	44.9	58.1	8.2	1.0	40	50	13.4
49	MTS1925	03X139cE98/MT0866	44.0	57.5	21.2	1.5	8	50	13.7
5	Loma	check	43.6	59.3	21.0	1.0	15	50	13.4
35	MTS1911	(Colter sib, MT08177)/MTS0916//MTS0826	42.9	58.4	23.7	1.5	2	8	13.6
11	MTS1804	Warhorse*2/Accipiter	42.9	59.0	21.8	2.0	5	15	13.8
1	Yellowstone	check	42.8	56.9	6.8	0.5	55	75	13.0
14	MTS1830	MTS0907/MTS0827	41.7	58.9	23.8	0.5	8	20	13.6
15	i MTS1831	MTS0907/MTS0827	41.7	60.9	22.1	1.0	4	10	13.0
28	MTS1904	MTS1054//Warhorse/MTS1008	37.4	57.5	18.5	3.0	10	45	13.4
48	MTS1924	03X273cE8/MTS0826	35.7	58.9	20.2	2.5	10	25	14.6
Average			50.7	58.9	21.1	1.6	7.9	33.7	13.4
LSD (0.05)			ns	1.8	2.0	2.1	6.9	12.8	0.4
C.V. (%)			13.3	1.5	4.8	64.5	43.1	18.9	1.7
P-value (Varieties)			0.0567	<.0001	<.0001	0.0056	<.0001	<.0001	<.0001

i = in 2020 Intrastate and Sawfly tests, a = lines in 2020 Advanced and Sawfly tests (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 100. 2019 Sawfly Yield Test (Exp. 58CD): Conrad (Northern Seeds)

		*** Not Harvested ***	July 3 = 51% sawfly infested stems						
Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Plant height in	Stem solid (5-25)	Stems infested (0-5)	Sawfly cutting %	Protein %
	w = white		RCB	RCB	RCB	1 rep	1 rep	RCB	bulk
Sawfly infestation of clipped stems = 39%									
1	Yellowstone	check				7.0	3		
2	Judee	check				23.0	3		
3	Decade	check				8.5	3		
4	Warhorse	check				25.0	2		
5	Loma	check				21.8	5		
6	Bobcat	Montana, 2019				24.5	4		
7	i MTCS1601R	MTS0531/7/MTS0532/6/96X17E69/3/MTCL0309/CDC Teal 11A//MTW01143/				21.0	2		
8	w MTS1731	MTS0531*2//PI640431/MTS04114				24.3	4		
9	MTS1801	Judee//MTS0907/MTS0827				22.0	2		
10	MTS1802	Warhorse*2/Accipiter				25.0	2		
11	MTS1804	Warhorse*2/Accipiter				24.3	3		
12	MTS1809	08X350-A6/Warhorse				21.8	2		
13	i MTS1810	08X350-A6/Warhorse				23.8	3		
14	MTS1830	MTS0907/MTS0827				23.8	3		
15	i MTS1831	MTS0907/MTS0827				22.8	3		
16	i MTS18116	Loma*2/Warhorse				24.0	3		
17	MTS18117	Loma*2/Warhorse				22.5	2		
18	MTS18143	Loma*2/Warhorse				24.8	5		
19	i MTS18149	Loma*2/AAC Gateway				22.8	2		
20	MTS18167	Loma*2/AAC Gateway				23.3	0		
21	MTS18169	Loma*2/AAC Gateway				22.9	2		
22	MTCS18195	MTCS1204*4/MT1138				21.3	3		
23	MTCS18211	MTS1597//MTCS1301/MTS1412				24.0	2		
24	MTCS18222	Judee//Warhorse/MTCS1204				24.3	2		
25	MTCS1901	Judee*2/MTCS1301				24.8	1		
26	MTS1902	(Judee sib, MTS0819)//08X350-A6/Warhorse				24.4	3		
27	a MTS1903	(Judee sib, MTS0819)//08X350-A6/Warhorse				25.0	4		
28	MTS1904	MTS1054//Warhorse/MTS1008				21.5	3		
29	MTS1905	MT10105/Warhorse//MTS1011				25.0	2		
30	MTS1906	MT10105/Warhorse//MTS1011				23.8	2		
31	w1 MTS1907	Judee//16FAWWON-Irr-87/(MT0977, Northern sib)				24.0	4		
32	a MTS1908	(Judee sib, MTS0819)//08X350-A6/Warhorse				24.3	3		
33	MTS1909	(Judee sib, MTS0819)//08X350-A6/Warhorse				24.2	4		
34	MTS1910	MTS1054//Warhorse/MTS1008				21.8	5		
35	MTS1911	(Colter sib, MT08177)/MTS0916//MTS0826				24.2	1		
36	MTS1912	MT10105/Warhorse//MTS1011				24.5	4		
37	MTS1913	Loma*2/AAC Gateway				21.0	2		
38	a MTS1914	MTS1585//Loma/AAC Gateway				24.0	5		
39	a MTS1915	MTS1596//Emerson/Spur				25.0	3		
40	a MTS1916	MTS1596//Emerson/Spur				23.9	1		
41	MTS1917	Judee//MTS0907/MTS0827				24.3	3		
42	a MTS1918	Judee//MTS0907/MTS0827				25.0	2		
43	a MTS1919	Warhorse*2/Accipiter				24.5	3		
44	a MTS1920	Warhorse*2/Accipiter				23.5	0		
45	MTS1921	Warhorse//MTS0910/DH01-29-125				24.7	1		
46	a MTS1922	08X350-A6/Warhorse				22.5	0		
47	MTS1923	08X350-A6/Warhorse				25.0	2		
48	MTS1924	03X273cE8/MTS0826				24.7	4		
49	MTS1925	03X139cE98/MT0866				22.8	0		
Average						23.0	2.6		
LSD (0.05)									
C.V. (%)									
P-value (Varieties)									

i = in 2020 Intrastate and Sawfly tests, a = lines in 2020 Advanced and Sawfly tests (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 101. 2019 Sawfly Yield Test (Exp. 58): All Location Yield (bu/a)

Entry	ID	Pedigree	Bozeman LAT	Havre RCB	Big Sandy LAT	Ft Benton RCB	NS Conrad	4 Loc Avg
	w = white							
		Lattice efficiency over RCB (%)	150%	100%	118%			
38 a	MTS1914	MTS1585//Loma/AAC Gateway	123.9	63.6	87.8	57.9		83.3
8 w	MTS1731	MTS0531*2//PI640431/MTS04114	129.5	57.7	82.5	60.4		82.5
16 i	MTS18116	Loma*2/Warhorse	120.8	63.3	84.1	55.6		81.0
27 a	MTS1903	(Judee sib, MTS0819)//08X350-A6/Warhor:	129.6	61.2	78.2	50.7		79.9
31 w1	MTS1907	Judee//16FAWWON-Irr-87/(MT0977, North	135.9	53.5	74.5	54.5		79.6
44 a	MTS1920	Warhorse*2/Accipiter	117.9	62.3	82.8	52.2		78.8
26	MTS1902	(Judee sib, MTS0819)//08X350-A6/Warhor:	137.0	55.0	73.6	48.1		78.4
19 i	MTS18149	Loma*2/AAC Gateway	128.3	57.0	69.5	57.0		78.0
20	MTS18167	Loma*2/AAC Gateway	125.2	52.7	74.7	59.0		77.9
6	Bobcat	Montana, 2019	116.2	65.8	79.2	49.4		77.7
18	MTS18143	Loma*2/Warhorse	127.5	51.7	77.7	53.7		77.7
21	MTS18169	Loma*2/AAC Gateway	119.4	58.7	74.2	58.3		77.7
39 a	MTS1915	MTS1596//Emerson/Spur	126.5	58.5	77.3	47.7		77.5
32 a	MTS1908	(Judee sib, MTS0819)//08X350-A6/Warhor:	137.4	47.0	74.8	49.8		77.3
33	MTS1909	(Judee sib, MTS0819)//08X350-A6/Warhor:	122.2	60.3	81.1	45.6		77.3
40 a	MTS1916	MTS1596//Emerson/Spur	111.0	65.5	79.1	52.8		77.1
42 a	MTS1918	Judee//MTS0907/MTS0827	123.1	52.9	78.1	54.3		77.1
15 i	MTS1831	MTS0907/MTS0827	128.6	58.6	77.7	41.7		76.7
7 i	MTCS1601R	MTS0531/7/MTS0532/6/96X17E69/3/MTCl	129.0	59.9	68.5	48.3		76.4
9	MTS1801	Judee//MTS0907/MTS0827	125.0	56.1	75.0	48.9		76.3
14	MTS1830	MTS0907/MTS0827	119.5	58.3	85.8	41.7		76.3
36	MTS1912	MT10105/Warhorse//MTS1011	115.3	61.1	73.0	54.9		76.1
43 a	MTS1919	Warhorse*2/Accipiter	110.2	55.4	83.4	55.1		76.0
10	MTS1802	Warhorse*2/Accipiter	118.1	52.6	75.8	57.0		75.9
46 a	MTS1922	08X350-A6/Warhorse	121.3	58.0	71.1	53.0		75.9
34	MTS1910	MTS1054//Warhorse/MTS1008	132.1	54.4	61.1	55.7		75.8
12	MTS1809	08X350-A6/Warhorse	121.1	56.1	64.7	60.8		75.7
2	Judee	check	121.6	51.2	71.3	57.1		75.3
25	MTCS1901	Judee*2/MTCS1301	117.9	57.3	74.4	51.1		75.2
13 i	MTS1810	08X350-A6/Warhorse	122.9	50.8	71.2	55.6		75.1
24	MTCS18222	Judee//Warhorse/MTCS1204	119.6	56.5	66.6	56.4		74.8
22	MTCS18195	MTCS1204*4/MT1138	121.1	57.2	67.8	52.4		74.6
1	Yellowstone	check	126.1	55.7	72.2	42.8		74.2
11	MTS1804	Warhorse*2/Accipiter	117.2	57.8	78.7	42.9		74.2
29	MTS1905	MT10105/Warhorse//MTS1011	124.0	45.6	73.0	53.1		73.9
30	MTS1906	MT10105/Warhorse//MTS1011	123.3	54.1	70.8	46.9		73.8
5	Loma	check	121.9	56.9	72.0	43.6		73.6
28	MTS1904	MTS1054//Warhorse/MTS1008	138.8	53.4	61.8	37.4		72.9
49	MTS1925	03X139cE98/MT0866	111.7	61.9	73.1	44.0		72.7
23	MTCS18211	MTS1597//MTCS1301/MTS1412	120.1	54.3	61.1	55.0		72.6
45	MTS1921	Warhorse//MTS0910/DH01-29-125	110.8	52.0	73.2	52.2		72.1
17	MTS18117	Loma*2/Warhorse	118.2	53.8	70.2	45.7		72.0
47	MTS1923	08X350-A6/Warhorse	107.3	56.4	72.9	50.5		71.8
41	MTS1917	Judee//MTS0907/MTS0827	118.2	54.6	68.4	45.2		71.6
4	Warhorse	check	116.8	47.4	69.4	52.3		71.5
37	MTS1913	Loma*2/AAC Gateway	110.7	55.6	67.6	52.2		71.5
3	Decade	check	125.0	51.7	62.1	44.9		70.9
35	MTS1911	(Colter sib, MT08177)/MTS0916//MTS0826	103.7	52.4	65.4	42.9		66.1
48	MTS1924	03X273cE8/MTS0826	115.7	51.3	57.7	35.7		65.1
Average			121.7	56.0	73.2	50.7		75.4
LSD (0.05)			12.3	7.7	9.4	ns		ns
C.V. (%)			4.6	6.8	5.9	13.3		8.1
P-value (Varieties)			0.0002	0.0013	<.0001	0.0567		0.1230

i = in 2020 Intrastate and Sawfly tests, a = lines in 2020 Advanced and Sawfly tests (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 102. 2019 Sawfly Yield Test (Exp. 58): All Location Test weight (lb/bu)

Entry	ID	Pedigree	Bozeman LAT	Havre LAT	Big Sandy LAT	Ft Benton RCB	4 Loc Avg
		Lattice efficiency over RCB (%)	230%	121%	163%		
24	MTCS18222	Judee//Warhorse/MTCS1204	64.8	62.6	61.9	58.3	61.9
23	MTCS18211	MTS1597//MTCS1301/MTS1412	64.1	60.5	60.8	61.5	61.7
47	MTS1923	08X350-A6/Warhorse	64.2	59.9	60.9	61.6	61.7
13 i	MTS1810	08X350-A6/Warhorse	64.8	59.2	61.5	60.8	61.6
15 i	MTS1831	MTS0907/MTS0827	63.2	60.5	61.4	60.9	61.5
2	Judee	check	63.9	61.3	61.1	59.3	61.4
29	MTS1905	MT10105/Warhorse//MTS1011	63.5	60.4	60.6	60.9	61.4
6	Bobcat	Montana, 2019	63.3	60.3	61.1	60.4	61.3
12	MTS1809	08X350-A6/Warhorse	63.6	60.4	61.1	60.1	61.3
7 i	MTCS1601R	MTS0531/7/MTS0532/6/96X17E69/3/MTCS	64.5	60.6	61.1	58.6	61.2
8 w	MTS1731	MTS0531*2//PI640431/MTS04114	62.8	60.6	60.1	60.7	61.1
31 w1	MTS1907	Judee//16FAWWON-Irr-87/(MT0977, North	63.5	60.2	60.6	60.0	61.1
22	MTCS18195	MTCS1204*4/MT1138	63.5	60.4	60.3	59.8	61.0
46 a	MTS1922	08X350-A6/Warhorse	63.9	59.8	60.3	60.1	61.0
4	Warhorse	check	62.5	59.9	60.5	60.7	60.9
14	MTS1830	MTS0907/MTS0827	63.4	60.4	61.0	58.9	60.9
17	MTS18117	Loma*2/Warhorse	63.0	60.0	60.3	60.1	60.9
25	MTCS1901	Judee*2/MTCS1301	63.2	60.5	60.9	59.0	60.9
43 a	MTS1919	Warhorse*2/Accipiter	63.1	60.3	61.1	59.2	60.9
10	MTS1802	Warhorse*2/Accipiter	63.0	60.4	60.8	59.1	60.8
16 i	MTS18116	Loma*2/Warhorse	62.6	60.0	61.3	59.2	60.8
39 a	MTS1915	MTS1596//Emerson/Spur	62.8	60.0	60.7	59.1	60.7
40 a	MTS1916	MTS1596//Emerson/Spur	61.8	60.5	60.6	59.2	60.5
44 a	MTS1920	Warhorse*2/Accipiter	62.9	60.2	60.5	58.5	60.5
11	MTS1804	Warhorse*2/Accipiter	62.4	59.9	60.3	59.0	60.4
37	MTS1913	Loma*2/AAC Gateway	62.4	59.7	60.4	58.9	60.4
3	Decade	check	62.7	60.3	59.7	58.1	60.2
19 i	MTS18149	Loma*2/AAC Gateway	62.6	58.9	60.6	58.8	60.2
32 a	MTS1908	(Judee sib, MTS0819)//08X350-A6/Warhor:	63.2	59.2	59.7	58.3	60.1
5	Loma	check	61.6	59.5	59.5	59.3	60.0
9	MTS1801	Judee//MTS0907/MTS0827	62.6	59.2	60.1	58.2	60.0
27 a	MTS1903	(Judee sib, MTS0819)//08X350-A6/Warhor:	62.7	59.4	59.7	58.1	60.0
34	MTS1910	MTS1054//Warhorse/MTS1008	62.6	59.7	58.9	58.6	60.0
41	MTS1917	Judee//MTS0907/MTS0827	62.0	58.7	59.9	58.8	59.9
36	MTS1912	MT10105/Warhorse//MTS1011	61.8	59.6	58.8	58.9	59.8
42 a	MTS1918	Judee//MTS0907/MTS0827	62.3	59.7	59.4	57.7	59.8
1	Yellowstone	check	62.9	59.1	59.5	56.9	59.6
21	MTS18169	Loma*2/AAC Gateway	61.1	59.3	60.3	57.7	59.6
35	MTS1911	(Colter sib, MT08177)/MTS0916//MTS0826	62.4	58.9	58.8	58.4	59.6
45	MTS1921	Warhorse//MTS0910/DH01-29-125	61.7	59.8	59.2	57.8	59.6
20	MTS18167	Loma*2/AAC Gateway	61.9	59.7	59.0	57.4	59.5
48	MTS1924	03X273cE8/MTS0826	62.4	58.3	58.5	58.9	59.5
28	MTS1904	MTS1054//Warhorse/MTS1008	63.6	58.8	57.1	57.5	59.3
26	MTS1902	(Judee sib, MTS0819)//08X350-A6/Warhor:	62.3	59.0	58.5	55.7	58.9
30	MTS1906	MT10105/Warhorse//MTS1011	61.1	58.9	58.2	57.5	58.9
33	MTS1909	(Judee sib, MTS0819)//08X350-A6/Warhor:	61.3	58.2	59.2	56.8	58.9
38 a	MTS1914	MTS1585//Loma/AAC Gateway	60.0	59.3	58.0	57.6	58.7
49	MTS1925	03X139cE98/MT0866	60.7	57.3	58.4	57.5	58.5
18	MTS18143	Loma*2/Warhorse	60.1	58.2	57.6	55.9	58.0
Average			62.7	59.7	60.0	58.9	60.3
LSD (0.05)			0.6	0.8	0.9	1.8	1.0
C.V. (%)			0.5	0.6	0.7	1.5	1.2
P-value (Varieties)			<.0001	<.0001	<.0001	<.0001	<.0001

i = in 2020 Intrastate and Sawfly tests, a = lines in 2020 Advanced and Sawfly tests (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 103. 2019 Sawfly Yield Test (Exp. 58): All Location Heading date (days from Jan 1)

Entry	ID	Pedigree	Bozeman LAT	Havre LAT	2 Loc Avg	
	w = white					
		Lattice efficiency over RCB (%)	182%	115%		
31	w1	MTS1907	Judee//16FAWWON-Irr-87/(MT0977, North	171.7	168.8	170.3
3		Decade	check	174.8	167.9	171.4
8	w	MTS1731	MTS0531*2//PI640431/MTS04114	174.9	167.9	171.4
12		MTS1809	08X350-A6/Warhorse	175.2	169.2	172.2
24		MTCS18222	Judee/Warhorse/MTCS1204	176.3	168.7	172.5
45		MTS1921	Warhorse//MTS0910/DH01-29-125	177.1	168.8	173.0
2		Judee	check	176.5	169.7	173.1
6		Bobcat	Montana, 2019	177.5	169.3	173.4
38	a	MTS1914	MTS1585//Loma/AAC Gateway	176.5	170.4	173.5
7	i	MTCS1601R	MTS0531/7/MTS0532/6/96X17E69/3/MTCS1	177.3	169.8	173.6
25		MTCS1901	Judee*2/MTCS1301	178.2	169.5	173.9
29		MTS1905	MT10105/Warhorse//MTS1011	176.7	171.1	173.9
22		MTCS18195	MTCS1204*4/MT1138	176.8	171.2	174.0
9		MTS1801	Judee//MTS0907/MTS0827	176.0	172.2	174.1
4		Warhorse	check	176.9	171.5	174.2
11		MTS1804	Warhorse*2/Accipiter	177.1	171.3	174.2
34		MTS1910	MTS1054//Warhorse/MTS1008	178.5	170.6	174.6
42	a	MTS1918	Judee//MTS0907/MTS0827	177.4	172.0	174.7
28		MTS1904	MTS1054//Warhorse/MTS1008	179.3	170.2	174.8
40	a	MTS1916	MTS1596//Emerson/Spur	178.8	170.8	174.8
1		Yellowstone	check	179.2	171.8	175.5
23		MTCS18211	MTS1597//MTCS1301/MTS1412	178.6	172.8	175.7
30		MTS1906	MT10105/Warhorse//MTS1011	178.2	173.2	175.7
36		MTS1912	MT10105/Warhorse//MTS1011	178.7	172.6	175.7
41		MTS1917	Judee//MTS0907/MTS0827	177.1	174.4	175.8
33		MTS1909	(Judee sib, MTS0819)//08X350-A6/Warhor:	180.4	171.4	175.9
17		MTS18117	Loma*2/Warhorse	179.4	172.5	176.0
37		MTS1913	Loma*2/AAC Gateway	179.6	172.5	176.1
5		Loma	check	180.6	171.8	176.2
18		MTS18143	Loma*2/Warhorse	178.3	174.1	176.2
10		MTS1802	Warhorse*2/Accipiter	179.5	173.1	176.3
47		MTS1923	08X350-A6/Warhorse	179.1	173.5	176.3
27	a	MTS1903	(Judee sib, MTS0819)//08X350-A6/Warhor:	179.6	173.2	176.4
43	a	MTS1919	Warhorse*2/Accipiter	180.6	172.2	176.4
13	i	MTS1810	08X350-A6/Warhorse	180.6	172.6	176.6
39	a	MTS1915	MTS1596//Emerson/Spur	179.7	173.4	176.6
44	a	MTS1920	Warhorse*2/Accipiter	179.9	173.4	176.7
48		MTS1924	03X273cE8/MTS0826	179.4	173.9	176.7
21		MTS18169	Loma*2/AAC Gateway	179.1	174.6	176.9
32	a	MTS1908	(Judee sib, MTS0819)//08X350-A6/Warhor:	180.3	174.1	177.2
14		MTS1830	MTS0907/MTS0827	181.4	173.6	177.5
26		MTS1902	(Judee sib, MTS0819)//08X350-A6/Warhor:	180.7	174.3	177.5
15	i	MTS1831	MTS0907/MTS0827	180.7	174.4	177.6
46	a	MTS1922	08X350-A6/Warhorse	180.3	175.1	177.7
20		MTS18167	Loma*2/AAC Gateway	181.1	174.9	178.0
35		MTS1911	(Colter sib, MT08177)/MTS0916//MTS0826	180.6	175.4	178.0
16	i	MTS18116	Loma*2/Warhorse	181.3	174.9	178.1
49		MTS1925	03X139cE98/MT0866	181.2	174.9	178.1
19	i	MTS18149	Loma*2/AAC Gateway	181.6	175.7	178.7
Average			178.6	172.1	175.4	
LSD (0.05)			1.4	3.4	2.1	
C.V. (%)			0.3	0.9	0.6	
P-value (Varieties)			<.0001	0.0001	<.0001	

i = in 2020 Intrastate and Sawfly tests, a = lines in 2020 Advanced and Sawfly tests (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 104. 2019 Sawfly Yield Test (Exp. 58): All Location Plant height (in)

Entry	ID	Pedigree	Bozeman LAT	Havre RCB	Big Sandy Ft Benton LAT	3 Loc Avg
	w = white					
		Lattice efficiency over RCB (%)	106%	101%	106%	
38 a	MTS1914	MTS1585//Loma/AAC Gateway	29.6	21.2	27.1	26.0
35	MTS1911	(Colter sib, MT08177)/MTS0916//MTS0826	29.9	27.4	28.0	28.4
30	MTS1906	MT10105/Warhorse//MTS1011	32.5	25.7	27.3	28.5
37	MTS1913	Loma*2//AAC Gateway	32.7	24.5	28.2	28.5
16 i	MTS18116	Loma*2/Warhorse	31.7	24.9	29.2	28.6
15 i	MTS1831	MTS0907//MTS0827	31.5	26.9	27.8	28.7
19 i	MTS18149	Loma*2//AAC Gateway	32.7	24.8	28.9	28.8
21	MTS18169	Loma*2//AAC Gateway	32.3	25.1	29.0	28.8
17	MTS18117	Loma*2/Warhorse	32.5	25.2	29.1	28.9
25	MTCS1901	Judee*2//MTCS1301	32.3	26.1	28.4	28.9
6	Bobcat	Montana, 2019	31.0	27.3	29.1	29.1
24	MTCS18222	Judee//Warhorse/MTCS1204	33.0	26.7	27.7	29.1
36	MTS1912	MT10105/Warhorse//MTS1011	32.1	26.3	29.0	29.1
20	MTS18167	Loma*2//AAC Gateway	33.2	26.0	28.5	29.2
40 a	MTS1916	MTS1596//Emerson/Spur	32.6	26.1	29.3	29.3
14	MTS1830	MTS0907//MTS0827	32.5	26.9	28.8	29.4
39 a	MTS1915	MTS1596//Emerson/Spur	32.1	27.0	29.1	29.4
45	MTS1921	Warhorse//MTS0910/DH01-29-125	33.1	25.5	29.5	29.4
4	Warhorse	check	32.9	26.7	29.0	29.5
5	Loma	check	32.7	26.4	29.8	29.6
8	w MTS1731	MTS0531*2//PI640431/MTS04114	32.6	26.8	29.8	29.7
11	MTS1804	Warhorse*2//Accipiter	34.0	25.7	29.6	29.8
18	MTS18143	Loma*2//Warhorse	33.0	27.5	29.1	29.9
48	MTS1924	03X273cE8//MTS0826	32.9	27.5	29.3	29.9
31 w1	MTS1907	Judee//16FAWWON-Irr-87/(MT0977, North	33.5	27.0	29.6	30.0
43 a	MTS1919	Warhorse*2//Accipiter	32.6	27.9	29.8	30.1
49	MTS1925	03X139cE98//MT0866	32.9	25.8	31.5	30.1
10	MTS1802	Warhorse*2//Accipiter	34.6	26.2	29.7	30.2
41	MTS1917	Judee//MTS0907//MTS0827	33.0	28.7	29.9	30.5
44 a	MTS1920	Warhorse*2//Accipiter	33.2	28.9	29.7	30.6
3	Decade	check	33.8	26.3	31.9	30.7
26	MTS1902	(Judee sib, MTS0819)//08X350-A6/Warhor:	34.8	26.4	30.9	30.7
27 a	MTS1903	(Judee sib, MTS0819)//08X350-A6/Warhor:	33.7	27.5	30.9	30.7
12	MTS1809	08X350-A6/Warhorse	34.3	27.7	30.9	31.0
29	MTS1905	MT10105/Warhorse//MTS1011	35.0	28.0	30.0	31.0
34	MTS1910	MTS1054//Warhorse/MTS1008	34.5	28.9	29.6	31.0
33	MTS1909	(Judee sib, MTS0819)//08X350-A6/Warhor:	33.2	28.7	32.0	31.3
46 a	MTS1922	08X350-A6/Warhorse	33.9	28.9	31.0	31.3
22	MTCS18195	MTCS1204*4//MT1138	35.5	28.0	30.9	31.5
42 a	MTS1918	Judee//MTS0907//MTS0827	34.4	29.2	30.9	31.5
32 a	MTS1908	(Judee sib, MTS0819)//08X350-A6/Warhor:	35.0	30.0	29.8	31.6
47	MTS1923	08X350-A6/Warhorse	35.3	28.2	31.2	31.6
2	Judee	check	35.1	28.4	31.6	31.7
9	MTS1801	Judee//MTS0907//MTS0827	35.7	30.0	29.8	31.8
7 i	MTCS1601R	MTS0531/7//MTS0532/6/96X17E69/3//MTCS	35.2	30.3	30.6	32.0
13 i	MTS1810	08X350-A6/Warhorse	35.2	29.0	31.7	32.0
28	MTS1904	MTS1054//Warhorse/MTS1008	35.4	29.0	31.7	32.0
1	Yellowstone	check	36.5	27.4	32.8	32.2
23	MTCS18211	MTS1597//MTCS1301/MTS1412	35.7	30.4	31.0	32.4
Average			33.4	27.2	29.8	30.1
LSD (0.05)			1.6	2.1	2.3	1.5
C.V. (%)			2.2	3.9	3.6	3.1
P-value (Varieties)			<.0001	<.0001	0.0012	<.0001

i = in 2020 Intrastate and Sawfly tests, a = lines in 2020 Advanced and Sawfly tests (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 105. 2019 Sawfly Yield Test (Exp. 58): All Location Stem solidness (5 - 25)

Entry	ID	Pedigree	Bozeman RCB	Havre RCB	Big Sandy RCB	Ft Benton RCB	Conrad 1 rep	5 Loc Avg
	w = white							
		Sawfly infestation of clipped stems	7%	27%	55%	33%	51%	
47	MTS1923	08X350-A6/Warhorse	23.8	24.8	23.0	24.7	25.0	24.3
13 i	MTS1810	08X350-A6/Warhorse	23.8	24.0	24.4	24.0	23.8	24.0
10	MTS1802	Warhorse*2/Accipiter	23.0	24.7	23.7	23.1	25.0	23.9
35	MTS1911	(Colter sib, MT08177)/MTS0916//MTS0826	23.1	24.1	24.0	23.7	24.2	23.8
6	Bobcat	Montana, 2019	23.0	23.7	23.8	23.7	24.5	23.7
14	MTS1830	MTS0907/MTS0827	22.4	24.8	23.4	23.8	23.8	23.6
29	MTS1905	MT10105/Warhorse//MTS1011	21.3	24.7	23.3	23.0	25.0	23.5
43 a	MTS1919	Warhorse*2/Accipiter	23.3	23.9	23.4	22.5	24.5	23.5
45	MTS1921	Warhorse//MTS0910/DH01-29-125	22.4	24.1	22.8	23.4	24.7	23.5
16 i	MTS18116	Loma*2/Warhorse	22.3	24.7	23.4	22.6	24.0	23.4
32 a	MTS1908	(Judee sib, MTS0819)//08X350-A6/Warhor:	22.4	23.7	23.5	23.1	24.3	23.4
36	MTS1912	MT10105/Warhorse//MTS1011	23.5	23.8	22.4	22.8	24.5	23.4
40 a	MTS1916	MTS1596//Emerson/Spur	22.8	24.0	23.5	22.6	23.9	23.4
18	MTS18143	Loma*2/Warhorse	22.4	24.4	23.0	21.9	24.8	23.3
30	MTS1906	MT10105/Warhorse//MTS1011	22.3	24.3	24.1	22.2	23.8	23.3
46 a	MTS1922	08X350-A6/Warhorse	22.7	24.7	24.2	22.6	22.5	23.3
39 a	MTS1915	MTS1596//Emerson/Spur	23.6	23.8	22.7	20.9	25.0	23.2
42 a	MTS1918	Judee//MTS0907/MTS0827	21.7	24.4	22.9	21.9	25.0	23.2
11	MTS1804	Warhorse*2/Accipiter	22.5	23.3	23.4	21.8	24.3	23.1
27 a	MTS1903	(Judee sib, MTS0819)//08X350-A6/Warhor:	21.3	24.2	23.3	21.6	25.0	23.1
33	MTS1909	(Judee sib, MTS0819)//08X350-A6/Warhor:	21.3	24.8	23.4	21.8	24.2	23.1
15 i	MTS1831	MTS0907/MTS0827	23.0	24.0	23.3	22.1	22.8	23.0
25	MTCS1901	Judee*2/MTCS1301	21.3	23.6	23.0	22.3	24.8	23.0
4	Warhorse	check	20.9	23.8	22.8	22.2	25.0	22.9
44 a	MTS1920	Warhorse*2/Accipiter	22.2	23.8	22.2	22.6	23.5	22.9
8 w	MTS1731	MTS0531*2//PI640431/MTS04114	21.2	24.3	22.3	22.0	24.3	22.8
24	MTCS18222	Judee//Warhorse/MTCS1204	21.1	23.8	22.5	21.6	24.3	22.7
41	MTS1917	Judee//MTS0907/MTS0827	19.8	24.1	22.6	22.0	24.3	22.6
12	MTS1809	08X350-A6/Warhorse	21.9	23.5	23.1	22.4	21.8	22.5
21	MTS18169	Loma*2/AAC Gateway	21.0	24.6	22.5	21.6	22.9	22.5
26	MTS1902	(Judee sib, MTS0819)//08X350-A6/Warhor:	21.4	23.3	22.7	20.5	24.4	22.5
48	MTS1924	03X273cE8/MTS0826	19.9	24.0	23.7	20.2	24.7	22.5
38 a	MTS1914	MTS1585//Loma/AAC Gateway	21.4	22.4	21.6	22.6	24.0	22.4
9	MTS1801	Judee//MTS0907/MTS0827	21.4	23.8	22.3	21.9	22.0	22.3
17	MTS18117	Loma*2/Warhorse	21.9	23.2	22.5	21.3	22.5	22.3
37	MTS1913	Loma*2/AAC Gateway	20.6	24.4	22.5	20.3	21.0	21.8
2	Judee	check	19.3	23.0	20.9	21.3	23.0	21.5
22	MTCS18195	MTCS1204*4/MT1138	18.4	23.4	21.8	22.8	21.3	21.5
5	Loma	check	19.6	23.5	21.1	21.0	21.8	21.4
49	MTS1925	03X139cE98/MT0866	16.9	23.1	22.3	21.2	22.8	21.3
19 i	MTS18149	Loma*2/AAC Gateway	19.1	23.5	20.6	18.9	22.8	21.0
31 w1	MTS1907	Judee//16FAWWON-Irr-87/(MT0977, North	18.6	22.3	20.7	19.6	24.0	21.0
7 i	MTCS1601R	MTS0531/7/MTS0532/6/96X17E69/3/MTCl	19.3	23.2	22.3	18.7	21.0	20.9
28	MTS1904	MTS1054//Warhorse/MTS1008	18.6	23.5	20.9	18.5	21.5	20.6
20	MTS18167	Loma*2/AAC Gateway	19.0	23.2	20.5	15.6	23.3	20.3
23	MTCS18211	MTS1597//MTCS1301/MTS1412	18.2	21.0	20.3	18.1	24.0	20.3
34	MTS1910	MTS1054//Warhorse/MTS1008	17.7	20.5	20.7	17.8	21.8	19.7
3	Decade	check	10.9	10.1	10.4	8.2	8.5	9.6
1	Yellowstone	check	10.0	9.3	9.4	6.8	7.0	8.5
Average			20.8	23.2	22.1	21.1	23.0	22.0
LSD (0.05)			2.3	1.9	2.1	2.0		1.3
C.V. (%)			5.4	4.1	4.8	4.8		4.6
P-value (Varieties)			<.0001	<.0001	<.0001	<.0001		<.0001

i = in 2020 Intrastate and Sawfly tests, a = lines in 2020 Advanced and Sawfly tests (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 106. 2019 Sawfly Yield Test (Exp. 58): All Location Sawfly - Infested stems

		Number of stems with tunneling/rep = 0-5					4 loc Avg	Stem solid
Entry	ID	Pedigree	Havre	Big Sandy	Ft Benton	Conrad		
w = white								
		Sawfly infestation of clipped stems	27%	55%	33%	51%		5 llocs
35	MTS1911	(Colter sib, MT08177)/MTS0916//MTS0826	0.0	0.9	1.5	1	0.9	23.8
20	MTS18167	Loma*2/AAC Gateway	1.0	2.2	0.5	0	0.9	20.3
44 a	MTS1920	Warhorse*2/Accipiter	0.0	2.5	1.0	0	0.9	22.9
47	MTS1923	08X350-A6/Warhorse	0.0	0.4	1.5	2	1.0	24.3
13 i	MTS1810	08X350-A6/Warhorse	0.5	1.0	0.0	3	1.1	24.0
4	Warhorse	check	0.5	2.1	0.0	2	1.2	22.9
21	MTS18169	Loma*2/AAC Gateway	0.5	2.1	0.0	2	1.2	22.5
46 a	MTS1922	08X350-A6/Warhorse	0.5	2.6	1.5	0	1.2	23.3
10	MTS1802	Warhorse*2/Accipiter	0.0	2.9	0.5	2	1.4	23.9
40 a	MTS1916	MTS1596//Emerson/Spur	1.0	3.5	0.0	1	1.4	23.4
3	Decade	check	0.0	2.1	1.0	3	1.5	9.6
12	MTS1809	08X350-A6/Warhorse	0.5	2.5	1.5	2	1.6	22.5
14	MTS1830	MTS0907/MTS0827	0.0	2.8	0.5	3	1.6	23.6
42 a	MTS1918	Judee//MTS0907/MTS0827	1.0	2.9	0.5	2	1.6	23.2
15 i	MTS1831	MTS0907/MTS0827	1.5	1.4	1.0	3	1.7	23.0
25	MTCS1901	Judee*2/MTCS1301	2.0	3.2	0.5	1	1.7	23.0
37	MTS1913	Loma*2/AAC Gateway	0.0	3.1	1.5	2	1.7	21.8
9	MTS1801	Judee//MTS0907/MTS0827	1.5	3.3	0.5	2	1.8	22.3
16 i	MTS18116	Loma*2/Warhorse	0.5	1.2	2.5	3	1.8	23.4
43 a	MTS1919	Warhorse*2/Accipiter	0.0	2.5	1.5	3	1.8	23.5
49	MTS1925	03X139cE98/MT0866	3.5	2.1	1.5	0	1.8	21.3
6	Bobcat	Montana, 2019	1.5	0.0	2.0	4	1.9	23.7
7 i	MTCS1601R	MTS0531/7//MTS0532/6/96X17E69/3//MTCS1	0.0	3.0	2.5	2	1.9	20.9
45	MTS1921	Warhorse//MTS0910/DH01-29-125	2.0	3.9	0.5	1	1.9	23.5
27 a	MTS1903	(Judee sib, MTS0819)//08X350-A6/Warhor:	1.5	1.8	0.5	4	2.0	23.1
29	MTS1905	MT10105/Warhorse//MTS1011	0.5	3.1	2.5	2	2.0	23.5
32 a	MTS1908	(Judee sib, MTS0819)//08X350-A6/Warhor:	1.0	1.6	2.5	3	2.0	23.4
1	Yellowstone	check	2.0	3.1	0.5	3	2.2	8.5
23	MTCS18211	MTS1597//MTCS1301/MTS1412	1.0	4.5	1.5	2	2.3	20.3
39 a	MTS1915	MTS1596//Emerson/Spur	2.5	2.3	1.5	3	2.3	23.2
11	MTS1804	Warhorse*2/Accipiter	2.0	2.7	2.0	3	2.4	23.1
19 i	MTS18149	Loma*2/AAC Gateway	2.0	2.4	3.0	2	2.4	21.0
26	MTS1902	(Judee sib, MTS0819)//08X350-A6/Warhor:	1.0	3.2	2.5	3	2.4	22.5
30	MTS1906	MT10105/Warhorse//MTS1011	1.5	2.4	3.5	2	2.4	23.3
8 w	MTS1731	MTS0531*2//PI640431/MTS04114	0.0	4.0	2.0	4	2.5	22.8
41	MTS1917	Judee//MTS0907/MTS0827	2.5	2.5	2.0	3	2.5	22.6
17	MTS18117	Loma*2/Warhorse	2.0	3.4	3.5	2	2.7	22.3
33	MTS1909	(Judee sib, MTS0819)//08X350-A6/Warhor:	1.0	2.1	3.5	4	2.7	23.1
24	MTCS18222	Judee//Warhorse/MTCS1204	3.5	2.0	3.5	2	2.8	22.7
36	MTS1912	MT10105/Warhorse//MTS1011	2.0	4.0	1.0	4	2.8	23.4
5	Loma	check	1.0	4.5	1.0	5	2.9	21.4
48	MTS1924	03X273cE8/MTS0826	2.0	3.3	2.5	4	3.0	22.5
2	Judee	check	2.0	3.8	3.5	3	3.1	21.5
22	MTCS18195	MTCS1204*4/MT1138	2.5	3.3	3.5	3	3.1	21.5
31 w1	MTS1907	Judee//16FAWWON-Irr-87/(MT0977, North	3.0	3.8	1.5	4	3.1	21.0
34	MTS1910	MTS1054//Warhorse/MTS1008	2.5	3.9	1.0	5	3.1	19.7
38 a	MTS1914	MTS1585//Loma/AAC Gateway	4.0	2.0	1.5	5	3.1	22.4
28	MTS1904	MTS1054//Warhorse/MTS1008	2.5	4.1	3.0	3	3.2	20.6
18	MTS18143	Loma*2/Warhorse	1.5	4.0	2.5	5	3.3	23.3
Average			1.3	2.7	1.6	2.6	2.1	22.0
LSD (0.05)			2.0	ns	2.1		1.4	1.3
C.V. (%)			75.1	47.3	64.5		49.1	4.6
P-value (Varieties)			0.0074	0.3725	0.0056		0.0016	<.0001

i = in 2020 Intrastate and Sawfly tests, a = lines in 2020 Advanced and Sawfly tests (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 107. 2019 Sawfly Yield Test (Exp. 58): All Location Sawfly Cutting %

Entry	ID	Pedigree	Havre LAT	Big Sandy LAT	Ft Benton RCB	3 Loc Avg
	w = white					
		Sawfly infestation of clipped stems	139%	150%		
13 i	MTS1810	08X350-A6/Warhorse	0	0	1	0
47	MTS1923	08X350-A6/Warhorse	0	0	1	0
35	MTS1911	(Colter sib, MT08177)/MTS0916/MTS0826	0	0	8	3
40 a	MTS1916	MTS1596//Emerson/Spur	2	0	8	3
39 a	MTS1915	MTS1596//Emerson/Spur	0	0	13	4
46 a	MTS1922	08X350-A6/Warhorse	3	0	18	7
15 i	MTS1831	MTS0907/MTS0827	3	9	10	7
11	MTS1804	Warhorse*2/Accipiter	0	10	15	8
16 i	MTS18116	Loma*2/Warhorse	2	8	15	8
6	Bobcat	Montana, 2019	0	9	18	9
4	Warhorse	check	2	9	23	11
32 a	MTS1908	(Judee sib, MTS0819)//08X350-A6/Warhor:	2	9	23	11
48	MTS1924	03X273cE8/MTS0826	2	8	25	12
10	MTS1802	Warhorse*2/Accipiter	3	14	20	12
14	MTS1830	MTS0907/MTS0827	2	15	20	12
29	MTS1905	MT10105/Warhorse//MTS1011	2	7	28	12
43 a	MTS1919	Warhorse*2/Accipiter	0	16	25	14
30	MTS1906	MT10105/Warhorse//MTS1011	6	14	30	17
27 a	MTS1903	(Judee sib, MTS0819)//08X350-A6/Warhor:	5	21	25	17
20	MTS18167	Loma*2/AAC Gateway	7	27	23	19
41	MTS1917	Judee//MTS0907/MTS0827	6	15	40	20
42 a	MTS1918	Judee//MTS0907/MTS0827	7	24	30	20
12	MTS1809	08X350-A6/Warhorse	6	18	38	21
36	MTS1912	MT10105/Warhorse//MTS1011	5	17	40	21
19 i	MTS18149	Loma*2/AAC Gateway	0	31	35	22
33	MTS1909	(Judee sib, MTS0819)//08X350-A6/Warhor:	9	24	35	23
44 a	MTS1920	Warhorse*2/Accipiter	4	37	28	23
25	MTCS1901	Judee*2/MTCS1301	14	20	40	25
38 a	MTS1914	MTS1585//Loma/AAC Gateway	5	34	35	25
21	MTS18169	Loma*2/AAC Gateway	2	23	55	27
26	MTS1902	(Judee sib, MTS0819)//08X350-A6/Warhor:	13	32	35	27
17	MTS18117	Loma*2/Warhorse	7	29	50	29
37	MTS1913	Loma*2/AAC Gateway	10	27	50	29
45	MTS1921	Warhorse//MTS0910/DH01-29-125	7	25	55	29
49	MTS1925	03X139cE98/MT0866	6	33	50	30
28	MTS1904	MTS1054//Warhorse/MTS1008	10	37	45	31
8	w MTS1731	MTS0531*2//PI640431/MTS04114	4	52	40	32
9	MTS1801	Judee//MTS0907/MTS0827	5	56	35	32
24	MTCS18222	Judee//Warhorse/MTCS1204	11	40	45	32
31	w1 MTS1907	Judee//16FAWWON-Irr-87/(MT0977, North	18	43	40	34
23	MTCS18211	MTS1597//MTCS1301/MTS1412	15	45	50	37
18	MTS18143	Loma*2/Warhorse	10	54	50	38
2	Judee	check	24	43	50	39
5	Loma	check	19	57	50	42
7 i	MTCS1601R	MTS0531/7/MTS0532/6/96X17E69/3/MTCL	4	70	55	43
3	Decade	check	16	67	50	44
34	MTS1910	MTS1054//Warhorse/MTS1008	11	74	55	47
22	MTCS18195	MTCS1204*4/MT1138	22	82	50	51
1	Yellowstone	check	45	93	75	71
Average			7.2	28.0	33.7	23.1
LSD (0.05)			11.0	27.4	12.8	17.0
C.V. (%)			70.0	44.2	18.9	45.6
P-value (Varieties)			<.0001	<.0001	<.0001	<.0001

i = in 2020 Intrastate and Sawfly tests, a = lines in 2020 Advanced and Sawfly tests (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 108. 2019 Sawfly Yield Test (Exp. 58): All Location Protein (%)

Entry	ID	Pedigree	Bozeman bulk	Havre RCB	Big Sandy LAT	Ft Benton RCB	4 Loc Avg
	w = white						
		Lattice efficiency over RCB (%)		100%	164%		
48	MTS1924	03X273cE8/MTS0826	13.2	15.6	14.8	14.6	14.6
43 a	MTS1919	Warhorse*2/Accipiter	13.1	15.8	14.0	13.7	14.2
10	MTS1802	Warhorse*2/Accipiter	12.9	15.7	13.8	13.9	14.1
25	MTCS1901	Judee*2/MTCS1301	12.8	15.3	14.3	13.9	14.1
2	Judee	check	12.1	15.7	14.4	13.6	14.0
11	MTS1804	Warhorse*2/Accipiter	12.6	15.6	14.1	13.8	14.0
12	MTS1809	08X350-A6/Warhorse	12.5	15.6	14.2	13.6	14.0
18	MTS18143	Loma*2/Warhorse	12.5	15.5	14.0	13.8	14.0
37	MTS1913	Loma*2/AAC Gateway	12.3	15.4	14.5	13.9	14.0
4	Warhorse	check	12.6	15.6	13.7	13.5	13.9
13 i	MTS1810	08X350-A6/Warhorse	12.2	15.8	14.0	13.7	13.9
44 a	MTS1920	Warhorse*2/Accipiter	12.8	15.1	13.8	14.0	13.9
3	Decade	check	12.1	15.2	14.5	13.4	13.8
17	MTS18117	Loma*2/Warhorse	12.3	15.1	14.0	13.7	13.8
28	MTS1904	MTS1054/Warhorse/MTS1008	12.3	15.5	13.8	13.4	13.8
47	MTS1923	08X350-A6/Warhorse	12.3	15.2	14.2	13.4	13.8
21	MTS18169	Loma*2/AAC Gateway	12.4	15.1	13.6	13.7	13.7
30	MTS1906	MT10105/Warhorse/MTS1011	12.5	15.0	13.8	13.6	13.7
35	MTS1911	(Colter sib, MT08177)/MTS0916/MTS0826	12.4	14.9	14.0	13.6	13.7
42 a	MTS1918	Judee/MTS0907/MTS0827	12.3	14.9	13.8	13.7	13.7
45	MTS1921	Warhorse/MTS0910/DH01-29-125	12.6	15.1	13.6	13.5	13.7
49	MTS1925	03X139cE98/MT0866	12.4	15.1	13.6	13.7	13.7
5	Loma	check	12.1	15.0	13.7	13.4	13.6
9	MTS1801	Judee/MTS0907/MTS0827	12.2	14.8	13.5	13.7	13.6
20	MTS18167	Loma*2/AAC Gateway	11.9	14.9	13.9	13.7	13.6
23	MTCS18211	MTS1597/MTCS1301/MTS1412	12.7	14.6	13.7	13.3	13.6
46 a	MTS1922	08X350-A6/Warhorse	12.1	14.8	14.0	13.3	13.6
8 w	MTS1731	MTS0531*2//PI640431/MTS04114	12.9	14.8	13.1	13.1	13.5
19 i	MTS18149	Loma*2/AAC Gateway	11.9	15.1	13.6	13.5	13.5
34	MTS1910	MTS1054/Warhorse/MTS1008	11.9	15.2	13.9	13.1	13.5
40 a	MTS1916	MTS1596/Emerson/Spur	13.2	14.6	13.1	13.2	13.5
41	MTS1917	Judee/MTS0907/MTS0827	12.3	14.8	13.6	13.4	13.5
33	MTS1909	(Judee sib, MTS0819)/08X350-A6/Warhor:	11.9	14.9	13.3	13.6	13.4
39 a	MTS1915	MTS1596/Emerson/Spur	12.6	14.4	13.2	13.5	13.4
1	Yellowstone	check	11.7	14.7	13.8	13.0	13.3
6	Bobcat	Montana, 2019	11.7	14.9	13.6	13.0	13.3
24	MTCS18222	Judee/Warhorse/MTCS1204	11.8	14.7	13.6	13.0	13.3
36	MTS1912	MT10105/Warhorse/MTS1011	12.0	14.9	13.4	13.0	13.3
7 i	MTCS1601R	MTS0531/7/MTS0532/6/96X17E69/3/MTCS	11.9	14.7	13.2	12.9	13.2
26	MTS1902	(Judee sib, MTS0819)/08X350-A6/Warhor:	11.8	14.5	13.2	12.9	13.1
27 a	MTS1903	(Judee sib, MTS0819)/08X350-A6/Warhor:	11.7	14.3	13.2	13.2	13.1
29	MTS1905	MT10105/Warhorse/MTS1011	11.8	14.5	13.1	12.8	13.1
32 a	MTS1908	(Judee sib, MTS0819)/08X350-A6/Warhor:	11.6	14.6	13.3	13.0	13.1
38 a	MTS1914	MTS1585/Loma/AAC Gateway	11.7	14.3	13.1	13.1	13.1
31 w1	MTS1907	Judee/16FAWWON-Irr-87/(MT0977, North	11.5	14.4	13.3	12.7	13.0
14	MTS1830	MTS0907/MTS0827	11.5	13.9	12.7	13.6	12.9
22	MTCS18195	MTCS1204*4/MT1138	11.9	14.2	13.1	12.4	12.9
16 i	MTS18116	Loma*2/Warhorse	11.4	14.1	12.7	12.8	12.8
15 i	MTS1831	MTS0907/MTS0827	11.2	14.0	12.7	13.0	12.7
Average			12.2	14.9	13.7	13.4	13.6
LSD (0.05)				0.4	0.4	0.4	0.4
C.V. (%)				1.2	1.4	1.7	2.0
P-value (Varieties)				<.0001	<.0001	<.0001	<.0001

i = in 2020 Intrastate and Sawfly tests, a = lines in 2020 Advanced and Sawfly tests (all other MT lines dropped from testing)

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 109. 2019 Sawfly Winter Wheat Test (Exp. 58): Plant Disease Assessment

Cultivar/Line		Stripe Rust					Aluminum tolerance				
		Pullman, WA		MT. Vernon, WA		Montana					
		Flowering		Stem elong.		Milk	Sr - FE	Rockford, WA			
		IT ^{1/}	%	IT ^{1/}	%			IT ^{1/}	%	'Early'	'Later'
								higher # is better			
1	Yellowstone	5	20	3	20	2	5	5	1	1	
2	Judee	2	2	3	20	2	10	60	2	2	
3	Decade	8	20	8	30	8	80		2	2	
4	Warhorse	2	2	3	30	2	10		2	2	
5	Loma	2	2	5	30	2	5		1	1	
6	Bobcat	2	5	2	10	2	10	5	1	1	
7 i	MTCS1601R	2	5	2	10	2	5		1	1	
8 w	MTS1731	2	5	2	10	2	5		1	1	
9	MTS1801	2	2	2	10	2	10		1	1	
10	MTS1802	2	2	2	10	2	10		4	4	
11	MTS1804	2	2	2	10	2	10		3	3	
12	MTS1809	2	2	2	10	2	10		3	2	
13 i	MTS1810	2	5	3	20	2	10		2	2	
14	MTS1830	2	2	2	10	2	5		1	1	
15 i	MTS1831	2	2	2	10	2	5		1	1	
16 i	MTS18116	2	2	2	10	3	20		1	1	
17	MTS18117	2	2	8	30	2	10		1	1	
18	MTS18143	2	2	2	10	2	10		1	1	
19 i	MTS18149	2	5	2	10	2	10		5	5	
20	MTS18167	2	2	3	20	2	15		5	1	1
21	MTS18169	2	2	3	20	2	10			1	1
22	MTCS18195	8	20	3	20	2	10	1		1	
23	MTCS18211	2	5	2	10	2	5	3		2	
24	MTCS18222	2	2	3	20	2	10		2	2	
25	MTCS1901	2	2	3	20	2	5		2	2	
26	MTS1902	2	2	3	20	2	5		2	2	
27 a	MTS1903	2	2	2	10	2	5		2	2	
28	MTS1904	2	2	3	20	3	15		2	2	
29	MTS1905	2	2	2	10	2	5		2	2	
30	MTS1906	2	2	3	20	2	5		1	1	
31 w1	MTS1907	2	2	2	10	2	5		1	1	
32 a	MTS1908	2	2	2	10	2	5		3	2	
33	MTS1909	2	2	2	10	2	2		3	3	
34	MTS1910	2	2	3	20	2	10		4	4	
35	MTS1911	2	2	2	10	2	5		1	1	
36	MTS1912	2	2	2	10	2	10		4	4	
37	MTS1913	2	2	2	10	2	5		1	1	
38 a	MTS1914	2	2	8	40	2	5		3	3	
39 a	MTS1915	2	2	2	10	2	5		3	2	
40 a	MTS1916	2	2	3	20	2	5		3	2	
41	MTS1917	2	2	3	20	2	10		2	1	
42 a	MTS1918	2	2	2	10	2	5		2	1	
43 a	MTS1919	2	2	2	10	2	10		3	2	
44 a	MTS1920	2	5	2	10	2	10		2	1	
45	MTS1921	2	2	3	20	2	10		3	2	
46 a	MTS1922	2	2	2	10	2	5		1	1	
47	MTS1923	2	2	3	20	2	5		1	1	
48	MTS1924	3	10	2	10	2	2	25	1	1	
49	MTS1925	8	60	8	80	8	80		2	2	
Average		5		17		11			2.0	1.8	

i = in 2020 Intrastate and Sawfly tests, a = lines in 2020 Advanced and Sawfly tests (all other MT lines dropped from testing)

1/ Infection Type (IT) was recorded based on the 0-9 scale with ITs 8 and 9 combined as 8 (the most susceptible reaction) in field data. Generally IT 0-3 are considered resistant, 4-6 intermediate, and 7-9 susceptible. Heterogenous reactions of an entry were indicated by two or more ITs separated by "," for most plants with the first IT and few plants with the second IT or connected with "-" for entries containing plants with continuous ITs.

Table 110. 2019 Preliminary A Test: All location Summary

Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Sawfly cutting %	Protein %
w = white								
		locations	5	5	4	4	2	5
4	SY Monument	check	90.8	60.4	171.8	32.1	57	11.5
49	MT19190	MT0871/02X159E41	87.8	58.9	173.4	31.6	54	12.8
39	MT19180	MT1090//MT0861/MT0887	87.3	60.0	172.0	32.9	54	11.9
8 a	MTCL19149	MTCL1125/MT1091	86.7	60.8	174.2	33.5	59	12.2
34 a	MT19175	SD08198/Northern	86.7	60.5	176.0	31.4	57	11.9
35 a	MT19176	MTW1098//Yellowstone-Lr41/Decade	86.7	62.2	170.4	31.3	41	12.7
55 a	MT19196	Northern//Yellowstone/MTW0880	86.7	60.6	175.3	34.2	47	12.2
42 a	MT19183	MT1078//AAC Gateway/MT1265	86.2	61.4	173.7	33.6	33	12.2
32 a	MT19173	HV9W04-1594R/Accipiter	86.1	61.6	173.1	30.5	50	12.2
47	MT19188	MT0866//MT08184/NE06549	85.8	60.2	173.3	31.1	36	12.0
45 a	MT19186	MT1090//MT08185/MT0742	85.0	61.5	173.6	33.7	70	12.5
12 a	MTCL19153	MT0871/(06X445B1-2, SY Clearstone si	84.9	62.1	174.0	30.1	51	12.2
10 a	MTCL19151	MT0871/(06X445B1-2, SY Clearstone si	84.4	61.6	171.3	30.0	58	12.1
18 a	MT19159	Northern//02X22cE38/MT10121	84.2	60.9	175.6	32.9	52	12.6
11 a	MTCL19152	MT0871/(06X445B1-2, SY Clearstone si	83.7	61.5	172.0	30.2	62	12.1
48 a	MT19189	MT1084//MT08184/CO04575(cl)	83.7	61.1	176.7	32.0	47	12.3
1	Yellowstone	check	83.3	60.2	174.8	36.3	72	12.0
5	w2 MTW19146	Bearpaw//16FAWWON-Irr-61/MT0871	83.3	58.4	176.0	32.6	52	12.8
13	MT19154	08X349-A5/MT0954//MT1078	83.3	58.8	173.7	32.5	51	11.8
41	MT19182	MT1078//AAC Gateway/MT1265	83.2	58.8	174.1	31.6	43	12.0
16	MT19157	Northern//02X22cE38/MT10121	82.9	60.2	174.7	32.7	49	12.3
64	MT19205	Yellowstone/HV9W06-975	82.6	61.0	169.9	31.4	73	12.0
57	MT19198	Northern//Yellowstone/MTW0880	82.2	60.4	177.8	30.8	57	12.3
33	MT19174	MT0871/(SD06156-1, Redfield sib)	82.1	59.3	176.4	30.8	37	13.5
50	MT19191	MT0871/02X159E41	82.1	60.6	174.7	30.7	48	12.4
21	MT19162	Accipiter//MT0871/02X159E41	82.0	59.8	175.7	32.1	45	12.7
52 a	MT19193	Yellowstone/SD08W015	81.9	62.5	170.1	31.3	44	12.1
37	MT19178	Northern//MT0861/CDC Falcon	81.8	59.9	176.7	31.5	48	12.3
51	MT19192	Yellowstone/SD08W015	81.8	62.2	169.0	29.9	27	12.3
15	MT19156	Yellowstone//((493-22, Reeder/6*Paul)/3,	81.7	61.4	175.2	30.8	56	12.7
56	MT19197	Northern//Yellowstone/MTW0880	81.5	60.7	176.9	31.2	54	12.1
24	MT19165	MT10121//Yellowstone/SD08W015	81.3	61.0	174.1	31.8	57	12.7
54	MT19195	MT10116//MTW0880/MT0950	81.3	60.9	174.0	33.2	51	12.1
61	MT19202	08X350-A2/MT0890	81.1	60.2	175.1	30.5	75	12.2
19	MT19160	Northern//02X22cE38/MT10121	80.8	60.6	176.2	32.5	39	12.7
63	MT19204	Yellowstone/KS07HW25	80.8	60.3	172.3	32.3	68	12.9
2	Decade	check	80.5	61.1	172.2	34.1	47	12.3
29	MT19170	MT1091/Accipiter	80.4	61.3	174.4	32.7	49	12.5
46	MT19187	MT1084//MT0859/SD06069	80.3	60.6	175.3	31.3	24	12.0
17	MT19158	Northern//02X22cE38/MT10121	80.1	60.4	174.7	31.5	61	12.4
7	MTCL19148	MTCL1125/Northern	80.0	58.9	175.8	33.8	55	12.8
9	MTCL19150	MTCL1125/MT10128	79.8	59.7	177.3	33.1	59	12.8
60	MT19201	08X350-A2/MT0890	79.8	60.8	174.6	31.1	65	12.1
44	MT19185	MT1078//Colter/Emerson	79.7	60.2	171.8	32.6	64	12.1
14	MT19155	08X349-A5/MT0954//MT1078	79.6	58.2	172.2	30.7	63	11.9
40	MT19181	MT10104//MT0861/MT0890	79.4	61.0	173.2	31.9	44	12.4
6	w3 MTW19147	MT10121*2/16FAWWON-Irr-67	79.0	59.5	177.4	31.7	56	12.3
58	MT19199	08X349-A3/Yellowstone	79.0	58.3	173.6	30.7	62	12.3
25	MT19166	MT1141//Yellowstone/HV9W06-975	78.6	59.5	172.9	31.3	60	12.7
43	MT19184	MT1078//AAC Gateway/MT1265	78.5	59.8	173.8	33.4	12	13.1
36	MT19177	(Northern sib, MT0977)//MT0859/MT093	78.2	62.5	174.3	33.6	53	12.5
31	MT19172	MT0871/MT1151	77.9	62.0	175.7	34.8	45	12.7

Table 110. 2019 Preliminary A Test: All location Summary

Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Sawfly cutting %	Protein %
	w = white							
		locations	5	5	4	4	2	5
22	MT19163	Colter//03X273cEx/MT10105	77.2	61.2	174.2	32.3	52	12.8
59	MT19200	08X349-A3/Yellowstone	76.8	58.8	175.5	29.4	46	12.6
23	MT19164	Colter//03X273cEx/MT10105	76.7	61.3	174.3	32.9	57	12.7
62	MT19203	Yellowstone/KS07HW25	76.5	60.5	171.8	30.2	47	12.3
26	MT19167	06X424B20//Yellowstone/Garrison	75.9	58.9	176.5	30.8	17	12.4
3	Judee	check	75.6	61.0	172.8	33.7	44	12.7
28	MT19169	06X424B20//Yellowstone/Garrison	75.6	58.1	176.6	31.8	19	12.9
20	MT19161	Accipiter//MT0871/02X159E41	75.4	59.6	177.7	30.1	43	12.6
38	MT19179	MT0951//MT0861/MT0754	75.1	60.4	174.0	31.3	51	12.1
30	MT19171	MT1145/MT0866	74.9	60.0	173.4	32.4	35	13.9
53	MT19194	Yellowstone/493-22(Reeder/6*Paul)	74.3	60.1	174.6	32.9	54	12.6
27	MT19168	06X424B20//Yellowstone/Garrison	72.4	57.9	177.3	31.8	30	12.7
Average			81.2	60.4	174.2	31.9	49.7	12.4
LSD (0.05)			7.5	1.0	1.9	1.5	20.3	0.6
C.V. (%)			7.4	1.3	0.8	3.4	20.5	4.1

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 111. 2018 Preliminary A Test (Exp. 3601): Bozeman

Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Protein %
w = white			RCB	LAT	LAT	RCB	Bulk
		lattice efficiency relative to RCB	101%	118%	120%	93%	
55 a	MT19196	Northern//Yellowstone/MTW0880	142.3	62.8	178.7	36.0	11.5
13	MT19154	08X349-A5/MT0954//MT1078	138.1	60.8	177.3	34.1	11.0
21	MT19162	Accipiter//MT0871/02X159E41	135.1	62.7	178.5	34.4	11.3
49	MT19190	MT0871/02X159E41	134.9	61.6	176.0	32.1	11.9
8 a	MTCL19149	MTCL1125/MT1091	134.9	62.2	178.0	34.3	11.1
45 a	MT19186	MT1090//MT08185/MT0742	134.1	63.8	177.6	34.4	12.0
46	MT19187	MT1084//MT0859/SD06069	133.9	63.4	176.7	33.7	11.2
14	MT19155	08X349-A5/MT0954//MT1078	132.6	60.6	176.3	32.7	11.0
39	MT19180	MT1090//MT0861/MT0887	132.5	61.9	175.7	31.5	11.4
63	MT19204	Yellowstone/KS07HW25	132.5	62.5	175.2	32.9	12.8
61	MT19202	08X350-A2/MT0890	132.3	62.7	179.3	31.7	11.6
1	Yellowstone	check	131.6	62.7	179.3	37.0	11.8
18 a	MT19159	Northern//02X22cE38/MT10121	130.4	62.8	179.5	34.4	11.9
57	MT19198	Northern//Yellowstone/MTW0880	130.3	62.9	180.9	31.7	11.4
42 a	MT19183	MT1078//AAC Gateway/MT1265	129.3	63.4	177.2	34.8	11.7
54	MT19195	MT10116//MTW0880/MT0950	128.7	62.9	177.0	34.8	12.0
35 a	MT19176	MTW1098//Yellowstone-Lr41/Decade	128.5	63.4	172.2	32.5	13.1
6 w3	MTW19147	MT10121*2/16FAWWON-Irr-67	128.4	61.6	181.0	32.7	11.5
19	MT19160	Northern//02X22cE38/MT10121	128.0	63.1	180.3	35.2	11.5
37	MT19178	Northern//MT0861/CDC Falcon	127.6	62.3	179.7	33.3	10.6
48 a	MT19189	MT1084//MT08184/CO04575(cl)	127.4	63.3	180.2	32.5	11.3
5 w2	MTW19146	Bearpaw//16FAWWON-Irr-61/MT0871	127.3	61.3	179.3	33.9	11.5
32 a	MT19173	HV9W04-1594R/Accipiter	127.1	63.5	176.0	32.5	11.8
17	MT19158	Northern//02X22cE38/MT10121	126.6	62.9	177.8	32.9	11.5
44	MT19185	MT1078//Colter/Emerson	125.5	62.8	176.1	34.8	11.6
31	MT19172	MT0871/MT1151	125.0	64.1	177.8	36.8	12.4
56	MT19197	Northern//Yellowstone/MTW0880	124.9	63.2	180.5	32.1	11.4
23	MT19164	Colter//03X273cEx/MT10105	124.8	63.9	178.7	35.0	12.5
47	MT19188	MT0866//MT08184/NE06549	124.8	62.0	175.7	31.7	12.0
24	MT19165	MT10121//Yellowstone/SD08W015	124.5	63.5	178.0	34.1	11.8
34 a	MT19175	SD08198/Northern	123.9	61.5	178.4	32.7	11.2
60	MT19201	08X350-A2/MT0890	123.8	62.9	177.7	31.7	11.4
22	MT19163	Colter//03X273cEx/MT10105	123.5	63.8	177.8	34.6	12.3
16	MT19157	Northern//02X22cE38/MT10121	123.5	62.8	177.7	34.4	11.3
15	MT19156	Yellowstone//((493-22, Reeder/6*Paul)/3/	123.3	63.4	177.7	32.3	12.4
41	MT19182	MT1078//AAC Gateway/MT1265	123.2	62.0	176.8	32.9	11.1
58	MT19199	08X349-A3/Yellowstone	122.9	60.7	176.5	31.7	11.7
20	MT19161	Accipiter//MT0871/02X159E41	122.9	62.3	181.3	33.1	11.8
11 a	MTCL19152	MT0871/(06X445B1-2, SY Clearstone si	122.8	63.1	175.4	31.3	11.3
64	MT19205	Yellowstone/HV9W06-975	122.7	63.1	170.4	32.5	11.5
4	SY Monument	check	122.4	62.2	175.2	31.9	10.7
3	Judee	check	121.6	63.3	176.0	35.4	11.9
29	MT19170	MT1091/Accipiter	121.6	63.5	178.0	34.6	11.9
51	MT19192	Yellowstone/SD08W015	121.3	63.7	170.0	31.1	11.9
36	MT19177	(Northern sib, MT0977)//MT0859/MT093	121.2	64.2	176.9	34.3	12.2
30	MT19171	MT1145/MT0866	120.4	62.8	176.5	34.6	12.6
33	MT19174	MT0871/(SD06156-1, Redfield sib)	120.3	60.5	178.2	33.5	12.7
28	MT19169	06X424B20//Yellowstone/Garrison	119.5	60.6	181.2	32.9	12.4
50	MT19191	MT0871/02X159E41	118.8	62.4	178.0	31.7	11.9
7	MTCL19148	MTCL1125/Northern	118.7	61.9	180.2	32.7	12.0
59	MT19200	08X349-A3/Yellowstone	118.3	61.9	179.3	29.7	11.5

Table 111. 2018 Preliminary A Test (Exp. 3601): Bozeman

Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Protein %
	w = white		RCB	LAT	LAT	RCB	Bulk
		lattice efficiency relative to RCB	101%	118%	120%	93%	
9	MTCL19150	MTCL1125/MT10128	117.7	62.5	182.5	31.5	12.1
10 a	MTCL19151	MT0871/(06X445B1-2, SY Clearstone si	117.4	63.4	175.2	31.3	11.5
43	MT19184	MT1078//AAC Gateway/MT1265	117.0	62.2	177.4	34.8	12.9
40	MT19181	MT10104//MT0861/MT0890	116.6	62.9	176.1	32.3	12.6
53	MT19194	Yellowstone/493-22(Reeder/6*Paul)	116.5	62.6	179.7	34.3	12.1
25	MT19166	MT1141//Yellowstone/HV9W06-975	116.4	61.9	176.3	32.3	11.7
27	MT19168	06X424B20//Yellowstone/Garrison	116.2	59.9	182.0	32.7	12.2
38	MT19179	MT0951//MT0861/MT0754	116.0	62.0	177.6	33.7	11.6
62	MT19203	Yellowstone/KS07HW25	114.7	63.0	175.1	31.9	11.3
26	MT19167	06X424B20//Yellowstone/Garrison	114.5	61.1	180.6	31.7	12.0
52 a	MT19193	Yellowstone/SD08W015	114.2	63.9	171.3	31.3	11.8
12 a	MTCL19153	MT0871/(06X445B1-2, SY Clearstone si	113.5	63.5	177.4	30.1	11.8
2	Decade	check	110.2	62.8	174.8	34.4	11.8
Average			124.4	62.6	177.5	33.2	11.8
LSD (0.05)			12.6	0.7	1.3	1.5	
C.V. (%)			5.1	1.3	0.3	2.3	
P-value (Varieties)			0.0021	<.0001	<.0001	<.0001	

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column

Table 112. 2019 Preliminary A Test (Exp. 3607): Moccasin

Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Protein %
w = white			LAT	LAT	LAT	LAT	1 rep
		lattice efficiency relative to RCB	109%	146%	145%	130%	
12 a	MTCL19153	MT0871/(06X445B1-2, SY Clearstone si	69.0	62.5	182.6	27.7	11.3
37	MT19178	Northern//MT0861/CDC Falcon	65.8	61.3	182.8	29.6	10.3
50	MT19191	MT0871/02X159E41	65.8	61.4	182.3	29.0	10.7
4	SY Monument	check	65.3	61.4	181.0	29.1	11.1
21	MT19162	Accipiter//MT0871/02X159E41	64.2	60.5	181.6	30.2	12.7
42 a	MT19183	MT1078//AAC Gateway/MT1265	62.7	61.7	182.3	31.6	11.5
39	MT19180	MT1090//MT0861/MT0887	62.2	61.1	181.3	28.9	10.6
34 a	MT19175	SD08198/Northern	62.1	60.7	182.2	29.5	11.7
53	MT19194	Yellowstone/493-22(Reeder/6*Paul)	61.7	61.4	181.3	31.9	10.7
6	w3 MTW19147	MT10121*2/16FAWWON-Irr-67	61.4	60.9	184.5	28.9	11.1
63	MT19204	Yellowstone/KS07HW25	61.3	61.1	183.1	30.4	10.9
5	w2 MTW19146	Bearpaw//16FAWWON-Irr-61/MT0871	61.3	60.0	183.2	29.9	11.1
17	MT19158	Northern//02X22cE38/MT10121	61.0	60.9	182.5	30.7	11.1
24	MT19165	MT10121//Yellowstone/SD08W015	60.9	61.4	181.5	28.1	11.0
2	Decade	check	60.8	61.0	180.7	30.5	12.0
9	MTCL19150	MTCL1125/MT10128	60.7	60.3	184.0	30.2	12.2
22	MT19163	Colter//03X273cEx/MT10105	60.5	62.6	180.4	30.5	10.9
57	MT19198	Northern//Yellowstone/MTW0880	60.1	61.6	184.9	29.6	10.9
48 a	MT19189	MT1084//MT08184/CO04575(cl)	59.7	61.6	183.6	30.1	11.9
10 a	MTCL19151	MT0871/(06X445B1-2, SY Clearstone si	59.3	62.7	180.5	27.3	11.3
55 a	MT19196	Northern//Yellowstone/MTW0880	58.6	61.8	181.9	30.5	11.0
25	MT19166	MT1141//Yellowstone/HV9W06-975	58.1	59.2	181.3	29.2	12.9
1	Yellowstone	check	58.0	60.3	181.5	34.3	10.0
49	MT19190	MT0871/02X159E41	57.9	58.6	182.9	29.1	12.3
11 a	MTCL19152	MT0871/(06X445B1-2, SY Clearstone si	57.4	62.4	181.4	28.0	10.9
61	MT19202	08X350-A2/MT0890	57.2	61.2	181.8	29.6	10.3
30	MT19171	MT1145/MT0866	57.1	61.0	181.7	30.0	13.2
13	MT19154	08X349-A5/MT0954//MT1078	57.1	59.3	181.5	29.4	9.7
16	MT19157	Northern//02X22cE38/MT10121	56.8	60.1	181.9	29.3	11.2
18 a	MT19159	Northern//02X22cE38/MT10121	56.5	61.4	181.7	30.1	11.5
15	MT19156	Yellowstone//((493-22, Reeder/6*Paul)/3,	56.5	61.6	183.5	28.8	11.4
33	MT19174	MT0871/(SD06156-1, Redfield sib)	56.2	58.0	182.7	28.8	13.9
38	MT19179	MT0951//MT0861/MT0754	56.0	61.7	181.1	29.0	10.3
60	MT19201	08X350-A2/MT0890	56.0	61.4	181.1	28.9	10.5
19	MT19160	Northern//02X22cE38/MT10121	56.0	61.0	183.0	29.6	11.0
47	MT19188	MT0866//MT08184/NE06549	55.7	59.8	182.1	29.4	10.0
59	MT19200	08X349-A3/Yellowstone	55.6	60.1	184.1	28.4	10.7
41	MT19182	MT1078//AAC Gateway/MT1265	55.6	58.8	182.4	29.6	10.9
58	MT19199	08X349-A3/Yellowstone	55.5	59.2	182.9	29.6	10.0
26	MT19167	06X424B20//Yellowstone/Garrison	55.2	60.7	181.3	29.4	10.8
56	MT19197	Northern//Yellowstone/MTW0880	55.0	62.0	182.1	28.4	10.8
40	MT19181	MT10104//MT0861/MT0890	54.9	61.5	180.5	31.7	10.8
3	Judee	check	54.8	61.9	181.8	30.9	11.7
35 a	MT19176	MTW1098//Yellowstone-Lr41/Decade	54.3	62.2	180.2	29.7	11.1
54	MT19195	MT10116//MTW0880/MT0950	54.3	61.9	181.6	30.6	10.4
29	MT19170	MT1091/Accipiter	54.3	62.6	181.9	28.7	10.8
36	MT19177	(Northern sib, MT0977)//MT0859/MT093	53.7	63.8	181.6	31.3	11.6
23	MT19164	Colter//03X273cEx/MT10105	53.3	62.1	181.3	31.3	10.8
43	MT19184	MT1078//AAC Gateway/MT1265	53.2	60.5	182.9	31.1	12.1
45 a	MT19186	MT1090//MT08185/MT0742	52.8	61.7	181.5	32.0	10.7
7	MTCL19148	MTCL1125/Northern	52.6	59.2	182.9	31.3	12.5

Table 112. 2019 Preliminary A Test (Exp. 3607): Moccasin

Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Protein %
	w = white		LAT	LAT	LAT	LAT	1 rep
		lattice efficiency relative to RCB	109%	146%	145%	130%	
31	MT19172	MT0871/MT1151	52.6	62.8	182.3	31.7	11.1
8 a	MTCL19149	MTCL1125/MT1091	52.3	60.8	181.9	31.5	12.7
62	MT19203	Yellowstone/KS07HW25	51.5	60.9	181.3	28.6	11.3
14	MT19155	08X349-A5/MT0954//MT1078	51.3	58.3	180.2	28.6	10.5
44	MT19185	MT1078//Colter/Emerson	51.2	60.4	182.2	28.6	10.2
64	MT19205	Yellowstone/HV9W06-975	50.8	61.4	181.7	27.1	11.3
52 a	MT19193	Yellowstone/SD08W015	50.2	63.0	181.2	28.9	10.8
51	MT19192	Yellowstone/SD08W015	49.5	62.5	180.3	27.9	11.5
32 a	MT19173	HV9W04-1594R/Accipiter	49.4	61.1	183.1	27.8	11.3
27	MT19168	06X424B20//Yellowstone/Garrison	49.0	58.8	183.8	29.7	10.6
28	MT19169	06X424B20//Yellowstone/Garrison	48.8	59.3	182.9	28.9	11.7
46	MT19187	MT1084//MT0859/SD06069	48.1	60.6	182.5	28.7	10.7
20	MT19161	Accipiter//MT0871/02X159E41	44.9	59.4	183.6	26.2	11.4
Average			56.6	61.0	182.1	29.6	11.2
LSD (0.05)			ns	1.6	1.9	2.5	
C.V. (%)			10.9	1.2	0.5	3.8	
P-value (Varieties)			0.3144	<.0001	0.0005	0.0002	

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 113. 2019 Preliminary A Test (Exp. 3608): Huntley

Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Lodging %	Protein %
	w = white		LAT	LAT	RCB	LAT	RCB	LAT
		lattice efficiency relative to RCB	108%	113%	100%	107%	100%	181%
9	MTCL19150	MTCL1125/MT10128	120.2	63.3	174.0	38.6	0.0	12.1
8 a	MTCL19149	MTCL1125/MT1091	117.2	62.4	168.5	38.0	1.8	11.6
4	SY Monument	check	117.0	60.6	166.5	38.0	0.0	11.5
39	MT19180	MT1090/MT0861/MT0887	116.9	61.1	166.0	38.8	0.4	11.8
49	MT19190	MT0871/02X159E41	116.6	60.2	169.5	36.4	0.0	12.7
12 a	MTCL19153	MT0871/(06X445B1-2, SY Clearstone si	114.8	63.1	168.5	35.0	0.0	12.1
47	MT19188	MT0866/MT08184/NE06549	113.2	61.8	168.0	36.6	0.0	11.9
35 a	MT19176	MTW1098//Yellowstone-Lr41/Decade	113.0	63.9	165.0	34.6	0.0	12.3
54	MT19195	MT10116//MTW0880/MT0950	112.6	62.8	171.0	39.4	0.0	11.8
7	MTCL19148	MTCL1125/Northern	112.5	60.9	170.5	41.7	0.0	12.8
14	MT19155	08X349-A5/MT0954//MT1078	112.5	58.9	167.0	37.0	0.0	11.6
42 a	MT19183	MT1078//AAC Gateway/MT1265	112.5	62.6	168.5	39.4	0.0	12.0
52 a	MT19193	Yellowstone/SD08W015	111.7	63.6	164.5	37.0	0.0	11.5
11 a	MTCL19152	MT0871/(06X445B1-2, SY Clearstone si	111.6	62.1	165.5	35.7	0.0	12.0
64	MT19205	Yellowstone/HV9W06-975	111.6	61.9	163.5	37.2	0.0	11.9
2	Decade	check	111.2	62.5	168.0	42.2	0.0	12.0
10 a	MTCL19151	MT0871/(06X445B1-2, SY Clearstone si	111.1	61.3	164.5	36.9	0.0	12.3
18 a	MT19159	Northern//02X22cE38/MT10121	111.1	62.1	172.5	37.4	0.0	12.2
32 a	MT19173	HV9W04-1594R/Accipiter	110.9	62.7	168.0	34.8	2.5	11.5
45 a	MT19186	MT1090/MT08185/MT0742	110.6	62.4	168.5	39.5	0.0	12.6
34 a	MT19175	SD08198/Northern	110.0	62.2	174.5	35.9	0.0	11.3
56	MT19197	Northern//Yellowstone/MTW0880	108.8	62.5	175.0	36.6	0.0	12.0
31	MT19172	MT0871/MT1151	108.6	64.0	173.5	41.2	0.0	12.1
48 a	MT19189	MT1084/MT08184/CO04575(cl)	108.2	63.1	173.5	37.6	0.0	11.8
61	MT19202	08X350-A2/MT0890	107.6	61.3	170.5	36.5	1.8	12.0
51	MT19192	Yellowstone/SD08W015	107.5	63.6	162.5	35.9	0.0	12.2
41	MT19182	MT1078//AAC Gateway/MT1265	106.8	59.0	169.0	36.5	0.0	12.3
33	MT19174	MT0871/(SD06156-1, Redfield sib)	106.6	61.1	175.0	34.6	0.4	12.2
40	MT19181	MT10104//MT0861/MT0890	106.2	61.6	168.5	36.0	0.4	12.2
55 a	MT19196	Northern//Yellowstone/MTW0880	105.6	62.0	172.5	39.7	1.8	12.1
57	MT19198	Northern//Yellowstone/MTW0880	105.6	62.1	176.0	35.7	0.0	12.0
36	MT19177	(Northern sib, MT0977)//MT0859/MT093	104.9	64.1	170.5	39.6	0.0	12.6
5	w2 MTW19146	Bearpaw//16FAWWON-Irr-61/MT0871	104.7	59.9	173.0	39.1	0.0	12.9
43	MT19184	MT1078//AAC Gateway/MT1265	103.9	62.1	168.0	38.9	0.0	13.3
24	MT19165	MT10121//Yellowstone/SD08W015	103.6	62.1	169.5	37.1	0.0	12.9
13	MT19154	08X349-A5/MT0954//MT1078	103.4	60.2	169.5	37.0	2.5	12.0
15	MT19156	Yellowstone//((493-22, Reeder/6*Paul)/3,	103.2	62.6	171.5	35.3	0.0	12.6
44	MT19185	MT1078//Colter/Emerson	102.6	61.3	165.0	37.6	0.0	12.6
1	Yellowstone	check	101.2	61.0	170.0	41.2	0.0	12.4
60	MT19201	08X350-A2/MT0890	101.2	60.7	171.0	36.4	2.5	12.3
46	MT19187	MT1084//MT0859/SD06069	100.9	61.7	174.5	34.4	0.0	12.3
50	MT19191	MT0871/02X159E41	100.9	61.9	170.0	35.2	0.0	12.7
63	MT19204	Yellowstone/KS07HW25	100.8	61.5	166.0	38.7	0.0	13.3
58	MT19199	08X349-A3/Yellowstone	100.6	58.5	168.5	36.1	0.4	12.8
20	MT19161	Accipiter//MT0871/02X159E41	100.5	61.3	175.5	35.3	0.4	12.3
25	MT19166	MT1141//Yellowstone/HV9W06-975	100.3	60.7	168.5	35.7	0.0	12.8
6	w3 MTW19147	MT10121*2/16FAWWON-Irr-67	100.1	61.4	174.5	37.0	0.0	11.6
19	MT19160	Northern//02X22cE38/MT10121	99.9	61.6	172.5	36.7	0.0	12.6
21	MT19162	Accipiter//MT0871/02X159E41	98.7	61.2	173.0	36.4	0.0	12.5
37	MT19178	Northern//MT0861/CDC Falcon	97.7	60.9	175.0	36.6	0.0	12.6
3	Judee	check	96.3	61.6	168.0	38.9	0.0	12.6

Table 113. 2019 Preliminary A Test (Exp. 3608): Huntley

Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Lodging %	Protein %
	w = white		LAT	LAT	RCB	LAT	RCB	LAT
		lattice efficiency relative to RCB	108%	113%	100%	107%	100%	181%
29	MT19170	MT1091/Accipiter	96.1	61.4	169.5	37.6	0.4	13.0
26	MT19167	06X424B20//Yellowstone/Garrison	95.5	59.0	174.5	36.3	0.0	12.1
59	MT19200	08X349-A3/Yellowstone	94.9	58.7	170.5	34.4	0.0	13.1
16	MT19157	Northern//02X22cE38/MT10121	94.4	60.4	170.5	37.6	0.0	12.6
38	MT19179	MT0951//MT0861/MT0754	93.8	59.8	170.0	35.7	0.7	12.8
62	MT19203	Yellowstone/KS07HW25	93.8	60.8	166.0	34.6	0.0	12.5
30	MT19171	MT1145/MT0866	93.7	61.1	169.5	36.7	0.0	13.8
17	MT19158	Northern//02X22cE38/MT10121	92.4	60.1	170.5	36.1	0.0	12.9
27	MT19168	06X424B20//Yellowstone/Garrison	92.2	58.6	173.0	37.0	0.0	13.1
53	MT19194	Yellowstone/493-22(Reeder/6*Paul)	91.7	61.3	170.5	37.0	0.0	12.8
28	MT19169	06X424B20//Yellowstone/Garrison	91.3	57.7	172.5	37.5	0.0	13.6
23	MT19164	Colter//03X273cEx/MT10105	86.4	61.4	169.0	36.3	5.5	13.3
22	MT19163	Colter//03X273cEx/MT10105	85.6	61.3	170.5	36.5	4.7	13.1
Average			104.3	61.4	170.0	37.1	0.4	12.4
LSD (0.05)			11.9	0.9	2.6	2.4	0.5	0.7
C.V. (%)			5.4	0.7	0.8	3.1	20.8	2.7
P-value (Varieties)								

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 114. 2019 Preliminary A Test (Exp. 3618): Conrad

Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Lodging/Sawly cutting %		Protein %
							30-Jul LAT	harvest LAT	
		w = white	LAT	LAT	LAT	LAT			bulk
		lattice efficiency relative to RCB	270%	270%	111%	125%	139%	111%	
4	SY Monument	check	78.3	58.2	164.3	29.2	16	59	12.1
35 a	MT19176	MTW1098//Yellowstone-Lr41/Decade	72.6	59.8	164.1	28.3	7	37	13.6
12 a	MTCL19153	MT0871/(06X445B1-2, SY Clearstone sib)	71.7	60.3	167.3	27.5	12	47	13.1
29	MT19170	MT1091/Accipiter	70.3	58.7	168.0	29.9	13	29	13.2
1	Yellowstone	check	69.7	57.7	168.2	32.7	27	63	13.0
51	MT19192	Yellowstone/SD08W015	69.3	59.1	163.2	24.6	9	14	12.8
52 a	MT19193	Yellowstone/SD08W015	68.7	59.6	163.5	27.9	9	39	13.9
16	MT19157	Northern//02X22cE38/MT10121	67.8	58.9	168.6	29.6	9	48	13.5
32 a	MT19173	HV9W04-1594R/Accipiter	67.7	59.2	165.3	26.7	14	59	13.3
34 a	MT19175	SD08198/Northern	67.3	58.7	169.0	27.3	23	62	12.7
8 a	MTCL19149	MTCL1125/MT1091	67.0	58.7	168.2	30.0	27	53	13.1
10 a	MTCL19151	MT0871/(06X445B1-2, SY Clearstone sib)	66.8	59.6	164.8	24.3	22	60	12.7
13	MT19154	08X349-A5/MT0954//MT1078	64.5	55.3	166.3	29.5	16	48	13.6
50	MT19191	MT0871/02X159E41	64.1	58.1	168.5	27.0	8	50	13.9
44	MT19185	MT1078//Colter/Emerson	64.0	56.5	163.9	29.3	13	62	13.2
48 a	MT19189	MT1084//MT08184/CO04575(cl)	63.7	57.0	169.4	27.8	10	61	13.4
39	MT19180	MT1090//MT0861/MT0887	63.7	56.0	165.0	32.2	17	47	13.1
42 a	MT19183	MT1078//AAC Gateway/MT1265	63.7	58.9	166.9	28.4	10	28	12.6
11 a	MTCL19152	MT0871/(06X445B1-2, SY Clearstone sib)	63.5	59.5	165.5	25.8	19	69	13.7
45 a	MT19186	MT1090//MT08185/MT0742	63.3	59.2	166.6	29.0	29	76	13.8
7	MTCL19148	MTCL1125/Northern	62.7	55.2	169.6	29.4	14	56	13.6
62	MT19203	Yellowstone/KS07HW25	62.5	58.2	164.7	25.7	18	50	13.5
47	MT19188	MT0866//MT08184/NE06549	62.5	56.7	167.5	26.8	5	26	13.3
28	MT19169	06X424B20//Yellowstone/Garrison	62.3	56.5	169.9	27.8	6	22	13.3
41	MT19182	MT1078//AAC Gateway/MT1265	62.0	55.1	168.0	27.5	15	50	13.5
18 a	MT19159	Northern//02X22cE38/MT10121	61.6	58.9	168.6	29.5	11	50	13.8
58	MT19199	08X349-A3/Yellowstone	61.5	56.2	166.4	25.2	17	48	13.8
24	MT19165	MT10121//Yellowstone/SD08W015	61.5	58.0	167.2	27.7	18	59	14.3
49	MT19190	MT0871/02X159E41	61.3	55.3	165.3	28.9	19	62	13.8
33	MT19174	MT0871/(SD06156-1, Redfield sib)	61.0	57.8	169.7	26.1	5	54	14.9
19	MT19160	Northern//02X22cE38/MT10121	60.8	57.7	168.8	28.5	9	44	14.5
25	MT19166	MT1141//Yellowstone/HV9W06-975	60.4	57.8	165.4	27.9	10	50	13.0
37	MT19178	Northern//MT0861/CDC Falcon	60.4	56.8	169.3	26.4	18	45	14.9
23	MT19164	Colter//03X273cEx/MT10105	60.3	59.0	168.2	28.8	31	48	13.5
55 a	MT19196	Northern//Yellowstone/MTW0880	59.9	58.2	168.1	30.6	13	44	13.6
15	MT19156	Yellowstone//((493-22, Reeder/6*Paul)/3)/MT0871	58.4	58.0	168.2	26.9	14	62	14.1
59	MT19200	08X349-A3/Yellowstone	58.4	56.6	167.9	25.1	20	41	14.2
63	MT19204	Yellowstone/KS07HW25	57.9	57.8	164.7	27.0	36	62	13.7
56	MT19197	Northern//Yellowstone/MTW0880	57.7	56.8	169.9	27.6	13	52	13.5
36	MT19177	(Northern sib, MT0977)//MT0859/MT0938	57.6	59.6	168.3	29.3	15	56	13.0
64	MT19205	Yellowstone/HV9W06-975	56.8	57.8	163.8	28.8	24	75	12.5
5	w2 MTW19146	Bearpaw//16FAWWON-Irr-61/MT0871	56.4	55.1	168.4	27.5	12	59	15.2
40	MT19181	MT10104//MT0861/MT0890	56.4	57.7	167.7	27.4	7	55	12.9
17	MT19158	Northern//02X22cE38/MT10121	56.1	57.4	168.1	26.1	18	62	13.5
43	MT19184	MT1078//AAC Gateway/MT1265	55.8	54.5	166.9	28.8	5	4	13.8
60	MT19201	08X350-A2/MT0890	55.0	58.3	168.4	27.3	19	65	13.3
21	MT19162	Accipiter//MT0871/02X159E41	54.9	55.0	169.6	27.4	17	41	13.9
53	MT19194	Yellowstone/493-22(Reeder/6*Paul)	54.9	56.8	166.9	28.2	17	48	13.9
22	MT19163	Colter//03X273cEx/MT10105	54.8	57.5	168.2	27.4	26	50	14.5
57	MT19198	Northern//Yellowstone/MTW0880	54.8	57.0	169.5	26.3	9	60	14.3
2	Decade	check	54.0	58.1	165.2	29.3	22	44	12.5
26	MT19167	06X424B20//Yellowstone/Garrison	53.9	55.1	169.7	25.7	9	28	14.1
54	MT19195	MT10116//MTW0880/MT0950	53.7	56.9	166.3	28.0	15	52	13.1
27	MT19168	06X424B20//Yellowstone/Garrison	53.6	54.9	170.4	27.6	3	41	14.0

Table 114. 2019 Preliminary A Test (Exp. 3618): Conrad

Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Lodging/Sawly cutting %		Protein %
							30-Jul LAT	harvest LAT	
	w = white		LAT	LAT	LAT	LAT			bulk
		lattice efficiency relative to RCB	270%	270%	111%	125%	139%	111%	
6	w3 MTW19147	MT10121*2/16FAWWON-Irr-67	53.5	55.0	169.6	28.1	10	58	13.8
46	MT19187	MT1084//MT0859/SD06069	53.4	56.7	167.5	28.3	6	34	13.3
20	MT19161	Accipiter//MT0871/02X159E41	53.3	55.8	170.5	25.6	10	47	14.2
38	MT19179	MT0951//MT0861/MT0754	53.3	57.6	167.2	26.8	7	51	13.3
3	Judee	check	52.3	57.4	165.5	29.5	17	42	14.1
9	MTCL19150	MTCL1125/MT10128	51.4	55.6	168.6	32.1	12	59	14.2
30	MT19171	MT1145/MT0866	49.7	55.5	165.9	28.2	7	45	15.7
61	MT19202	08X350-A2/MT0890	49.5	57.1	168.9	24.2	25	70	13.6
31	MT19172	MT0871/MT1151	49.1	57.9	169.1	29.6	6	37	14.0
14	MT19155	08X349-A5/MT0954//MT1078	45.7	54.8	165.4	24.6	20	70	13.5
Average			60.0	57.4	167.3	27.9	14.7	49.8	13.6
LSD (0.05)			11.7	2.1	1.6	3.7	14.4	ns	
C.V. (%)			8.8	1.6	0.5	6.2	45.2	30.0	
P-value (Varieties)			0.0008	<.0001	<.0001	0.0083	0.0057	0.0643	

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 115. 2019 Preliminary A Test (Exp. 36BI): Ft. Benton (Northern Seeds)

Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Lodging/Sawfly cutting %		Protein %	
					29-Jul RCB	4-Aug RCB		
w = white			RCB	RCB	RCB	RCB	RCB	
32	a	MT19173	HV9W04-1594R/Accipiter	75.4	61.3	10	40	13.1
47		MT19188	MT0866//MT08184/NE06549	72.7	60.6	13	45	12.7
16		MT19157	Northern//02X22cE38/MT10121	71.8	59.0	23	50	12.9
64		MT19205	Yellowstone/HV9W06-975	71.1	60.9	35	70	12.6
4		SY Monument	check	71.0	59.8	28	55	12.1
34	a	MT19175	SD08198/Northern	70.4	59.5	25	53	12.8
41		MT19182	MT1078//AAC Gateway/MT1265	68.6	59.0	8	35	12.1
49		MT19190	MT0871/02X159E41	68.4	58.9	18	45	13.1
10	a	MTCL19151	MT0871/(06X445B1-2, SY Clearstone sib)	67.4	61.2	30	55	12.7
15		MT19156	Yellowstone//((493-22, Reeder/6*Paul)/3/MT08	67.1	61.3	15	50	13.1
5	w2	MTW19146	Bearpaw//16FAWWON-Irr-61/MT0871	67.0	55.8	13	45	13.2
55	a	MT19196	Northern//Yellowstone/MTW0880	67.0	58.4	20	50	12.6
2		Decade	check	66.5	61.3	23	50	13.2
33		MT19174	MT0871/(SD06156-1, Redfield sib)	66.4	59.3	8	20	13.8
46		MT19187	MT1084//MT0859/SD06069	65.2	60.5	8	13	12.5
35	a	MT19176	MTW1098//Yellowstone-Lr41/Decade	65.2	61.5	4	45	13.3
52	a	MT19193	Yellowstone/SD08W015	64.9	62.5	13	48	12.6
17		MT19158	Northern//02X22cE38/MT10121	64.2	60.8	20	60	13.1
45	a	MT19186	MT1090//MT08185/MT0742	64.2	60.2	63	65	13.4
11	a	MTCL19152	MT0871/(06X445B1-2, SY Clearstone sib)	63.3	60.6	33	55	12.7
60		MT19201	08X350-A2/MT0890	63.2	60.8	38	65	12.9
40		MT19181	MT10104//MT0861/MT0890	62.9	61.1	8	33	13.5
42	a	MT19183	MT1078//AAC Gateway/MT1265	62.6	60.6	5	38	13.1
43		MT19184	MT1078//AAC Gateway/MT1265	62.6	59.9	4	20	13.3
8	a	MTCL19149	MTCL1125/MT1091	62.2	59.7	55	65	12.7
22		MT19163	Colter//03X273cEx/MT10105	61.4	60.6	40	55	13.4
39		MT19180	MT1090//MT0861/MT0887	61.3	60.0	35	60	12.7
18	a	MT19159	Northern//02X22cE38/MT10121	61.2	59.5	25	55	13.5
51		MT19192	Yellowstone/SD08W015	61.2	62.1	13	40	13.1
56		MT19197	Northern//Yellowstone/MTW0880	61.1	59.2	28	55	12.9
50		MT19191	MT0871/02X159E41	61.0	59.2	15	45	13.0
57		MT19198	Northern//Yellowstone/MTW0880	60.3	58.6	15	55	13.0
26		MT19167	06X424B20//Yellowstone/Garrison	60.2	58.5	8	5	13.0
62		MT19203	Yellowstone/KS07HW25	60.2	59.6	10	45	12.8
29		MT19170	MT1091/Accipiter	59.5	60.3	35	70	13.7
48	a	MT19189	MT1084//MT08184/CO04575(cl)	59.4	60.7	8	33	12.9
19		MT19160	Northern//02X22cE38/MT10121	59.2	59.6	25	35	13.8
61		MT19202	08X350-A2/MT0890	58.9	58.6	45	80	13.3
23		MT19164	Colter//03X273cEx/MT10105	58.6	60.0	50	65	13.4
25		MT19166	MT1141//Yellowstone/HV9W06-975	57.8	58.1	23	70	13.0
37		MT19178	Northern//MT0861/CDC Falcon	57.5	58.4	30	50	13.1
21		MT19162	Accipiter//MT0871/02X159E41	57.3	59.5	18	50	13.3
54		MT19195	MT10116//MTW0880/MT0950	57.1	59.8	30	50	13.1
59		MT19200	08X349-A3//Yellowstone	56.8	56.5	8	50	13.7
38		MT19179	MT0951//MT0861/MT0754	56.6	60.7	10	50	12.7
1		Yellowstone	check	56.2	59.1	60	80	12.8
24		MT19165	MT10121//Yellowstone/SD08W015	56.0	60.0	15	55	13.3
14		MT19155	08X349-A5/MT0954//MT1078	55.9	58.3	25	55	12.8
28		MT19169	06X424B20//Yellowstone/Garrison	55.9	56.5	8	15	13.6
12	a	MTCL19153	MT0871/(06X445B1-2, SY Clearstone sib)	55.7	61.0	25	55	12.9
20		MT19161	Accipiter//MT0871/02X159E41	55.6	59.1	18	40	13.3

Table 115. 2019 Preliminary A Test (Exp. 36BI): Ft. Benton (Northern Seeds)

Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Lodging/Sawfly cutting %		Protein %
					29-Jul RCB	4-Aug RCB	
w = white			RCB	RCB	RCB	RCB	RCB
44	MT19185	MT1078//Colter/Emerson	55.0	60.1	15	65	12.8
31	MT19172	MT0871/MT1151	54.4	61.1	20	53	13.8
58	MT19199	08X349-A3/Yellowstone	54.3	56.8	40	75	13.2
30	MT19171	MT1145/MT0866	53.7	59.5	5	25	14.0
36	MT19177	(Northern sib, MT0977)//MT0859/MT0938	53.7	60.6	13	50	13.1
7	MTCL19148	MTCL1125/Northern	53.3	57.3	20	53	13.3
13	MT19154	08X349-A5/MT0954//MT1078	53.3	58.6	55	55	12.9
3	Judee	check	53.1	60.7	10	45	13.4
6	w3 MTW19147	MT10121*2/16FAWWON-Irr-67	51.8	58.6	23	55	13.7
63	MT19204	Yellowstone/KS07HW25	51.5	58.7	75	75	13.6
27	MT19168	06X424B20//Yellowstone/Garrison	50.9	57.2	5	18	13.7
9	MTCL19150	MTCL1125/MT10128	49.2	57.0	20	60	13.5
53	MT19194	Yellowstone/493-22(Reeder/6*Paul)	46.5	58.2	23	60	13.5
Average			60.5	59.6	22.7	49.6	13.1
LSD (0.05)			12.8	1.9	20.5	22.1	0.6
C.V. (%)			10.6	1.6	45.3	22.3	2.2
P-value (Varieties)			0.0063	<.0001	<.0001	<.0001	<.0001

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 116. 2019 Preliminary A Test (Exp. 36): All Location Yield (bu/a)

Entry	ID	Pedigree	Bozeman RCB	Moccasin LAT	Huntley LAT	Conrad LAT	Ft. Benton RCB	5 Loc avg
	w = white							
		lattice efficiency relative to RCB	101%	109%	108%	270%		
4	SY Monument	check	122.4	65.3	117.0	78.3	71.0	90.8
49	MT19190	MT0871/02X159E41	134.9	57.9	116.6	61.3	68.4	87.8
39	MT19180	MT1090//MT0861/MT0887	132.5	62.2	116.9	63.7	61.3	87.3
8 a	MTCL19149	MTCL1125/MT1091	134.9	52.3	117.2	67.0	62.2	86.7
34 a	MT19175	SD08198/Northern	123.9	62.1	110.0	67.3	70.4	86.7
35 a	MT19176	MTW1098//Yellowstone-Lr41/Decade	128.5	54.3	113.0	72.6	65.2	86.7
55 a	MT19196	Northern//Yellowstone/MTW0880	142.3	58.6	105.6	59.9	67.0	86.7
42 a	MT19183	MT1078//AAC Gateway/MT1265	129.3	62.7	112.5	63.7	62.6	86.2
32 a	MT19173	HV9W04-1594R/Accipiter	127.1	49.4	110.9	67.7	75.4	86.1
47	MT19188	MT0866//MT08184/NE06549	124.8	55.7	113.2	62.5	72.7	85.8
45 a	MT19186	MT1090//MT08185/MT0742	134.1	52.8	110.6	63.3	64.2	85.0
12 a	MTCL19153	MT0871/(06X445B1-2, SY Clearstone sib)	113.5	69.0	114.8	71.7	55.7	84.9
10 a	MTCL19151	MT0871/(06X445B1-2, SY Clearstone sib)	117.4	59.3	111.1	66.8	67.4	84.4
18 a	MT19159	Northern//02X22cE38/MT10121	130.4	56.5	111.1	61.6	61.2	84.2
11 a	MTCL19152	MT0871/(06X445B1-2, SY Clearstone sib)	122.8	57.4	111.6	63.5	63.3	83.7
48 a	MT19189	MT1084//MT08184/CO04575(cl)	127.4	59.7	108.2	63.7	59.4	83.7
1	Yellowstone	check	131.6	58.0	101.2	69.7	56.2	83.3
5	w2 MTW19146	Bearpaw//16FAWWON-Irr-61/MT0871	127.3	61.3	104.7	56.4	67.0	83.3
13	MT19154	08X349-A5/MT0954//MT1078	138.1	57.1	103.4	64.5	53.3	83.3
41	MT19182	MT1078//AAC Gateway/MT1265	123.2	55.6	106.8	62.0	68.6	83.2
16	MT19157	Northern//02X22cE38/MT10121	123.5	56.8	94.4	67.8	71.8	82.9
64	MT19205	Yellowstone/HV9W06-975	122.7	50.8	111.6	56.8	71.1	82.6
57	MT19198	Northern//Yellowstone/MTW0880	130.3	60.1	105.6	54.8	60.3	82.2
33	MT19174	MT0871/(SD06156-1, Redfield sib)	120.3	56.2	106.6	61.0	66.4	82.1
50	MT19191	MT0871/02X159E41	118.8	65.8	100.9	64.1	61.0	82.1
21	MT19162	Accipiter//MT0871/02X159E41	135.1	64.2	98.7	54.9	57.3	82.0
52 a	MT19193	Yellowstone/SD08W015	114.2	50.2	111.7	68.7	64.9	81.9
37	MT19178	Northern//MT0861/CDC Falcon	127.6	65.8	97.7	60.4	57.5	81.8
51	MT19192	Yellowstone/SD08W015	121.3	49.5	107.5	69.3	61.2	81.8
15	MT19156	Yellowstone//((493-22, Reeder/6*Paul)/3/MT0871)	123.3	56.5	103.2	58.4	67.1	81.7
56	MT19197	Northern//Yellowstone/MTW0880	124.9	55.0	108.8	57.7	61.1	81.5
24	MT19165	MT10121//Yellowstone/SD08W015	124.5	60.9	103.6	61.5	56.0	81.3
54	MT19195	MT10116//MTW0880/MT0950	128.7	54.3	112.6	53.7	57.1	81.3
61	MT19202	08X350-A2/MT0890	132.3	57.2	107.6	49.5	58.9	81.1
19	MT19160	Northern//02X22cE38/MT10121	128.0	56.0	99.9	60.8	59.2	80.8
63	MT19204	Yellowstone/KS07HW25	132.5	61.3	100.8	57.9	51.5	80.8
2	Decade	check	110.2	60.8	111.2	54.0	66.5	80.5
29	MT19170	MT1091/Accipiter	121.6	54.3	96.1	70.3	59.5	80.4
46	MT19187	MT1084//MT0859/SD06069	133.9	48.1	100.9	53.4	65.2	80.3
17	MT19158	Northern//02X22cE38/MT10121	126.6	61.0	92.4	56.1	64.2	80.1
7	MTCL19148	MTCL1125/Northern	118.7	52.6	112.5	62.7	53.3	80.0
9	MTCL19150	MTCL1125/MT10128	117.7	60.7	120.2	51.4	49.2	79.8
60	MT19201	08X350-A2/MT0890	123.8	56.0	101.2	55.0	63.2	79.8
44	MT19185	MT1078//Colter/Emerson	125.5	51.2	102.6	64.0	55.0	79.7
14	MT19155	08X349-A5/MT0954//MT1078	132.6	51.3	112.5	45.7	55.9	79.6
40	MT19181	MT10104//MT0861/MT0890	116.6	54.9	106.2	56.4	62.9	79.4
6	w3 MTW19147	MT10121*2/16FAWWON-Irr-67	128.4	61.4	100.1	53.5	51.8	79.0
58	MT19199	08X349-A3/Yellowstone	122.9	55.5	100.6	61.5	54.3	79.0
25	MT19166	MT1141//Yellowstone/HV9W06-975	116.4	58.1	100.3	60.4	57.8	78.6
43	MT19184	MT1078//AAC Gateway/MT1265	117.0	53.2	103.9	55.8	62.6	78.5
36	MT19177	(Northern sib, MT0977)//MT0859/MT0938	121.2	53.7	104.9	57.6	53.7	78.2
31	MT19172	MT0871/MT1151	125.0	52.6	108.6	49.1	54.4	77.9
22	MT19163	Colter//03X273cEx/MT10105	123.5	60.5	85.6	54.8	61.4	77.2
59	MT19200	08X349-A3/Yellowstone	118.3	55.6	94.9	58.4	56.8	76.8
23	MT19164	Colter//03X273cEx/MT10105	124.8	53.3	86.4	60.3	58.6	76.7
62	MT19203	Yellowstone/KS07HW25	114.7	51.5	93.8	62.5	60.2	76.5

Table 116. 2019 Preliminary A Test (Exp. 36): All Location Yield (bu/a)

Entry	ID	Pedigree	Bozeman RCB	Moccasin LAT	Huntley LAT	Conrad LAT	Ft. Benton RCB	5 Loc avg
	w = white							
		lattice efficiency relative to RCB	101%	109%	108%	270%		
26	MT19167	06X424B20//Yellowstone/Garrison	114.5	55.2	95.5	53.9	60.2	75.9
3	Judee	check	121.6	54.8	96.3	52.3	53.1	75.6
28	MT19169	06X424B20//Yellowstone/Garrison	119.5	48.8	91.3	62.3	55.9	75.6
20	MT19161	Accipiter//MT0871/02X159E41	122.9	44.9	100.5	53.3	55.6	75.4
38	MT19179	MT0951//MT0861/MT0754	116.0	56.0	93.8	53.3	56.6	75.1
30	MT19171	MT1145/MT0866	120.4	57.1	93.7	49.7	53.7	74.9
53	MT19194	Yellowstone/493-22(Reeder/6*Paul)	116.5	61.7	91.7	54.9	46.5	74.3
27	MT19168	06X424B20//Yellowstone/Garrison	116.2	49.0	92.2	53.6	50.9	72.4
Average			124.4	56.6	104.3	60.0	60.5	81.2
LSD (0.05)			12.6	ns	11.9	11.7	12.8	7.5
C.V. (%)			5.1	10.9	5.4	8.8	10.6	7.4
P-value (Varieties)			0.0021	0.3144		0.0008	0.0063	<.0001

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 117. 2019 Preliminary A Test (Exp. 36): All Location Test weight (lb/bu)

Entry	ID	Pedigree	Bozeman LAT	Moccasin LAT	Huntley LAT	Conrad LAT	Ft. Benton RCB	5 Loc avg
	w = white							
		lattice efficiency relative to RCB	118%	146%	113%	270%		
52 a	MT19193	Yellowstone/SD08W015	63.9	63.0	63.6	59.6	62.5	62.5
36	MT19177	(Northern sib, MT0977)/MT0859/MT0938	64.2	63.8	64.1	59.6	60.6	62.5
51	MT19192	Yellowstone/SD08W015	63.7	62.5	63.6	59.1	62.1	62.2
35 a	MT19176	MTW1098//Yellowstone-Lr41/Decade	63.4	62.2	63.9	59.8	61.5	62.2
12 a	MTCL19153	MT0871/(06X445B1-2, SY Clearstone sib)	63.5	62.5	63.1	60.3	61.0	62.1
31	MT19172	MT0871/MT1151	64.1	62.8	64.0	57.9	61.1	62.0
10 a	MTCL19151	MT0871/(06X445B1-2, SY Clearstone sib)	63.4	62.7	61.3	59.6	61.2	61.6
32 a	MT19173	HV9W04-1594R/Accipiter	63.5	61.1	62.7	59.2	61.3	61.6
11 a	MTCL19152	MT0871/(06X445B1-2, SY Clearstone sib)	63.1	62.4	62.1	59.5	60.6	61.5
45 a	MT19186	MT1090/MT08185/MT0742	63.8	61.7	62.4	59.2	60.2	61.5
42 a	MT19183	MT1078//AAC Gateway/MT1265	63.4	61.7	62.6	58.9	60.6	61.4
15	MT19156	Yellowstone/(493-22, Reeder/6*Paul)/3/MT08	63.4	61.6	62.6	58.0	61.3	61.4
29	MT19170	MT1091/Accipiter	63.5	62.6	61.4	58.7	60.3	61.3
23	MT19164	Colter//03X273cEx/MT10105	63.9	62.1	61.4	59.0	60.0	61.3
22	MT19163	Colter//03X273cEx/MT10105	63.8	62.6	61.3	57.5	60.6	61.2
2	Decade	check	62.8	61.0	62.5	58.1	61.3	61.1
48 a	MT19189	MT1084//MT08184/CO04575(cl)	63.3	61.6	63.1	57.0	60.7	61.1
64	MT19205	Yellowstone/HV9W06-975	63.1	61.4	61.9	57.8	60.9	61.0
24	MT19165	MT10121//Yellowstone/SD08W015	63.5	61.4	62.1	58.0	60.0	61.0
3	Judee	check	63.3	61.9	61.6	57.4	60.7	61.0
40	MT19181	MT10104//MT0861/MT0890	62.9	61.5	61.6	57.7	61.1	61.0
18 a	MT19159	Northern//02X22cE38/MT10121	62.8	61.4	62.1	58.9	59.5	60.9
54	MT19195	MT10116//MTW0880/MT0950	62.9	61.9	62.8	56.9	59.8	60.9
60	MT19201	08X350-A2/MT0890	62.9	61.4	60.7	58.3	60.8	60.8
8 a	MTCL19149	MTCL1125/MT1091	62.2	60.8	62.4	58.7	59.7	60.8
56	MT19197	Northern//Yellowstone/MTW0880	63.2	62.0	62.5	56.8	59.2	60.7
55 a	MT19196	Northern//Yellowstone/MTW0880	62.8	61.8	62.0	58.2	58.4	60.6
19	MT19160	Northern//02X22cE38/MT10121	63.1	61.0	61.6	57.7	59.6	60.6
50	MT19191	MT0871/02X159E41	62.4	61.4	61.9	58.1	59.2	60.6
46	MT19187	MT1084//MT0859/SD06069	63.4	60.6	61.7	56.7	60.5	60.6
34 a	MT19175	SD08198/Northern	61.5	60.7	62.2	58.7	59.5	60.5
62	MT19203	Yellowstone/KS07HW25	63.0	60.9	60.8	58.2	59.6	60.5
4	SY Monument	check	62.2	61.4	60.6	58.2	59.8	60.4
57	MT19198	Northern//Yellowstone/MTW0880	62.9	61.6	62.1	57.0	58.6	60.4
17	MT19158	Northern//02X22cE38/MT10121	62.9	60.9	60.1	57.4	60.8	60.4
38	MT19179	MT0951//MT0861/MT0754	62.0	61.7	59.8	57.6	60.7	60.4
63	MT19204	Yellowstone/KS07HW25	62.5	61.1	61.5	57.8	58.7	60.3
16	MT19157	Northern//02X22cE38/MT10121	62.8	60.1	60.4	58.9	59.0	60.2
44	MT19185	MT1078//Colter/Emerson	62.8	60.4	61.3	56.5	60.1	60.2
47	MT19188	MT0866//MT08184/NE06549	62.0	59.8	61.8	56.7	60.6	60.2
61	MT19202	08X350-A2/MT0890	62.7	61.2	61.3	57.1	58.6	60.2
1	Yellowstone	check	62.7	60.3	61.0	57.7	59.1	60.2
53	MT19194	Yellowstone/493-22(Reeder/6*Paul)	62.6	61.4	61.3	56.8	58.2	60.1
39	MT19180	MT1090//MT0861/MT0887	61.9	61.1	61.1	56.0	60.0	60.0
30	MT19171	MT1145/MT0866	62.8	61.0	61.1	55.5	59.5	60.0
37	MT19178	Northern//MT0861/CDC Falcon	62.3	61.3	60.9	56.8	58.4	59.9
43	MT19184	MT1078//AAC Gateway/MT1265	62.2	60.5	62.1	54.5	59.9	59.8
21	MT19162	Accipiter//MT0871/02X159E41	62.7	60.5	61.2	55.0	59.5	59.8
9	MTCL19150	MTCL1125/MT10128	62.5	60.3	63.3	55.6	57.0	59.7
20	MT19161	Accipiter//MT0871/02X159E41	62.3	59.4	61.3	55.8	59.1	59.6
25	MT19166	MT1141//Yellowstone/HV9W06-975	61.9	59.2	60.7	57.8	58.1	59.5
6	w3 MTW19147	MT10121*2/16FAWWON-Irr-67	61.6	60.9	61.4	55.0	58.6	59.5
33	MT19174	MT0871/(SD06156-1, Redfield sib)	60.5	58.0	61.1	57.8	59.3	59.3
49	MT19190	MT0871/02X159E41	61.6	58.6	60.2	55.3	58.9	58.9
7	MTCL19148	MTCL1125/Northern	61.9	59.2	60.9	55.2	57.3	58.9
26	MT19167	06X424B20//Yellowstone/Garrison	61.1	60.7	59.0	55.1	58.5	58.9

Table 117. 2019 Preliminary A Test (Exp. 36): All Location Test weight (lb/bu)

Entry	ID	Pedigree	Bozeman LAT	Moccasin LAT	Huntley LAT	Conrad LAT	Ft. Benton RCB	5 Loc avg
	w = white							
		lattice efficiency relative to RCB	118%	146%	113%	270%		
13	MT19154	08X349-A5/MT0954//MT1078	60.8	59.3	60.2	55.3	58.6	58.8
41	MT19182	MT1078//AAC Gateway/MT1265	62.0	58.8	59.0	55.1	59.0	58.8
59	MT19200	08X349-A3/Yellowstone	61.9	60.1	58.7	56.6	56.5	58.8
5	w2 MTW19146	Bearpaw//16FAWWON-Irr-61/MT0871	61.3	60.0	59.9	55.1	55.8	58.4
58	MT19199	08X349-A3/Yellowstone	60.7	59.2	58.5	56.2	56.8	58.3
14	MT19155	08X349-A5/MT0954//MT1078	60.6	58.3	58.9	54.8	58.3	58.2
28	MT19169	06X424B20//Yellowstone/Garrison	60.6	59.3	57.7	56.5	56.5	58.1
27	MT19168	06X424B20//Yellowstone/Garrison	59.9	58.8	58.6	54.9	57.2	57.9
Average			62.6	61.0	61.4	57.4	59.6	60.4
LSD (0.05)			0.7	1.6	0.9	2.1	1.9	1.0
C.V. (%)			1.3	1.2	0.7	1.6	1.6	1.3
P-value (Varieties)			<.0001	<.0001		<.0001	<.0001	<.0001

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column

1/ = data not in multi-location analysis

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 118. 2019 Preliminary A Test (Exp. 36): All Location Heading date (days from Jan 1)

Entry	ID	Pedigree	Bozeman LAT	Moccasin LAT	Huntley RCB	Conrad LAT	4 Loc avg
	w = white						
		lattice efficiency relative to RCB	120%	145%	100%	111%	
51	MT19192	Yellowstone/SD08W015	170.0	180.3	162.5	163.2	169.0
64	MT19205	Yellowstone/HV9W06-975	170.4	181.7	163.5	163.8	169.9
52 a	MT19193	Yellowstone/SD08W015	171.3	181.2	164.5	163.5	170.1
35 a	MT19176	MTW1098//Yellowstone-Lr41/Decade	172.2	180.2	165.0	164.1	170.4
10 a	MTCL19151	MT0871/(06X445B1-2, SY Clearstone sib)	175.2	180.5	164.5	164.8	171.3
4	SY Monument	check	175.2	181.0	166.5	164.3	171.8
44	MT19185	MT1078//Colter/Emerson	176.1	182.2	165.0	163.9	171.8
62	MT19203	Yellowstone/KS07HW25	175.1	181.3	166.0	164.7	171.8
11 a	MTCL19152	MT0871/(06X445B1-2, SY Clearstone sib)	175.4	181.4	165.5	165.5	172.0
39	MT19180	MT1090//MT0861/MT0887	175.7	181.3	166.0	165.0	172.0
2	Decade	check	174.8	180.7	168.0	165.2	172.2
14	MT19155	08X349-A5/MT0954//MT1078	176.3	180.2	167.0	165.4	172.2
63	MT19204	Yellowstone/KS07HW25	175.2	183.1	166.0	164.7	172.3
3	Judee	check	176.0	181.8	168.0	165.5	172.8
25	MT19166	MT1141//Yellowstone/HV9W06-975	176.3	181.3	168.5	165.4	172.9
32 a	MT19173	HV9W04-1594R/Accipiter	176.0	183.1	168.0	165.3	173.1
40	MT19181	MT10104//MT0861/MT0890	176.1	180.5	168.5	167.7	173.2
47	MT19188	MT0866//MT08184/NE06549	175.7	182.1	168.0	167.5	173.3
30	MT19171	MT1145/MT0866	176.5	181.7	169.5	165.9	173.4
49	MT19190	MT0871/02X159E41	176.0	182.9	169.5	165.3	173.4
45 a	MT19186	MT1090//MT08185/MT0742	177.6	181.5	168.5	166.6	173.6
58	MT19199	08X349-A3/Yellowstone	176.5	182.9	168.5	166.4	173.6
13	MT19154	08X349-A5/MT0954//MT1078	177.3	181.5	169.5	166.3	173.7
42 a	MT19183	MT1078//AAC Gateway/MT1265	177.2	182.3	168.5	166.9	173.7
43	MT19184	MT1078//AAC Gateway/MT1265	177.4	182.9	168.0	166.9	173.8
12 a	MTCL19153	MT0871/(06X445B1-2, SY Clearstone sib)	177.4	182.6	168.5	167.3	174.0
38	MT19179	MT0951//MT0861/MT0754	177.6	181.1	170.0	167.2	174.0
54	MT19195	MT10116//MTW0880/MT0950	177.0	181.6	171.0	166.3	174.0
24	MT19165	MT10121//Yellowstone/SD08W015	178.0	181.5	169.5	167.2	174.1
41	MT19182	MT1078//AAC Gateway/MT1265	176.8	182.4	169.0	168.0	174.1
8 a	MTCL19149	MTCL1125/MT1091	178.0	181.9	168.5	168.2	174.2
22	MT19163	Colter//03X273cEx/MT10105	177.8	180.4	170.5	168.2	174.2
23	MT19164	Colter//03X273cEx/MT10105	178.7	181.3	169.0	168.2	174.3
36	MT19177	(Northern sib, MT0977)//MT0859/MT0938	176.9	181.6	170.5	168.3	174.3
29	MT19170	MT1091/Accipiter	178.0	181.9	169.5	168.0	174.4
53	MT19194	Yellowstone/493-22(Reeder/6*Paul)	179.7	181.3	170.5	166.9	174.6
60	MT19201	08X350-A2/MT0890	177.7	181.1	171.0	168.4	174.6
16	MT19157	Northern//02X22cE38/MT10121	177.7	181.9	170.5	168.6	174.7
17	MT19158	Northern//02X22cE38/MT10121	177.8	182.5	170.5	168.1	174.7
50	MT19191	MT0871/02X159E41	178.0	182.3	170.0	168.5	174.7
1	Yellowstone	check	179.3	181.5	170.0	168.2	174.8
61	MT19202	08X350-A2/MT0890	179.3	181.8	170.5	168.9	175.1
15	MT19156	Yellowstone//(493-22, Reeder/6*Paul)/3/MT08	177.7	183.5	171.5	168.2	175.2
46	MT19187	MT1084//MT0859/SD06069	176.7	182.5	174.5	167.5	175.3
55 a	MT19196	Northern//Yellowstone/MTW0880	178.7	181.9	172.5	168.1	175.3
59	MT19200	08X349-A3/Yellowstone	179.3	184.1	170.5	167.9	175.5
18 a	MT19159	Northern//02X22cE38/MT10121	179.5	181.7	172.5	168.6	175.6
21	MT19162	Accipiter//MT0871/02X159E41	178.5	181.6	173.0	169.6	175.7
31	MT19172	MT0871/MT1151	177.8	182.3	173.5	169.1	175.7
7	MTCL19148	MTCL1125/Northern	180.2	182.9	170.5	169.6	175.8
5	w2 MTW19146	Bearpaw//16FAWWON-Irr-61/MT0871	179.3	183.2	173.0	168.4	176.0
34 a	MT19175	SD08198/Northern	178.4	182.2	174.5	169.0	176.0
19	MT19160	Northern//02X22cE38/MT10121	180.3	183.0	172.5	168.8	176.2

Table 118. 2019 Preliminary A Test (Exp. 36): All Location Heading date (days from Jan 1)

Entry	ID	Pedigree	Bozeman LAT	Moccasin LAT	Huntley RCB	Conrad LAT	4 Loc avg
	w = white						
		lattice efficiency relative to RCB	120%	145%	100%	111%	
33	MT19174	MT0871/(SD06156-1, Redfield sib)	178.2	182.7	175.0	169.7	176.4
26	MT19167	06X424B20//Yellowstone/Garrison	180.6	181.3	174.5	169.7	176.5
28	MT19169	06X424B20//Yellowstone/Garrison	181.2	182.9	172.5	169.9	176.6
37	MT19178	Northern//MT0861/CDC Falcon	179.7	182.8	175.0	169.3	176.7
48 a	MT19189	MT1084//MT08184/CO04575(cl)	180.2	183.6	173.5	169.4	176.7
56	MT19197	Northern//Yellowstone/MTW0880	180.5	182.1	175.0	169.9	176.9
9	MTCL19150	MTCL1125/MT10128	182.5	184.0	174.0	168.6	177.3
27	MT19168	06X424B20//Yellowstone/Garrison	182.0	183.8	173.0	170.4	177.3
6	w3 MTW19147	MT10121*2/16FAWWON-Irr-67	181.0	184.5	174.5	169.6	177.4
20	MT19161	Accipiter//MT0871/02X159E41	181.3	183.6	175.5	170.5	177.7
57	MT19198	Northern//Yellowstone/MTW0880	180.9	184.9	176.0	169.5	177.8
Average			177.5	182.1	170.0	167.3	174.2
LSD (0.05)			1.3	1.9	2.6	1.6	1.9
C.V. (%)			0.3	0.5	0.8	0.5	0.8
P-value (Varieties)			<.0001	0.0005		<.0001	<.0001

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 119. 2019 Preliminary A Test (Exp. 36): All Location Plant height (in)

Entry	ID	Pedigree	Bozeman RCB	Moccasin LAT	Huntley LAT	Conrad LAT
	w = white					
		lattice efficiency relative to RCB	93%	130%	107%	125%
59	MT19200	08X349-A3/Yellowstone	29.7	28.4	34.4	25.1
51	MT19192	Yellowstone/SD08W015	31.1	27.9	35.9	24.6
10 a	MTCL19151	MT0871/(06X445B1-2, SY Clearstone sib)	31.3	27.3	36.9	24.3
12 a	MTCL19153	MT0871/(06X445B1-2, SY Clearstone sib)	30.1	27.7	35.0	27.5
20	MT19161	Accipiter//MT0871/02X159E41	33.1	26.2	35.3	25.6
11 a	MTCL19152	MT0871/(06X445B1-2, SY Clearstone sib)	31.3	28.0	35.7	25.8
62	MT19203	Yellowstone/KS07HW25	31.9	28.6	34.6	25.7
32 a	MT19173	HV9W04-1594R/Accipiter	32.5	27.8	34.8	26.7
61	MT19202	08X350-A2/MT0890	31.7	29.6	36.5	24.2
14	MT19155	08X349-A5/MT0954//MT1078	32.7	28.6	37.0	24.6
50	MT19191	MT0871/02X159E41	31.7	29.0	35.2	27.0
58	MT19199	08X349-A3/Yellowstone	31.7	29.6	36.1	25.2
15	MT19156	Yellowstone//((493-22, Reeder/6*Paul)/3/MT08	32.3	28.8	35.3	26.9
26	MT19167	06X424B20//Yellowstone/Garrison	31.7	29.4	36.3	25.7
33	MT19174	MT0871/(SD06156-1, Redfield sib)	33.5	28.8	34.6	26.1
57	MT19198	Northern//Yellowstone/MTW0880	31.7	29.6	35.7	26.3
47	MT19188	MT0866//MT08184/NE06549	31.7	29.4	36.6	26.8
60	MT19201	08X350-A2/MT0890	31.7	28.9	36.4	27.3
56	MT19197	Northern//Yellowstone/MTW0880	32.1	28.4	36.6	27.6
25	MT19166	MT1141//Yellowstone/HV9W06-975	32.3	29.2	35.7	27.9
35 a	MT19176	MTW1098//Yellowstone-Lr41/Decade	32.5	29.7	34.6	28.3
38	MT19179	MT0951//MT0861/MT0754	33.7	29.0	35.7	26.8
46	MT19187	MT1084//MT0859/SD06069	33.7	28.7	34.4	28.3
52 a	MT19193	Yellowstone/SD08W015	31.3	28.9	37.0	27.9
34 a	MT19175	SD08198/Northern	32.7	29.5	35.9	27.3
64	MT19205	Yellowstone/HV9W06-975	32.5	27.1	37.2	28.8
17	MT19158	Northern//02X22cE38/MT10121	32.9	30.7	36.1	26.1
37	MT19178	Northern//MT0861/CDC Falcon	33.3	29.6	36.6	26.4
41	MT19182	MT1078//AAC Gateway/MT1265	32.9	29.6	36.5	27.5
49	MT19190	MT0871/02X159E41	32.1	29.1	36.4	28.9
6	w3 MTW19147	MT10121*2/16FAWWON-Irr-67	32.7	28.9	37.0	28.1
24	MT19165	MT10121//Yellowstone/SD08W015	34.1	28.1	37.1	27.7
27	MT19168	06X424B20//Yellowstone/Garrison	32.7	29.7	37.0	27.6
28	MT19169	06X424B20//Yellowstone/Garrison	32.9	28.9	37.5	27.8
40	MT19181	MT10104//MT0861/MT0890	32.3	31.7	36.0	27.4
48 a	MT19189	MT1084//MT08184/CO04575(cl)	32.5	30.1	37.6	27.8
4	SY Monument	check	31.9	29.1	38.0	29.2
21	MT19162	Accipiter//MT0871/02X159E41	34.4	30.2	36.4	27.4
22	MT19163	Colter//03X273cEx/MT10105	34.6	30.5	36.5	27.4
63	MT19204	Yellowstone/KS07HW25	32.9	30.4	38.7	27.0
30	MT19171	MT1145/MT0866	34.6	30.0	36.7	28.2
13	MT19154	08X349-A5/MT0954//MT1078	34.1	29.4	37.0	29.5
19	MT19160	Northern//02X22cE38/MT10121	35.2	29.6	36.7	28.5
5	w2 MTW19146	Bearpaw//16FAWWON-Irr-61/MT0871	33.9	29.9	39.1	27.5
44	MT19185	MT1078//Colter/Emerson	34.8	28.6	37.6	29.3
16	MT19157	Northern//02X22cE38/MT10121	34.4	29.3	37.6	29.6
29	MT19170	MT1091/Accipiter	34.6	28.7	37.6	29.9
18 a	MT19159	Northern//02X22cE38/MT10121	34.4	30.1	37.4	29.5
23	MT19164	Colter//03X273cEx/MT10105	35.0	31.3	36.3	28.8
39	MT19180	MT1090//MT0861/MT0887	31.5	28.9	38.8	32.2
53	MT19194	Yellowstone/493-22(Reeder/6*Paul)	34.3	31.9	37.0	28.2
9	MTCL19150	MTCL1125/MT10128	31.5	30.2	38.6	32.1
54	MT19195	MT10116//MTW0880/MT0950	34.8	30.6	39.4	28.0

Table 119. 2019 Preliminary A Test (Exp. 36): All Location Plant height (in)

Entry	ID	Pedigree	Bozeman RCB	Moccasin LAT	Huntley LAT	Conrad LAT
	w = white					
		lattice efficiency relative to RCB	93%	130%	107%	125%
43	MT19184	MT1078//AAC Gateway/MT1265	34.8	31.1	38.9	28.8
8 a	MTCL19149	MTCL1125/MT1091	34.3	31.5	38.0	30.0
36	MT19177	(Northern sib, MT0977)//MT0859/MT0938	34.3	31.3	39.6	29.3
42 a	MT19183	MT1078//AAC Gateway/MT1265	34.8	31.6	39.4	28.4
3	Judee	check	35.4	30.9	38.9	29.5
45 a	MT19186	MT1090//MT08185/MT0742	34.4	32.0	39.5	29.0
7	MTCL19148	MTCL1125/Northern	32.7	31.3	41.7	29.4
2	Decade	check	34.4	30.5	42.2	29.3
55 a	MT19196	Northern//Yellowstone/MTW0880	36.0	30.5	39.7	30.6
31	MT19172	MT0871/MT1151	36.8	31.7	41.2	29.6
1	Yellowstone	check	37.0	34.3	41.2	32.7
Average			33.2	29.6	37.1	27.9
LSD (0.05)			1.5	2.5	2.4	3.7
C.V. (%)			2.3	3.8	3.1	6.2
P-value (Varieties)			<.0001	0.0002		0.0083

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 120. 2019 Preliminary A Test (Exp. 36): All Location Lodging/Sawfly Cutting (%)

Entry	ID	Pedigree	Conrad LAT	Ft. Benton RCB	2 Loc avg
	w = white				
			111%		
43	MT19184	MT1078//AAC Gateway/MT1265	4	20	12
26	MT19167	06X424B20//Yellowstone/Garrison	28	5	17
28	MT19169	06X424B20//Yellowstone/Garrison	22	15	19
46	MT19187	MT1084//MT0859/SD06069	34	13	24
51	MT19192	Yellowstone/SD08W015	14	40	27
27	MT19168	06X424B20//Yellowstone/Garrison	41	18	30
42 a	MT19183	MT1078//AAC Gateway/MT1265	28	38	33
30	MT19171	MT1145/MT0866	45	25	35
47	MT19188	MT0866//MT08184/NE06549	26	45	36
33	MT19174	MT0871/(SD06156-1, Redfield sib)	54	20	37
19	MT19160	Northern//02X22cE38/MT10121	44	35	39
35 a	MT19176	MTW1098//Yellowstone-Lr41/Decade	37	45	41
41	MT19182	MT1078//AAC Gateway/MT1265	50	35	43
20	MT19161	Accipiter//MT0871/02X159E41	47	40	43
52 a	MT19193	Yellowstone/SD08W015	39	48	44
3	Judee	check	42	45	44
40	MT19181	MT10104//MT0861/MT0890	55	33	44
31	MT19172	MT0871/MT1151	37	53	45
21	MT19162	Accipiter//MT0871/02X159E41	41	50	45
59	MT19200	08X349-A3/Yellowstone	41	50	46
55 a	MT19196	Northern//Yellowstone/MTW0880	44	50	47
48 a	MT19189	MT1084//MT08184/CO04575(cl)	61	33	47
2	Decade	check	44	50	47
62	MT19203	Yellowstone/KS07HW25	50	45	47
37	MT19178	Northern//MT0861/CDC Falcon	45	50	48
50	MT19191	MT0871/02X159E41	50	45	48
16	MT19157	Northern//02X22cE38/MT10121	48	50	49
29	MT19170	MT1091/Accipiter	29	70	49
32 a	MT19173	HV9W04-1594R/Accipiter	59	40	50
38	MT19179	MT0951//MT0861/MT0754	51	50	51
12 a	MTCL19153	MT0871/(06X445B1-2, SY Clearstone sib)	47	55	51
54	MT19195	MT10116//MTW0880/MT0950	52	50	51
13	MT19154	08X349-A5/MT0954//MT1078	48	55	51
5	w2 MTW19146	Bearpaw//16FAWWON-Irr-61/MT0871	59	45	52
18 a	MT19159	Northern//02X22cE38/MT10121	50	55	52
22	MT19163	Colter//03X273cEx/MT10105	50	55	52
36	MT19177	(Northern sib, MT0977)//MT0859/MT0938	56	50	53
39	MT19180	MT1090//MT0861/MT0887	47	60	54
49	MT19190	MT0871/02X159E41	62	45	54
56	MT19197	Northern//Yellowstone/MTW0880	52	55	54
53	MT19194	Yellowstone/493-22(Reeder/6*Paul)	48	60	54
7	MTCL19148	MTCL1125/Northern	56	53	55
15	MT19156	Yellowstone//((493-22, Reeder/6*Paul)/3/MT08	62	50	56
6	w3 MTW19147	MT10121*2/16FAWWON-Irr-67	58	55	56
23	MT19164	Colter//03X273cEx/MT10105	48	65	57
4	SY Monument	check	59	55	57
24	MT19165	MT10121//Yellowstone/SD08W015	59	55	57
34 a	MT19175	SD08198/Northern	62	53	57
57	MT19198	Northern//Yellowstone/MTW0880	60	55	57
10 a	MTCL19151	MT0871/(06X445B1-2, SY Clearstone sib)	60	55	58
8 a	MTCL19149	MTCL1125/MT1091	53	65	59
9	MTCL19150	MTCL1125/MT10128	59	60	59
25	MT19166	MT1141//Yellowstone/HV9W06-975	50	70	60

Table 120. 2019 Preliminary A Test (Exp. 36): All Location Lodging/Sawfly Cutting (%)

Entry	ID	Pedigree	Conrad LAT	Ft. Benton RCB	2 Loc avg
	w = white				
			111%		
17	MT19158	Northern//02X22cE38/MT10121	62	60	61
58	MT19199	08X349-A3/Yellowstone	48	75	62
11 a	MTCL19152	MT0871/(06X445B1-2, SY Clearstone sib)	69	55	62
14	MT19155	08X349-A5/MT0954//MT1078	70	55	63
44	MT19185	MT1078//Colter/Emerson	62	65	64
60	MT19201	08X350-A2/MT0890	65	65	65
63	MT19204	Yellowstone/KS07HW25	62	75	68
45 a	MT19186	MT1090//MT08185/MT0742	76	65	70
1	Yellowstone	check	63	80	72
64	MT19205	Yellowstone/HV9W06-975	75	70	73
61	MT19202	08X350-A2/MT0890	70	80	75
Average			49.8	49.6	49.7
LSD (0.05)			ns	22.1	20.3
C.V. (%)			30.0	22.3	20.5
P-value (Varieties)			0.0643	<.0001	<.0001

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 121. 2019 Preliminary A Test (Exp. 36): All Location Protein (%)

Entry	ID	Pedigree	Bozeman Bulk	Moccasin 1 rep	Huntley LAT	Conrad bulk	Ft. Benton RCB	5 Loc avg
	w = white							
		lattice efficiency relative to RCB			181%			
30	MT19171	MT1145/MT0866	12.6	13.2	13.8	15.7	14.0	13.9
33	MT19174	MT0871/(SD06156-1, Redfield sib)	12.7	13.9	12.2	14.9	13.8	13.5
43	MT19184	MT1078//AAC Gateway/MT1265	12.9	12.1	13.3	13.8	13.3	13.1
28	MT19169	06X424B20//Yellowstone/Garrison	12.4	11.7	13.6	13.3	13.6	12.9
63	MT19204	Yellowstone/KS07HW25	12.8	10.9	13.3	13.7	13.6	12.9
5	w2 MTW19146	Bearpaw//16FAWWON-Irr-61/MT0871	11.5	11.1	12.9	15.2	13.2	12.8
7	MTCL19148	MTCL1125/Northern	12.0	12.5	12.8	13.6	13.3	12.8
9	MTCL19150	MTCL1125/MT10128	12.1	12.2	12.1	14.2	13.5	12.8
22	MT19163	Colter//03X273cEx/MT10105	12.3	10.9	13.1	14.5	13.4	12.8
49	MT19190	MT0871/02X159E41	11.9	12.3	12.7	13.8	13.1	12.8
3	Judee	check	11.9	11.7	12.6	14.1	13.4	12.7
15	MT19156	Yellowstone//((493-22, Reeder/6*Paul)/3/MT0871)	12.4	11.4	12.6	14.1	13.1	12.7
19	MT19160	Northern//02X22cE38/MT10121	11.5	11.0	12.6	14.5	13.8	12.7
21	MT19162	Accipiter//MT0871/02X159E41	11.3	12.7	12.5	13.9	13.3	12.7
23	MT19164	Colter//03X273cEx/MT10105	12.5	10.8	13.3	13.5	13.4	12.7
24	MT19165	MT10121//Yellowstone/SD08W015	11.8	11.0	12.9	14.3	13.3	12.7
25	MT19166	MT1141//Yellowstone/HV9W06-975	11.7	12.9	12.8	13.0	13.0	12.7
27	MT19168	06X424B20//Yellowstone/Garrison	12.2	10.6	13.1	14.0	13.7	12.7
31	MT19172	MT0871/MT1151	12.4	11.1	12.1	14.0	13.8	12.7
35	a MT19176	MTW1098//Yellowstone-Lr41/Decade	13.1	11.1	12.3	13.6	13.3	12.7
18	a MT19159	Northern//02X22cE38/MT10121	11.9	11.5	12.2	13.8	13.5	12.6
20	MT19161	Accipiter//MT0871/02X159E41	11.8	11.4	12.3	14.2	13.3	12.6
53	MT19194	Yellowstone/493-22(Reeder/6*Paul)	12.1	10.7	12.8	13.9	13.5	12.6
59	MT19200	08X349-A3/Yellowstone	11.5	10.7	13.1	14.2	13.7	12.6
29	MT19170	MT1091/Accipiter	11.9	10.8	13.0	13.2	13.7	12.5
36	MT19177	(Northern sib, MT0977)//MT0859/MT0938	12.2	11.6	12.6	13.0	13.1	12.5
45	a MT19186	MT1090//MT08185/MT0742	12.0	10.7	12.6	13.8	13.4	12.5
17	MT19158	Northern//02X22cE38/MT10121	11.5	11.1	12.9	13.5	13.1	12.4
26	MT19167	06X424B20//Yellowstone/Garrison	12.0	10.8	12.1	14.1	13.0	12.4
40	MT19181	MT10104//MT0861/MT0890	12.6	10.8	12.2	12.9	13.5	12.4
50	MT19191	MT0871/02X159E41	11.9	10.7	12.7	13.9	13.0	12.4
2	Decade	check	11.8	12.0	12.0	12.5	13.2	12.3
6	w3 MTW19147	MT10121*2/16FAWWON-Irr-67	11.5	11.1	11.6	13.8	13.7	12.3
16	MT19157	Northern//02X22cE38/MT10121	11.3	11.2	12.6	13.5	12.9	12.3
37	MT19178	Northern//MT0861/CDC Falcon	10.6	10.3	12.6	14.9	13.1	12.3
48	a MT19189	MT1084//MT08184/CO04575(cl)	11.3	11.9	11.8	13.4	12.9	12.3
51	MT19192	Yellowstone/SD08W015	11.9	11.5	12.2	12.8	13.1	12.3
57	MT19198	Northern//Yellowstone/MTW0880	11.4	10.9	12.0	14.3	13.0	12.3
58	MT19199	08X349-A3/Yellowstone	11.7	10.0	12.8	13.8	13.2	12.3
62	MT19203	Yellowstone/KS07HW25	11.3	11.3	12.5	13.5	12.8	12.3
8	a MTCL19149	MTCL1125/MT1091	11.1	12.7	11.6	13.1	12.7	12.2
12	a MTCL19153	MT0871/(06X445B1-2, SY Clearstone sib)	11.8	11.3	12.1	13.1	12.9	12.2
32	a MT19173	HV9W04-1594R/Accipiter	11.8	11.3	11.5	13.3	13.1	12.2
42	a MT19183	MT1078//AAC Gateway/MT1265	11.7	11.5	12.0	12.6	13.1	12.2
55	a MT19196	Northern//Yellowstone/MTW0880	11.5	11.0	12.1	13.6	12.6	12.2
61	MT19202	08X350-A2/MT0890	11.6	10.3	12.0	13.6	13.3	12.2
10	a MTCL19151	MT0871/(06X445B1-2, SY Clearstone sib)	11.5	11.3	12.3	12.7	12.7	12.1
11	a MTCL19152	MT0871/(06X445B1-2, SY Clearstone sib)	11.3	10.9	12.0	13.7	12.7	12.1
38	MT19179	MT0951//MT0861/MT0754	11.6	10.3	12.8	13.3	12.7	12.1
44	MT19185	MT1078//Colter/Emerson	11.6	10.2	12.6	13.2	12.8	12.1
52	a MT19193	Yellowstone/SD08W015	11.8	10.8	11.5	13.9	12.6	12.1
54	MT19195	MT10116//MTW0880/MT0950	12.0	10.4	11.8	13.1	13.1	12.1
56	MT19197	Northern//Yellowstone/MTW0880	11.4	10.8	12.0	13.5	12.9	12.1
60	MT19201	08X350-A2/MT0890	11.4	10.5	12.3	13.3	12.9	12.1

Table 121. 2019 Preliminary A Test (Exp. 36): All Location Protein (%)

Entry	ID	Pedigree	Bozeman Bulk	Moccasin 1 rep	Huntley LAT	Conrad bulk	Ft. Benton RCB	5 Loc avg
	w = white							
		lattice efficiency relative to RCB			181%			
1	Yellowstone	check	11.8	10.0	12.4	13.0	12.8	12.0
41	MT19182	MT1078//AAC Gateway/MT1265	11.1	10.9	12.3	13.5	12.1	12.0
46	MT19187	MT1084//MT0859/SD06069	11.2	10.7	12.3	13.3	12.5	12.0
47	MT19188	MT0866//MT08184/NE06549	12.0	10.0	11.9	13.3	12.7	12.0
64	MT19205	Yellowstone/HV9W06-975	11.5	11.3	11.9	12.5	12.6	12.0
14	MT19155	08X349-A5/MT0954//MT1078	11.0	10.5	11.6	13.5	12.8	11.9
34 a	MT19175	SD08198/Northern	11.2	11.7	11.3	12.7	12.8	11.9
39	MT19180	MT1090//MT0861/MT0887	11.4	10.6	11.8	13.1	12.7	11.9
13	MT19154	08X349-A5/MT0954//MT1078	11.0	9.7	12.0	13.6	12.9	11.8
4	SY Monument	check	10.7	11.1	11.5	12.1	12.1	11.5
Average			11.8	11.2	12.4	13.6	13.1	12.4
LSD (0.05)					0.7		0.6	0.6
C.V. (%)					2.7		2.2	4.1
P-value (Varieties)							<.0001	<.0001

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 122. 2019 Preliminary A Test (Exp. 36): Rust Disease Evaluations

		Stripe Rust						Aluminum tolerance			
Entry	ID	Pullman, WA		MT. Vernon, WA				MT		Rockford, WA	
		Flowering IT ^{1/}	% %	Stem elong. IT ^{1/}	% %	Milk IT ^{1/}	% %	Ft. Ellis Sr Nursery	'Early'	'Later'	
											higher # is better
w = white											
1	Yellowstone	2	2	5	30	2	10	40	1	1	
2	Decade	8	80	8	40	5	50		2	2	
3	Judee	2	2	2	10	2	10		2	2	
4	SY Monument	8	60	2	10	2	5		3	2	
5	w2 MTW19146	2	10	5	30	2	15	10	1	1	
6	w3 MTW19147	3	20	3	20	2	15		1	1	
7	MTCL19148	8	20	3	20	2	5		1	1	
8	a MTCL19149	2	10	2	10	2	5		1	1	
9	MTCL19150	8	60	5	30	2	10	5	1	1	
10	a MTCL19151	2	20	2	10	2	10		2	2	
11	a MTCL19152	2	10	5	20	2	5		2	2	
12	a MTCL19153	2	2	2	10	2	5		3	2	
13	MT19154	5	30	2	10	3	20		1	1	
14	MT19155	3	20	2	10	2	10		1	1	
15	MT19156	2	10	3	20	2	10		1	1	
16	MT19157	2	20	5	30	2	10		1	1	
17	MT19158	2	10	2	10	2	10		1	1	
18	a MT19159	2	10	3	20	2	10	5	1	1	
19	MT19160	2	10	3	20	2	5		1	1	
20	MT19161	2	2	2	10	2	10		1	1	
21	MT19162	2	2	2	10	2	10		1	1	
22	MT19163	2	2	2	5	2	10		1	1	
23	MT19164	2	5	2	5	2	10	25	1	1	
24	MT19165	2	2	2	5	2	10	15	1	1	
25	MT19166	5	10	5	20	2	10	30	2	1	
26	MT19167	2	2	3	20	2	10		1	1	
27	MT19168	2	2	2	10	2	5		1	1	
28	MT19169	2	5	3	20	2	10		1	1	
29	MT19170	8	30	2	10	2	5		50	1	1
30	MT19171	5	30	2	10	3	30	25	1	1	
31	MT19172	2	2	5	30	2	10	10	1	1	
32	a MT19173	2	10	2	10	2	10	50	3	3	
33	MT19174	2	5	2	10	2	10	10	1	1	
34	a MT19175	2	15	2	10	2	10		2	1	
35	a MT19176	3	15	2	10	2	10		2	2	
36	MT19177	2	2	2	10	2	10		3	2	
37	MT19178	2	5	8	40	2	15		2	3	
38	MT19179	3	30	5	30	2	15		1	1	
39	MT19180	2	2	2	10	2	5		3	4	
40	MT19181	2	2	2	10	2	10		4	4	
41	MT19182	2	2	2	10	2	5	15	2	3	
42	a MT19183	2	10	3	10	2	10		2	2	
43	MT19184	2	2	3	10	2	10		3	3	
44	MT19185	2	2	2	2	2	5		1	1	
45	a MT19186	8	5	3	10	2	5	25	1	1	
46	MT19187	2	5	2	10	2	5	15	1	2	
47	MT19188	2	15	3	10	2	15		1	3	
48	a MT19189	2	5	2	10	2	10		2	3	
49	MT19190	2	5	5	20	2	10		3	4	
50	MT19191	2	5	3	10	2	10		2	3	

Table 122. 2019 Preliminary A Test (Exp. 36): Rust Disease Evaluations

		Stripe Rust				Aluminum tolerance	
Entry	ID	Pullman, WA		MT. Vernon, WA		MT	
		Flowering IT ^{1/} %	Stem elong. IT ^{1/} %	Milk IT ^{1/} %	Ft. Ellis Sr Nursery	Rockford, WA	
						'Early'	'Later'
w = white						higher # is better	
51	MT19192	2	2	3	10	2	2
52	a MT19193	2	5	3	10	2	2
53	MT19194	2	2	3	10	2	2
54	MT19195	5	30	2	5	2	2
55	a MT19196	2,8	10,20	3	10	2	5
56	MT19197	2	10	3	10	2	10
57	MT19198	2	10	3	10	2	5
58	MT19199	5	20	2	10	2	10
59	MT19200	3	20	2	10	2	10
60	MT19201	2	5	2	10	2	10
61	MT19202	2	5	2	10	2	5
62	MT19203	2	5	2	2	2	5
63	MT19204	2	5	2	2	2	5
64	MT19205	5	30	3	2	2	5
Average		13		14		10	
						25	
						1	
						1	
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Table 123. 2019 Preliminary B Fhb Test: All location Summary

Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	FHB index	Stripe rust %	Protein %
	w = white								
		locations	2	2	2	2	1	1	2
1	MT19103	09x257cD9-2/DecadeFhb1-DH7	75.6	61.3	168.1	25.2	26	0	13.6
2	MT19104	09x257cD9-2/DecadeFhb1-DH7	74.7	61.2	170.1	26.3	17	0	14.1
3	MT19105	09x257cD9-2/DecadeFhb1-DH7	85.8	61.1	169.5	28.5	17	3	14.4
4	MT19106	09x257cD9-2/DecadeFhb1-DH7	85.6	60.5	170.7	30.8	9	7	12.1
5	MT19107	DecadeFhb1-DH11/Overland FHB-1	76.0	60.8	164.1	28.8	7	30	12.9
6	MT19108	DecadeFhb1-DH11/Overland FHB-1	78.3	61.5	164.6	28.0	8	42	12.5
7	MT19109	DecadeFhb1-DH11/Overland FHB-1	68.3	58.9	168.1	27.5	8	47	12.4
8	MT19110	DecadeFhb1-DH11/Overland FHB-1	79.3	60.4	167.9	25.9	12	0	13.1
9	MT19111	DecadeFhb1-DH11/Overland FHB-1	79.1	59.9	170.6	27.8	19	8	12.7
10	MT19112	DecadeFhb1-DH11/Overland FHB-1	77.7	62.3	168.8	29.0	14	10	12.4
11	MT19113	DecadeFhb1-DH11/Overland FHB-1	80.8	61.1	166.5	28.8	18	6	13.4
12	MT19114	DecadeFhb1-DH11/Overland FHB-1	75.2	61.0	170.8	29.0	13	5	13.9
13	MT19115	DecadeFhb1-DH11/Overland FHB-1	82.9	62.4	168.4	30.2	12	8	12.5
14 a	MT19116	DecadeFhb1-DH11/Overland FHB-1	92.2	62.0	163.2	29.4	4	6	13.8
15	MT19117	DecadeFhb1-DH11/Overland FHB-1	85.9	61.0	170.0	30.8	10	12	12.6
16	MT19118	DecadeFhb1-DH11/Overland FHB-1	82.7	62.1	164.5	28.9	6	26	12.8
17	MT19119	DecadeFhb1-DH11/Overland FHB-1	89.8	60.7	170.5	28.7	14	0	12.9
18	MT19120	DecadeFhb1-DH11/Overland FHB-1	82.6	61.5	166.0	28.9	10	5	13.2
19	MT19121	DecadeFhb1-DH11/Overland FHB-1	76.3	60.7	169.9	29.1	11	17	13.6
20	MT19122	DecadeFhb1-DH11/Overland FHB-1	87.6	61.9	169.5	29.4	3	1	13.7
21	MT19123	DecadeFhb1-DH13//MT1078/Langin	86.1	60.6	172.1	31.6	13	3	13.1
22	MT19124	DecadeFhb1-DH13//MT1078/Langin	76.2	61.3	168.6	28.3	3	7	14.7
23	MT19125	DecadeFhb1-DH13//MT1078/Langin	77.4	61.6	167.9	29.0	12	9	13.8
24	MT19126	DecadeFhb1-DH13//MT1078/Langin	76.4	60.6	169.1	29.7	9	19	13.3
25	MT19127	DecadeFhb1-DH13//MT1078/Langin	77.9	59.5	169.1	27.7	16	8	12.2
26	MT19128	DecadeFhb1-DH13//MT1078/Langin	81.7	61.2	171.7	30.5	5	5	12.6
27	MT19129	Judee*2/Emerson	84.1	62.1	171.0	30.8	22	2	13.1
28	MT19130	MT1078//Colter/Emerson	70.1	60.2	173.7	32.2	6	18	12.7
29	MT19131	MT1078//Colter/Emerson	86.7	59.6	170.9	32.4	12	0	12.7
30 a	MT19132	MT1078//Colter/Emerson	87.0	60.0	169.8	32.3	5	6	12.5
31 a	MT19133	MT1078//Judee/Emerson	86.5	60.8	171.0	32.5	6	3	12.1
32	MT19134	MT1078//Judee/Emerson	83.8	61.0	170.8	30.4	10	2	12.7
33	MT19135	MT1078//Judee/Emerson	80.2	60.7	172.5	31.1	5	2	13.9
34	MT19136	MT1078//Judee/Emerson	82.2	60.3	169.1	28.9	10	0	13.1
35	MT19137	MT1078//Judee/Emerson	87.6	60.9	170.4	31.9	14	3	12.8
36	MT19138	MT1078//Judee/Emerson	81.2	60.4	169.5	29.4	15	3	13.2
37	MT19139	MT1078//Judee/Emerson	83.8	61.8	169.4	31.6	14	4	12.8
38	MT19140	MT1332/DecadeFhb1-DH17	72.6	60.9	165.9	29.6	14	59	12.3
39	MT19141	MT1332/DecadeFhb1-DH17	73.0	60.6	165.5	29.8	3	31	11.9
40 a	MT19142	MT1332/DecadeFhb1-DH17	87.7	60.6	172.2	31.7	9	4	12.5
41	MT19143	MTS1596//Emerson/Spur	70.6	61.2	169.2	27.5	11	1	14.2
42	MT19144	MTS1596//Emerson/Spur	68.6	62.7	173.2	29.2	3	4	13.4
43	MT19145	MTS1596//Emerson/Spur	73.9	59.3	171.9	27.4	8	2	12.7
44	Decade	check	78.4	61.0	168.1	30.4	4	23	12.8
45	Yellowstone	check	88.8	61.4	171.7	31.3	15	1	12.2
46	Emerson	check	77.0	61.6	172.5	32.9	0	1	13.3
47	MT1793	check	82.5	61.3	165.2	28.8	7	10	13.5
48	MT1796	check	83.6	61.7	167.8	30.5	7	4	13.8
49	Ray	check	93.5	59.9	174.3	35.0	3	0	12.8
Average			80.7	60.9	169.3	29.7	10.1	9.3	13.0
LSD (0.05)			ns	ns	2.4	2.4	7.0	21.1	1.1
C.V. (%)			10.3	1.5	0.7	4.0	42.5	104	4.2

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 124. 2019 Preliminary B FHB Test: Bozeman

Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Stripe rust % 19-Jul	Protein %
	w = white		RCB	LAT	LAT	RCB	LAT	bulk
			104%	107%	135%		120%	
49	Ray	check	135.5	61.4	181.9	39.6	0	12.3
31 a	MT19133	MT1078//Judee/Emerson	127.2	61.2	177.6	37.4	3	11.3
20	MT19122	DecadeFhb1-DH11/Overland FHB-1	123.8	63.0	175.0	34.6	1	12.6
30 a	MT19132	MT1078//Colter/Emerson	123.2	60.8	176.8	37.8	6	11.2
35	MT19137	MT1078//Judee/Emerson	121.5	62.0	176.7	37.8	3	11.7
29	MT19131	MT1078//Colter/Emerson	120.6	60.1	176.5	36.8	0	12.3
18	MT19120	DecadeFhb1-DH11/Overland FHB-1	119.9	63.2	171.7	33.7	5	12.2
37	MT19139	MT1078//Judee/Emerson	118.5	62.3	176.0	37.2	4	11.9
16	MT19118	DecadeFhb1-DH11/Overland FHB-1	118.5	63.5	169.0	32.3	26	11.9
17	MT19119	DecadeFhb1-DH11/Overland FHB-1	117.9	61.1	176.6	33.1	0	11.6
45	Yellowstone	check	117.3	62.4	179.1	36.4	1	11.6
4	MT19106	09x257cD9-2/DecadeFhb1-DH7	117.1	60.9	177.7	37.2	7	11.1
32	MT19134	MT1078//Judee/Emerson	116.1	61.7	176.9	35.8	2	11.4
47	MT1793	check	115.5	61.9	170.6	32.7	10	12.3
3	MT19105	09x257cD9-2/DecadeFhb1-DH7	115.5	62.2	176.3	34.3	3	13.4
36	MT19138	MT1078//Judee/Emerson	115.3	61.2	176.7	35.0	3	12.3
40 a	MT19142	MT1332/DecadeFhb1-DH17	115.3	60.9	178.7	36.0	4	11.5
14 a	MT19116	DecadeFhb1-DH11/Overland FHB-1	113.9	63.6	168.4	34.3	6	13.0
27	MT19129	Judee*2/Emerson	113.2	62.5	177.3	35.4	2	12.1
23	MT19125	DecadeFhb1-DH13//MT1078/Langin	112.6	63.2	174.1	33.1	9	12.0
6	MT19108	DecadeFhb1-DH11/Overland FHB-1	112.4	63.3	169.1	32.3	42	11.2
15	MT19117	DecadeFhb1-DH11/Overland FHB-1	112.3	62.0	176.6	36.4	12	11.3
13	MT19115	DecadeFhb1-DH11/Overland FHB-1	112.2	63.3	174.4	34.6	8	11.2
34	MT19136	MT1078//Judee/Emerson	112.0	61.7	176.5	34.3	0	11.9
8	MT19110	DecadeFhb1-DH11/Overland FHB-1	111.6	61.8	174.8	30.3	0	11.7
21	MT19123	DecadeFhb1-DH13//MT1078/Langin	111.3	60.7	178.8	35.4	3	11.9
48	MT1796	check	110.1	62.4	173.2	35.0	4	12.5
33	MT19135	MT1078//Judee/Emerson	109.1	61.3	180.0	35.6	2	13.2
10	MT19112	DecadeFhb1-DH11/Overland FHB-1	108.9	62.9	173.3	34.1	10	10.4
39	MT19141	MT1332/DecadeFhb1-DH17	108.7	61.9	171.9	35.6	31	11.0
26	MT19128	DecadeFhb1-DH13//MT1078/Langin	107.4	61.2	178.1	34.4	5	11.9
19	MT19121	DecadeFhb1-DH11/Overland FHB-1	105.6	62.2	176.1	34.4	17	11.6
11	MT19113	DecadeFhb1-DH11/Overland FHB-1	105.5	62.0	171.7	33.3	6	11.9
2	MT19104	09x257cD9-2/DecadeFhb1-DH7	105.0	62.4	176.4	30.1	0	13.0
1	MT19103	09x257cD9-2/DecadeFhb1-DH7	104.7	62.4	174.1	29.3	0	12.9
12	MT19114	DecadeFhb1-DH11/Overland FHB-1	104.2	62.1	176.3	35.0	5	11.8
5	MT19107	DecadeFhb1-DH11/Overland FHB-1	104.2	61.6	169.4	33.9	30	11.6
22	MT19124	DecadeFhb1-DH13//MT1078/Langin	103.4	63.0	175.4	31.7	7	13.1
24	MT19126	DecadeFhb1-DH13//MT1078/Langin	102.9	61.0	175.4	34.4	19	11.5
46	Emerson	check	101.1	63.0	180.2	38.6	1	12.7
9	MT19111	DecadeFhb1-DH11/Overland FHB-1	100.6	58.9	176.8	32.3	8	11.3
44	Decade	check	100.3	61.1	174.8	34.8	23	11.8
38	MT19140	MT1332/DecadeFhb1-DH17	98.6	61.3	170.4	35.6	59	11.0
41	MT19143	MTS1596//Emerson/Spur	98.3	61.9	175.0	30.9	1	12.8
25	MT19127	DecadeFhb1-DH13//MT1078/Langin	97.6	59.2	175.8	30.5	8	11.2
43	MT19145	MTS1596//Emerson/Spur	96.3	59.3	179.5	31.1	2	11.8
28	MT19130	MT1078//Colter/Emerson	91.0	60.2	180.7	35.8	18	10.9
42	MT19144	MTS1596//Emerson/Spur	83.6	63.2	180.6	32.3	4	12.3
7	MT19109	DecadeFhb1-DH11/Overland FHB-1	83.0	57.6	174.8	32.3	47	11.0
Average			109.8	61.7	175.6	34.4	9.3	11.9
LSD (0.05)			13.3	1.0	1.4	2.0	21.1	
C.V. (%)			6.0	0.8	0.4	2.8	104	
P-value (Varieties)			<.0001	<.0001	<.0001	<.0001	0.0002	

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 125. 201(Preliminary B FHB Test: Huntley

Test destroyed by hail and high winds					
Entry #	ID	Pedigree	Heading date Julian	Plant height in	FHB
w = white					Incidence Severity Index
					RCB RCB RCB
Lattice efficiency over RCB (%)					100%
46	Emerson	check			11.1 0.8 0.1
39	MT19141	MT1332/DecadeFhb1-DH17			41.1 5.3 2.6
22	MT19124	DecadeFhb1-DH13//MT1078/Langin			46.6 5.7 2.9
49	Ray	check			43.3 7.3 3.3
20	MT19122	DecadeFhb1-DH11/Overland FHB-1			40.0 7.2 3.3
42	MT19144	MTS1596//Emerson/Spur			40.0 6.5 3.5
14 a	MT19116	DecadeFhb1-DH11/Overland FHB-1			52.2 7.6 4.0
44	Decade	check			47.8 7.9 4.0
30 a	MT19132	MT1078//Colter/Emerson			57.8 8.2 4.9
33	MT19135	MT1078//Judee/Emerson			56.7 8.5 5.1
26	MT19128	DecadeFhb1-DH13//MT1078/Langin			57.8 8.5 5.3
16	MT19118	DecadeFhb1-DH11/Overland FHB-1			60.0 8.9 5.8
28	MT19130	MT1078//Colter/Emerson			56.7 9.8 6.2
31 a	MT19133	MT1078//Judee/Emerson			55.6 9.2 6.4
48	MT1796	check			63.3 10.0 6.5
47	MT1793	check			62.2 10.5 6.6
5	MT19107	DecadeFhb1-DH11/Overland FHB-1			63.3 10.6 6.7
7	MT19109	DecadeFhb1-DH11/Overland FHB-1			66.7 11.0 7.7
43	MT19145	MTS1596//Emerson/Spur			64.5 11.9 7.8
6	MT19108	DecadeFhb1-DH11/Overland FHB-1			70.0 11.2 8.0
24	MT19126	DecadeFhb1-DH13//MT1078/Langin			63.3 13.3 8.9
40 a	MT19142	MT1332/DecadeFhb1-DH17			67.8 11.9 9.1
4	MT19106	09x257cD9-2/DecadeFhb1-DH7			64.4 13.4 9.3
15	MT19117	DecadeFhb1-DH11/Overland FHB-1			74.4 12.8 9.6
32	MT19134	MT1078//Judee/Emerson			64.4 15.6 10.1
34	MT19136	MT1078//Judee/Emerson			65.5 14.5 10.3
18	MT19120	DecadeFhb1-DH11/Overland FHB-1			81.1 12.2 10.3
41	MT19143	MTS1596//Emerson/Spur			71.1 14.3 10.6
19	MT19121	DecadeFhb1-DH11/Overland FHB-1			75.6 14.2 11.1
23	MT19125	DecadeFhb1-DH13//MT1078/Langin			73.3 15.5 11.5
13	MT19115	DecadeFhb1-DH11/Overland FHB-1			77.8 14.7 11.6
29	MT19131	MT1078//Colter/Emerson			66.7 16.9 11.9
8	MT19110	DecadeFhb1-DH11/Overland FHB-1			78.9 15.2 12.0
21	MT19123	DecadeFhb1-DH13//MT1078/Langin			83.3 14.8 12.5
12	MT19114	DecadeFhb1-DH11/Overland FHB-1			70.0 17.9 12.7
37	MT19139	MT1078//Judee/Emerson			73.3 18.1 13.5
17	MT19119	DecadeFhb1-DH11/Overland FHB-1			74.4 17.3 13.7
10	MT19112	DecadeFhb1-DH11/Overland FHB-1			85.5 16.0 13.8
35	MT19137	MT1078//Judee/Emerson			75.6 18.5 14.0
38	MT19140	MT1332/DecadeFhb1-DH17			78.9 16.9 14.1
36	MT19138	MT1078//Judee/Emerson			83.3 18.3 15.2
45	Yellowstone	check			83.3 18.3 15.3
25	MT19127	DecadeFhb1-DH13//MT1078/Langin			80.0 19.5 15.7
3	MT19105	09x257cD9-2/DecadeFhb1-DH7			77.8 21.3 16.6
2	MT19104	09x257cD9-2/DecadeFhb1-DH7			78.9 20.6 16.8
11	MT19113	DecadeFhb1-DH11/Overland FHB-1			80.0 21.7 17.7
9	MT19111	DecadeFhb1-DH11/Overland FHB-1			83.3 22.4 18.9
27	MT19129	Judee*2/Emerson			84.4 25.8 22.2
1	MT19103	09x257cD9-2/DecadeFhb1-DH7			91.1 28.8 26.3
Average					66.6 13.6 10.1
LSD (0.05)					19.4 7.0 7.0
C.V. (%)					18.0 31.7 42.5
P-value (Varieties)					<.0001 <.0001 <.0001

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 126. 2019 Preliminary B FHB Test: Minot, ND

Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Lodging score (0-9)	Grain moisture %	Protein %
	w = white		RCB	RCB	RCB	RCB	RCB	RCB	RCB
14 a	MT19116	DecadeFhb1-DH11/Overland FHB-1	70.4	60.4	158.0	24.5	0.0	15.1	14.5
17	MT19119	DecadeFhb1-DH11/Overland FHB-1	61.6	60.3	164.3	24.2	0.0	15.3	14.1
21	MT19123	DecadeFhb1-DH13//MT1078/Langin	60.9	60.5	165.3	27.8	0.0	15.5	14.2
45	Yellowstone	check	60.3	60.3	164.3	26.1	0.3	15.3	12.8
40 a	MT19142	MT1332/DecadeFhb1-DH17	60.1	60.2	165.7	27.3	0.3	15.7	13.4
15	MT19117	DecadeFhb1-DH11/Overland FHB-1	59.5	60.0	163.3	25.2	0.0	14.8	13.8
25	MT19127	DecadeFhb1-DH13//MT1078/Langin	58.1	59.8	162.3	24.8	0.0	15.5	13.1
9	MT19111	DecadeFhb1-DH11/Overland FHB-1	57.5	60.9	164.3	23.2	0.0	17.3	14.1
48	MT1796	check	57.0	61.0	162.3	26.0	0.0	16.7	15.0
44	Decade	check	56.4	60.8	161.3	25.9	0.0	15.6	13.8
3	MT19105	09x257cD9-2/DecadeFhb1-DH7	56.1	59.9	162.7	22.7	0.7	14.5	15.4
11	MT19113	DecadeFhb1-DH11/Overland FHB-1	56.0	60.1	161.3	24.2	0.0	15.4	14.9
26	MT19128	DecadeFhb1-DH13//MT1078/Langin	55.9	61.2	165.3	26.5	0.0	15.8	13.2
27	MT19129	Judee*2/Emerson	54.9	61.6	164.7	26.1	0.0	15.8	14.1
4	MT19106	09x257cD9-2/DecadeFhb1-DH7	54.1	60.1	163.7	24.4	0.3	16.7	13.0
13	MT19115	DecadeFhb1-DH11/Overland FHB-1	53.6	61.5	162.3	25.7	0.3	15.6	13.7
7	MT19109	DecadeFhb1-DH11/Overland FHB-1	53.6	60.2	161.3	22.7	0.0	17.1	13.8
35	MT19137	MT1078//Judee/Emerson	53.6	59.7	164.0	25.9	1.3	15.8	13.9
42	MT19144	MTS1596//Emerson/Spur	53.5	62.1	165.7	26.1	0.0	16.0	14.5
46	Emerson	check	52.9	60.2	164.7	27.2	0.0	15.0	13.9
29	MT19131	MT1078//Colter/Emerson	52.7	59.0	165.3	28.0	0.7	15.2	13.1
34	MT19136	MT1078//Judee/Emerson	52.3	58.8	161.7	23.5	1.0	15.1	14.2
32	MT19134	MT1078//Judee/Emerson	51.5	60.3	164.7	24.9	1.0	20.6	13.9
49	Ray	check	51.4	58.3	166.7	30.3	0.0	15.0	13.2
43	MT19145	MTS1596//Emerson/Spur	51.4	59.2	164.3	23.6	0.0	15.2	13.5
20	MT19122	DecadeFhb1-DH11/Overland FHB-1	51.3	60.7	164.0	24.2	0.0	16.3	14.8
33	MT19135	MT1078//Judee/Emerson	51.2	60.1	165.0	26.6	0.0	15.4	14.5
30 a	MT19132	MT1078//Colter/Emerson	50.7	59.2	162.7	26.8	0.7	14.9	13.7
24	MT19126	DecadeFhb1-DH13//MT1078/Langin	49.8	60.1	162.7	24.9	0.7	15.9	15.0
47	MT1793	check	49.5	60.6	159.7	24.9	0.0	15.9	14.6
28	MT19130	MT1078//Colter/Emerson	49.2	60.2	166.7	28.5	1.0	15.2	14.4
22	MT19124	DecadeFhb1-DH13//MT1078/Langin	49.0	59.6	161.7	24.9	0.0	15.2	16.3
37	MT19139	MT1078//Judee/Emerson	49.0	61.2	162.7	26.0	0.7	15.8	13.6
5	MT19107	DecadeFhb1-DH11/Overland FHB-1	47.8	59.9	158.7	23.6	0.3	15.4	14.2
8	MT19110	DecadeFhb1-DH11/Overland FHB-1	47.0	58.9	161.0	21.5	0.0	15.3	14.4
36	MT19138	MT1078//Judee/Emerson	47.0	59.5	162.3	23.8	1.0	17.4	14.1
19	MT19121	DecadeFhb1-DH11/Overland FHB-1	46.9	59.1	163.7	23.8	0.0	15.1	15.5
16	MT19118	DecadeFhb1-DH11/Overland FHB-1	46.9	60.6	160.0	25.5	0.0	15.4	13.6
38	MT19140	MT1332/DecadeFhb1-DH17	46.5	60.5	161.3	23.6	0.3	15.7	13.6
10	MT19112	DecadeFhb1-DH11/Overland FHB-1	46.5	61.6	164.3	23.9	0.0	19.2	14.4
1	MT19103	09x257cD9-2/DecadeFhb1-DH7	46.4	60.1	162.0	21.1	0.0	16.9	14.3
12	MT19114	DecadeFhb1-DH11/Overland FHB-1	46.1	59.8	165.3	23.0	0.0	16.7	15.9
31 a	MT19133	MT1078//Judee/Emerson	45.8	60.4	164.3	27.6	1.0	15.2	12.8
18	MT19120	DecadeFhb1-DH11/Overland FHB-1	45.2	59.8	160.3	24.0	0.0	15.8	14.1
2	MT19104	09x257cD9-2/DecadeFhb1-DH7	44.4	59.9	163.7	22.4	0.0	14.9	15.1
6	MT19108	DecadeFhb1-DH11/Overland FHB-1	44.1	59.7	160.0	23.6	0.3	19.3	13.8
41	MT19143	MTS1596//Emerson/Spur	42.8	60.5	163.3	24.0	0.0	16.3	15.6
23	MT19125	DecadeFhb1-DH13//MT1078/Langin	42.1	59.9	161.7	24.9	0.7	18.4	15.5
39	MT19141	MT1332/DecadeFhb1-DH17	37.2	59.3	159.0	23.9	2.3	23.0	12.8
Average			51.6	60.1	163.0	25.0	0.3	16.1	14.2
LSD (0.05)			10.4	0.9	1.8	2.3	0.6	3.5	0.7
C.V. (%)			12.4	0.9	0.7	5.7	123.5	13.4	3.2
P-value (Varieties)			<.0001	<.0001	<.0001	<.0001	<.0001	0.0205	<.0001

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 127. 2019 Preliminary B Fhb Test: All location Yield (bu/a)

Entry	ID	Pedigree	Bozeman RCB	Huntley hail	Minot RCB	2 Loc avg
	w = white					
		lattice efficiency relative to RCB	104%			
49	Ray	check	135.5		51.4	93.5
14 a	MT19116	DecadeFhb1-DH11/Overland FHB-1	113.9		70.4	92.2
17	MT19119	DecadeFhb1-DH11/Overland FHB-1	117.9		61.6	89.8
45	Yellowstone	check	117.3		60.3	88.8
40 a	MT19142	MT1332/DecadeFhb1-DH17	115.3		60.1	87.7
20	MT19122	DecadeFhb1-DH11/Overland FHB-1	123.8		51.3	87.6
35	MT19137	MT1078//Judee/Emerson	121.5		53.6	87.6
30 a	MT19132	MT1078//Colter/Emerson	123.2		50.7	87.0
29	MT19131	MT1078//Colter/Emerson	120.6		52.7	86.7
31 a	MT19133	MT1078//Judee/Emerson	127.2		45.8	86.5
21	MT19123	DecadeFhb1-DH13//MT1078/Langin	111.3		60.9	86.1
15	MT19117	DecadeFhb1-DH11/Overland FHB-1	112.3		59.5	85.9
3	MT19105	09x257cD9-2/DecadeFhb1-DH7	115.5		56.1	85.8
4	MT19106	09x257cD9-2/DecadeFhb1-DH7	117.1		54.1	85.6
27	MT19129	Judee*2/Emerson	113.2		54.9	84.1
32	MT19134	MT1078//Judee/Emerson	116.1		51.5	83.8
37	MT19139	MT1078//Judee/Emerson	118.5		49.0	83.8
48	MT1796	check	110.1		57.0	83.6
13	MT19115	DecadeFhb1-DH11/Overland FHB-1	112.2		53.6	82.9
16	MT19118	DecadeFhb1-DH11/Overland FHB-1	118.5		46.9	82.7
18	MT19120	DecadeFhb1-DH11/Overland FHB-1	119.9		45.2	82.6
47	MT1793	check	115.5		49.5	82.5
34	MT19136	MT1078//Judee/Emerson	112.0		52.3	82.2
26	MT19128	DecadeFhb1-DH13//MT1078/Langin	107.4		55.9	81.7
36	MT19138	MT1078//Judee/Emerson	115.3		47.0	81.2
11	MT19113	DecadeFhb1-DH11/Overland FHB-1	105.5		56.0	80.8
33	MT19135	MT1078//Judee/Emerson	109.1		51.2	80.2
8	MT19110	DecadeFhb1-DH11/Overland FHB-1	111.6		47.0	79.3
9	MT19111	DecadeFhb1-DH11/Overland FHB-1	100.6		57.5	79.1
44	Decade	check	100.3		56.4	78.4
6	MT19108	DecadeFhb1-DH11/Overland FHB-1	112.4		44.1	78.3
25	MT19127	DecadeFhb1-DH13//MT1078/Langin	97.6		58.1	77.9
10	MT19112	DecadeFhb1-DH11/Overland FHB-1	108.9		46.5	77.7
23	MT19125	DecadeFhb1-DH13//MT1078/Langin	112.6		42.1	77.4
46	Emerson	check	101.1		52.9	77.0
24	MT19126	DecadeFhb1-DH13//MT1078/Langin	102.9		49.8	76.4
19	MT19121	DecadeFhb1-DH11/Overland FHB-1	105.6		46.9	76.3
22	MT19124	DecadeFhb1-DH13//MT1078/Langin	103.4		49.0	76.2
5	MT19107	DecadeFhb1-DH11/Overland FHB-1	104.2		47.8	76.0
1	MT19103	09x257cD9-2/DecadeFhb1-DH7	104.7		46.4	75.6
12	MT19114	DecadeFhb1-DH11/Overland FHB-1	104.2		46.1	75.2
2	MT19104	09x257cD9-2/DecadeFhb1-DH7	105.0		44.4	74.7
43	MT19145	MTS1596//Emerson/Spur	96.3		51.4	73.9
39	MT19141	MT1332/DecadeFhb1-DH17	108.7		37.2	73.0
38	MT19140	MT1332/DecadeFhb1-DH17	98.6		46.5	72.6
41	MT19143	MTS1596//Emerson/Spur	98.3		42.8	70.6
28	MT19130	MT1078//Colter/Emerson	91.0		49.2	70.1
42	MT19144	MTS1596//Emerson/Spur	83.6		53.5	68.6
7	MT19109	DecadeFhb1-DH11/Overland FHB-1	83.0		53.6	68.3
Average			109.8		51.6	80.7
LSD (0.05)			13.3		10.4	ns
C.V. (%)			6.0		12.4	10.3
P-value (Varieties)			<.0001		<.0001	0.4008

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 128. 2019 Preliminary B Fhb Test: All location Test Weight (lb/bu)

Entry	ID	Pedigree	Bozeman LAT	Huntley hail	Minot RCB	2 Loc avg
	w = white					
		lattice efficiency relative to RCB	107%			
42	MT19144	MTS1596//Emerson/Spur	63.2		62.1	62.7
13	MT19115	DecadeFhb1-DH11/Overland FHB-1	63.3		61.5	62.4
10	MT19112	DecadeFhb1-DH11/Overland FHB-1	62.9		61.6	62.3
16	MT19118	DecadeFhb1-DH11/Overland FHB-1	63.5		60.6	62.1
27	MT19129	Judee*2/Emerson	62.5		61.6	62.1
14 a	MT19116	DecadeFhb1-DH11/Overland FHB-1	63.6		60.4	62.0
20	MT19122	DecadeFhb1-DH11/Overland FHB-1	63.0		60.7	61.9
37	MT19139	MT1078//Judee/Emerson	62.3		61.2	61.8
48	MT1796	check	62.4		61.0	61.7
23	MT19125	DecadeFhb1-DH13//MT1078/Langin	63.2		59.9	61.6
46	Emerson	check	63.0		60.2	61.6
6	MT19108	DecadeFhb1-DH11/Overland FHB-1	63.3		59.7	61.5
18	MT19120	DecadeFhb1-DH11/Overland FHB-1	63.2		59.8	61.5
45	Yellowstone	check	62.4		60.3	61.4
1	MT19103	09x257cD9-2/DecadeFhb1-DH7	62.4		60.1	61.3
22	MT19124	DecadeFhb1-DH13//MT1078/Langin	63.0		59.6	61.3
47	MT1793	check	61.9		60.6	61.3
2	MT19104	09x257cD9-2/DecadeFhb1-DH7	62.4		59.9	61.2
26	MT19128	DecadeFhb1-DH13//MT1078/Langin	61.2		61.2	61.2
41	MT19143	MTS1596//Emerson/Spur	61.9		60.5	61.2
3	MT19105	09x257cD9-2/DecadeFhb1-DH7	62.2		59.9	61.1
11	MT19113	DecadeFhb1-DH11/Overland FHB-1	62.0		60.1	61.1
12	MT19114	DecadeFhb1-DH11/Overland FHB-1	62.1		59.8	61.0
15	MT19117	DecadeFhb1-DH11/Overland FHB-1	62.0		60.0	61.0
32	MT19134	MT1078//Judee/Emerson	61.7		60.3	61.0
44	Decade	check	61.1		60.8	61.0
35	MT19137	MT1078//Judee/Emerson	62.0		59.7	60.9
38	MT19140	MT1332/DecadeFhb1-DH17	61.3		60.5	60.9
5	MT19107	DecadeFhb1-DH11/Overland FHB-1	61.6		59.9	60.8
31 a	MT19133	MT1078//Judee/Emerson	61.2		60.4	60.8
17	MT19119	DecadeFhb1-DH11/Overland FHB-1	61.1		60.3	60.7
19	MT19121	DecadeFhb1-DH11/Overland FHB-1	62.2		59.1	60.7
33	MT19135	MT1078//Judee/Emerson	61.3		60.1	60.7
21	MT19123	DecadeFhb1-DH13//MT1078/Langin	60.7		60.5	60.6
24	MT19126	DecadeFhb1-DH13//MT1078/Langin	61.0		60.1	60.6
39	MT19141	MT1332/DecadeFhb1-DH17	61.9		59.3	60.6
40 a	MT19142	MT1332/DecadeFhb1-DH17	60.9		60.2	60.6
4	MT19106	09x257cD9-2/DecadeFhb1-DH7	60.9		60.1	60.5
8	MT19110	DecadeFhb1-DH11/Overland FHB-1	61.8		58.9	60.4
36	MT19138	MT1078//Judee/Emerson	61.2		59.5	60.4
34	MT19136	MT1078//Judee/Emerson	61.7		58.8	60.3
28	MT19130	MT1078//Colter/Emerson	60.2		60.2	60.2
30 a	MT19132	MT1078//Colter/Emerson	60.8		59.2	60.0
9	MT19111	DecadeFhb1-DH11/Overland FHB-1	58.9		60.9	59.9
49	Ray	check	61.4		58.3	59.9
29	MT19131	MT1078//Colter/Emerson	60.1		59.0	59.6
25	MT19127	DecadeFhb1-DH13//MT1078/Langin	59.2		59.8	59.5
43	MT19145	MTS1596//Emerson/Spur	59.3		59.2	59.3
7	MT19109	DecadeFhb1-DH11/Overland FHB-1	57.6		60.2	58.9
Average			61.7		60.1	60.9
LSD (0.05)			1.0		0.9	ns
C.V. (%)			0.8		0.9	1.5
P-value (Varieties)			<.0001		<.0001	0.0809

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 129. 2019 Preliminary B Fhb Test: All location Heading Date (days from Jan 1)

Entry	ID	Pedigree	Bozeman LAT	Huntley hail	Minot RCB	2 Loc avg
	w = white					
		lattice efficiency relative to RCB	135%			
14 a	MT19116	DecadeFhb1-DH11/Overland FHB-1	168.4		158.0	163.2
5	MT19107	DecadeFhb1-DH11/Overland FHB-1	169.4		158.7	164.1
16	MT19118	DecadeFhb1-DH11/Overland FHB-1	169.0		160.0	164.5
6	MT19108	DecadeFhb1-DH11/Overland FHB-1	169.1		160.0	164.6
47	MT1793	check	170.6		159.7	165.2
39	MT19141	MT1332/DecadeFhb1-DH17	171.9		159.0	165.5
38	MT19140	MT1332/DecadeFhb1-DH17	170.4		161.3	165.9
18	MT19120	DecadeFhb1-DH11/Overland FHB-1	171.7		160.3	166.0
11	MT19113	DecadeFhb1-DH11/Overland FHB-1	171.7		161.3	166.5
48	MT1796	check	173.2		162.3	167.8
8	MT19110	DecadeFhb1-DH11/Overland FHB-1	174.8		161.0	167.9
23	MT19125	DecadeFhb1-DH13//MT1078/Langin	174.1		161.7	167.9
1	MT19103	09x257cD9-2/DecadeFhb1-DH7	174.1		162.0	168.1
7	MT19109	DecadeFhb1-DH11/Overland FHB-1	174.8		161.3	168.1
44	Decade	check	174.8		161.3	168.1
13	MT19115	DecadeFhb1-DH11/Overland FHB-1	174.4		162.3	168.4
22	MT19124	DecadeFhb1-DH13//MT1078/Langin	175.4		161.7	168.6
10	MT19112	DecadeFhb1-DH11/Overland FHB-1	173.3		164.3	168.8
24	MT19126	DecadeFhb1-DH13//MT1078/Langin	175.4		162.7	169.1
25	MT19127	DecadeFhb1-DH13//MT1078/Langin	175.8		162.3	169.1
34	MT19136	MT1078//Judee/Emerson	176.5		161.7	169.1
41	MT19143	MTS1596//Emerson/Spur	175.0		163.3	169.2
37	MT19139	MT1078//Judee/Emerson	176.0		162.7	169.4
3	MT19105	09x257cD9-2/DecadeFhb1-DH7	176.3		162.7	169.5
20	MT19122	DecadeFhb1-DH11/Overland FHB-1	175.0		164.0	169.5
36	MT19138	MT1078//Judee/Emerson	176.7		162.3	169.5
30 a	MT19132	MT1078//Colter/Emerson	176.8		162.7	169.8
19	MT19121	DecadeFhb1-DH11/Overland FHB-1	176.1		163.7	169.9
15	MT19117	DecadeFhb1-DH11/Overland FHB-1	176.6		163.3	170.0
2	MT19104	09x257cD9-2/DecadeFhb1-DH7	176.4		163.7	170.1
35	MT19137	MT1078//Judee/Emerson	176.7		164.0	170.4
17	MT19119	DecadeFhb1-DH11/Overland FHB-1	176.6		164.3	170.5
9	MT19111	DecadeFhb1-DH11/Overland FHB-1	176.8		164.3	170.6
4	MT19106	09x257cD9-2/DecadeFhb1-DH7	177.7		163.7	170.7
12	MT19114	DecadeFhb1-DH11/Overland FHB-1	176.3		165.3	170.8
32	MT19134	MT1078//Judee/Emerson	176.9		164.7	170.8
29	MT19131	MT1078//Colter/Emerson	176.5		165.3	170.9
27	MT19129	Judee*2/Emerson	177.3		164.7	171.0
31 a	MT19133	MT1078//Judee/Emerson	177.6		164.3	171.0
26	MT19128	DecadeFhb1-DH13//MT1078/Langin	178.1		165.3	171.7
45	Yellowstone	check	179.1		164.3	171.7
43	MT19145	MTS1596//Emerson/Spur	179.5		164.3	171.9
21	MT19123	DecadeFhb1-DH13//MT1078/Langin	178.8		165.3	172.1
40 a	MT19142	MT1332/DecadeFhb1-DH17	178.7		165.7	172.2
33	MT19135	MT1078//Judee/Emerson	180.0		165.0	172.5
46	Emerson	check	180.2		164.7	172.5
42	MT19144	MTS1596//Emerson/Spur	180.6		165.7	173.2
28	MT19130	MT1078//Colter/Emerson	180.7		166.7	173.7
49	Ray	check	181.9		166.7	174.3
Average			175.6		163.0	169.3
LSD (0.05)			1.4		1.8	2.4
C.V. (%)			0.4		0.7	0.7
P-value (Varieties)			<.0001		<.0001	<.0001

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 130. 2019 Preliminary B Fhb Test: All location Plant Height (in)

Entry	ID	Pedigree	Bozeman RCB	Huntley hail	Minot RCB	2 Loc avg
	w = white					
		lattice efficiency relative to RCB				
1	MT19103	09x257cD9-2/DecadeFhb1-DH7	29.3		21.1	25.2
8	MT19110	DecadeFhb1-DH11/Overland FHB-1	30.3		21.5	25.9
2	MT19104	09x257cD9-2/DecadeFhb1-DH7	30.1		22.4	26.3
43	MT19145	MTS1596//Emerson/Spur	31.1		23.6	27.4
7	MT19109	DecadeFhb1-DH11/Overland FHB-1	32.3		22.7	27.5
41	MT19143	MTS1596//Emerson/Spur	30.9		24.0	27.5
25	MT19127	DecadeFhb1-DH13//MT1078/Langin	30.5		24.8	27.7
9	MT19111	DecadeFhb1-DH11/Overland FHB-1	32.3		23.2	27.8
6	MT19108	DecadeFhb1-DH11/Overland FHB-1	32.3		23.6	28.0
22	MT19124	DecadeFhb1-DH13//MT1078/Langin	31.7		24.9	28.3
3	MT19105	09x257cD9-2/DecadeFhb1-DH7	34.3		22.7	28.5
17	MT19119	DecadeFhb1-DH11/Overland FHB-1	33.1		24.2	28.7
5	MT19107	DecadeFhb1-DH11/Overland FHB-1	33.9		23.6	28.8
11	MT19113	DecadeFhb1-DH11/Overland FHB-1	33.3		24.2	28.8
47	MT1793	check	32.7		24.9	28.8
16	MT19118	DecadeFhb1-DH11/Overland FHB-1	32.3		25.5	28.9
18	MT19120	DecadeFhb1-DH11/Overland FHB-1	33.7		24.0	28.9
34	MT19136	MT1078//Judee/Emerson	34.3		23.5	28.9
10	MT19112	DecadeFhb1-DH11/Overland FHB-1	34.1		23.9	29.0
12	MT19114	DecadeFhb1-DH11/Overland FHB-1	35.0		23.0	29.0
23	MT19125	DecadeFhb1-DH13//MT1078/Langin	33.1		24.9	29.0
19	MT19121	DecadeFhb1-DH11/Overland FHB-1	34.4		23.8	29.1
42	MT19144	MTS1596//Emerson/Spur	32.3		26.1	29.2
14 a	MT19116	DecadeFhb1-DH11/Overland FHB-1	34.3		24.5	29.4
20	MT19122	DecadeFhb1-DH11/Overland FHB-1	34.6		24.2	29.4
36	MT19138	MT1078//Judee/Emerson	35.0		23.8	29.4
38	MT19140	MT1332/DecadeFhb1-DH17	35.6		23.6	29.6
24	MT19126	DecadeFhb1-DH13//MT1078/Langin	34.4		24.9	29.7
39	MT19141	MT1332/DecadeFhb1-DH17	35.6		23.9	29.8
13	MT19115	DecadeFhb1-DH11/Overland FHB-1	34.6		25.7	30.2
32	MT19134	MT1078//Judee/Emerson	35.8		24.9	30.4
44	Decade	check	34.8		25.9	30.4
26	MT19128	DecadeFhb1-DH13//MT1078/Langin	34.4		26.5	30.5
48	MT1796	check	35.0		26.0	30.5
4	MT19106	09x257cD9-2/DecadeFhb1-DH7	37.2		24.4	30.8
15	MT19117	DecadeFhb1-DH11/Overland FHB-1	36.4		25.2	30.8
27	MT19129	Judee*2/Emerson	35.4		26.1	30.8
33	MT19135	MT1078//Judee/Emerson	35.6		26.6	31.1
45	Yellowstone	check	36.4		26.1	31.3
21	MT19123	DecadeFhb1-DH13//MT1078/Langin	35.4		27.8	31.6
37	MT19139	MT1078//Judee/Emerson	37.2		26.0	31.6
40 a	MT19142	MT1332/DecadeFhb1-DH17	36.0		27.3	31.7
35	MT19137	MT1078//Judee/Emerson	37.8		25.9	31.9
28	MT19130	MT1078//Colter/Emerson	35.8		28.5	32.2
30 a	MT19132	MT1078//Colter/Emerson	37.8		26.8	32.3
29	MT19131	MT1078//Colter/Emerson	36.8		28.0	32.4
31 a	MT19133	MT1078//Judee/Emerson	37.4		27.6	32.5
46	Emerson	check	38.6		27.2	32.9
49	Ray	check	39.6		30.3	35.0
Average			34.4		25.0	29.7
LSD (0.05)			2.0		2.3	2.4
C.V. (%)			2.8		5.7	4.0
P-value (Varieties)			<.0001		<.0001	<.0001

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 131. 2019 Preliminary B Fhb Test: All location Protein (%)

Entry	ID	Pedigree	Bozeman bulk	Huntley hail	Minot RCB	2 Loc avg
	w = white					
		lattice efficiency relative to RCB				
22	MT19124	DecadeFhb1-DH13/MT1078/Langin	13.1		16.3	14.7
3	MT19105	09x257cD9-2/DecadeFhb1-DH7	13.4		15.4	14.4
41	MT19143	MTS1596//Emerson/Spur	12.8		15.6	14.2
2	MT19104	09x257cD9-2/DecadeFhb1-DH7	13.0		15.1	14.1
12	MT19114	DecadeFhb1-DH11/Overland FHB-1	11.8		15.9	13.9
33	MT19135	MT1078//Judee/Emerson	13.2		14.5	13.9
14 a	MT19116	DecadeFhb1-DH11/Overland FHB-1	13.0		14.5	13.8
23	MT19125	DecadeFhb1-DH13/MT1078/Langin	12.0		15.5	13.8
48	MT1796	check	12.5		15.0	13.8
20	MT19122	DecadeFhb1-DH11/Overland FHB-1	12.6		14.8	13.7
1	MT19103	09x257cD9-2/DecadeFhb1-DH7	12.9		14.3	13.6
19	MT19121	DecadeFhb1-DH11/Overland FHB-1	11.6		15.5	13.6
47	MT1793	check	12.3		14.6	13.5
11	MT19113	DecadeFhb1-DH11/Overland FHB-1	11.9		14.9	13.4
42	MT19144	MTS1596//Emerson/Spur	12.3		14.5	13.4
24	MT19126	DecadeFhb1-DH13/MT1078/Langin	11.5		15.0	13.3
46	Emerson	check	12.7		13.9	13.3
18	MT19120	DecadeFhb1-DH11/Overland FHB-1	12.2		14.1	13.2
36	MT19138	MT1078//Judee/Emerson	12.3		14.1	13.2
8	MT19110	DecadeFhb1-DH11/Overland FHB-1	11.7		14.4	13.1
21	MT19123	DecadeFhb1-DH13/MT1078/Langin	11.9		14.2	13.1
27	MT19129	Judee*2/Emerson	12.1		14.1	13.1
34	MT19136	MT1078//Judee/Emerson	11.9		14.2	13.1
5	MT19107	DecadeFhb1-DH11/Overland FHB-1	11.6		14.2	12.9
17	MT19119	DecadeFhb1-DH11/Overland FHB-1	11.6		14.1	12.9
16	MT19118	DecadeFhb1-DH11/Overland FHB-1	11.9		13.6	12.8
35	MT19137	MT1078//Judee/Emerson	11.7		13.9	12.8
37	MT19139	MT1078//Judee/Emerson	11.9		13.6	12.8
44	Decade	check	11.8		13.8	12.8
49	Ray	check	12.3		13.2	12.8
9	MT19111	DecadeFhb1-DH11/Overland FHB-1	11.3		14.1	12.7
28	MT19130	MT1078//Colter/Emerson	10.9		14.4	12.7
29	MT19131	MT1078//Colter/Emerson	12.3		13.1	12.7
32	MT19134	MT1078//Judee/Emerson	11.4		13.9	12.7
43	MT19145	MTS1596//Emerson/Spur	11.8		13.5	12.7
15	MT19117	DecadeFhb1-DH11/Overland FHB-1	11.3		13.8	12.6
26	MT19128	DecadeFhb1-DH13/MT1078/Langin	11.9		13.2	12.6
6	MT19108	DecadeFhb1-DH11/Overland FHB-1	11.2		13.8	12.5
13	MT19115	DecadeFhb1-DH11/Overland FHB-1	11.2		13.7	12.5
30 a	MT19132	MT1078//Colter/Emerson	11.2		13.7	12.5
40 a	MT19142	MT1332/DecadeFhb1-DH17	11.5		13.4	12.5
7	MT19109	DecadeFhb1-DH11/Overland FHB-1	11.0		13.8	12.4
10	MT19112	DecadeFhb1-DH11/Overland FHB-1	10.4		14.4	12.4
38	MT19140	MT1332/DecadeFhb1-DH17	11.0		13.6	12.3
25	MT19127	DecadeFhb1-DH13/MT1078/Langin	11.2		13.1	12.2
45	Yellowstone	check	11.6		12.8	12.2
4	MT19106	09x257cD9-2/DecadeFhb1-DH7	11.1		13.0	12.1
31 a	MT19133	MT1078//Judee/Emerson	11.3		12.8	12.1
39	MT19141	MT1332/DecadeFhb1-DH17	11.0		12.8	11.9
Average			11.9		14.2	13.0
LSD (0.05)					0.7	1.1
C.V. (%)					3.2	4.2
P-value (Varieties)					<.0001	0.0002

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 132. 2019 Preliminary C Sawfly Test: All location Summary

Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Stem solid (5-25)	Sawfly cutting %	Protein %
d = SDS discard									
		locations	2	2	1	2	2	1	2
13	MTS1934	MTS1584/2*Loma	100.6	61.4	180.5	30.1	22.3	40	12.5
4	MTS1588	check	100.3	61.7	178.2	30.7	23.6	25	12.8
1	Yellowstone	check	99.5	60.9	179.1	33.1	10.1	94	12.7
9	MTS1930	MTS1584/2*Loma	99.3	61.0	178.0	33.6	20.7	68	12.6
15	MTS1936	MTS1584/2*Loma	99.1	61.5	178.7	33.5	21.5	43	12.7
33 a	MTS1954	MTS1584*2/Loma	98.1	60.6	179.2	30.6	22.1	21	12.9
28	MTS1949	MTS1584*2/Loma	97.9	59.9	177.6	30.7	22.9	48	12.1
2	Warhorse	check	97.8	61.6	177.9	33.4	22.7	14	13.2
24 a	MTS1945	MTS1584*2/Loma	97.7	59.9	178.3	29.4	24.2	31	12.7
35	MTS1956	MTS1584*2/Loma	97.1	62.0	180.3	33.2	22.2	40	12.6
38	MTS1959	MTS1584*2/Loma	96.5	61.3	178.9	32.2	23.6	20	11.9
14	MTS1935	MTS1584/2*Loma	96.2	58.9	176.4	31.2	20.0	79	12.9
22 a	MTS1943	MTS1584*2/Loma	95.9	60.4	178.3	31.4	23.8	34	12.2
12	MTS1933	MTS1584/2*Loma	95.8	60.3	179.5	30.4	21.8	40	12.5
32	MTS1953	MTS1584*2/Loma	95.3	61.3	175.9	31.3	24.1	28	12.7
23	MTS1944	MTS1584*2/Loma	95.3	61.3	177.0	32.1	21.9	36	12.1
45	MTS1966	Loma*2/AAC Gateway	95.2	62.1	178.7	29.9	19.8	71	12.5
48	MTS1969	Loma*2/Warhorse	94.7	60.5	178.6	28.2	21.2	59	13.1
37	MTS1958	MTS1584*2/Loma	94.2	60.9	179.0	30.3	24.0	30	12.7
3	Loma	check	94.2	60.2	180.3	32.1	21.7	53	12.8
20	MTS1941	MTS1584*2/Loma	94.0	61.3	177.4	31.8	23.6	23	12.7
25	MTS1946	MTS1584*2/Loma	94.0	60.6	181.1	32.3	23.0	35	12.4
5	MTS1926	MTS1584/2*Loma	94.0	59.5	179.8	32.2	22.2	29	12.6
29	MTS1950	MTS1584*2/Loma	93.9	59.5	179.1	30.1	24.1	37	12.5
49	MTS1970	Loma*2/Warhorse	93.6	60.5	182.8	30.9	22.8	46	13.7
44	MTS1965	Loma*2/AAC Gateway	93.5	60.2	181.5	31.0	21.1	42	13.0
19	MTS1940	MTS1584/2*Loma	93.4	61.1	177.0	31.2	23.7	32	13.4
6	MTS1927	MTS1584/2*Loma	92.3	61.4	181.2	30.8	20.9	39	12.6
30	MTS1951	MTS1584*2/Loma	92.3	59.5	177.0	30.1	23.0	36	12.4
43	MTS1964	Loma*2/AAC Gateway	92.1	60.5	177.8	29.3	20.4	75	13.1
47	MTS1968	MTS1585//Loma/AAC Gateway	92.1	60.0	177.5	28.3	22.0	45	12.8
41	MTS1962	MTS1584*2/Loma	91.7	60.3	179.3	31.4	23.2	29	13.1
7	MTS1928	MTS1584/2*Loma	91.5	58.5	178.5	33.5	23.2	47	13.2
36	MTS1957	MTS1584*2/Loma	91.0	61.3	176.7	32.4	23.4	27	12.1
8	MTS1929	MTS1584/2*Loma	90.9	60.7	179.6	31.4	20.4	60	13.4
26	MTS1947	MTS1584*2/Loma	90.8	61.4	176.9	31.4	23.9	36	12.5
39	MTS1960	MTS1584*2/Loma	90.1	61.7	173.8	30.8	23.6	28	12.5
21	MTS1942	MTS1584*2/Loma	90.0	62.0	178.1	30.9	24.0	47	12.3
40	MTS1961	MTS1584*2/Loma	89.9	61.3	179.9	30.0	23.1	39	12.7
17	MTS1938	MTS1584/2*Loma	88.3	58.8	180.8	31.8	20.3	22	13.3
16	MTS1937	MTS1584/2*Loma	88.1	60.1	179.5	31.4	22.2	41	12.4
11	MTS1932	MTS1584/2*Loma	88.1	59.7	182.7	29.3	22.6	35	12.8
42	MTS1963	MTS1584*2/Loma	87.9	59.3	176.7	29.6	23.7	31	12.6
18	MTS1939	MTS1584/2*Loma	87.9	59.0	181.7	31.3	21.1	31	13.8
46	MTS1967	MTS1585//Loma/AAC Gateway	87.7	60.6	179.2	33.1	23.8	32	13.2
10	MTS1931	MTS1584/2*Loma	86.6	59.9	178.9	29.2	22.7	37	13.0
27	MTS1948	MTS1584*2/Loma	86.4	61.0	179.5	29.9	24.0	41	12.8
31	MTS1952	MTS1584*2/Loma	84.5	61.6	179.9	31.0	23.9	31	13.2
34	MTS1955	MTS1584*2/Loma	84.3	59.9	178.7	28.7	23.8	25	13.0
Average			93.1	60.6	178.8	31.0	22.3	39.8	12.7
LSD (0.05)			ns	1.1	1.3	2.1	2.3	25.5	0.9
C.V. (%)			6.4	0.9	0.3	3.4	5.2	28.5	3.3

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 133. 2019 Preliminary C Sawfly Test: Bozeman

Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in RCB	Stem solid (5-25) LAT	Protein % bulk
	d = SDS discard		LAT	LAT	LAT	RCB	LAT	bulk
			142%	208%	174%	103%	115%	
35	MTS1956	MTS1584*2/Loma	127.9	63.5	180.3	34.8	20.1	12.1
1	Yellowstone	check	126.3	62.6	179.1	36.2	9.7	11.9
25	MTS1946	MTS1584*2/Loma	123.0	61.6	181.1	34.7	21.7	12.0
9	MTS1930	MTS1584/2*Loma	123.0	62.5	178.0	36.4	18.8	11.7
5	MTS1926	MTS1584/2*Loma	122.1	60.6	179.8	34.5	20.6	11.9
38	MTS1959	MTS1584*2/Loma	121.9	61.9	178.9	35.2	23.5	11.0
13	MTS1934	MTS1584/2*Loma	121.4	62.6	180.5	31.5	21.1	11.6
19	MTS1940	MTS1584/2*Loma	120.9	62.0	177.0	33.3	22.9	12.8
23	MTS1944	MTS1584*2/Loma	120.3	62.5	177.0	34.5	21.4	11.5
33 a	MTS1954	MTS1584*2/Loma	119.6	60.8	179.2	32.1	20.9	12.3
6	MTS1927	MTS1584/2*Loma	118.4	62.0	181.2	32.9	20.3	11.5
36	MTS1957	MTS1584*2/Loma	118.3	62.4	176.7	35.0	22.8	11.4
24 a	MTS1945	MTS1584*2/Loma	118.1	60.2	178.3	31.1	23.9	12.2
2	Warhorse	check	117.8	62.6	177.9	34.8	22.6	12.6
45	MTS1966	Loma*2/AAC Gateway	117.2	63.0	178.7	33.1	19.2	11.6
15	MTS1936	MTS1584/2*Loma	117.0	62.3	178.7	34.6	19.5	12.0
4	Bobcat	check	116.5	62.2	178.2	31.7	22.5	12.3
39	MTS1960	MTS1584*2/Loma	116.0	62.2	173.8	33.1	22.7	11.4
3	Loma	check	115.4	61.4	180.3	31.9	19.0	11.8
22 a	MTS1943	MTS1584*2/Loma	115.4	60.8	178.3	34.1	23.5	12.1
49	MTS1970	Loma*2/Warhorse	115.3	61.7	182.8	32.7	21.8	12.9
14	MTS1935	MTS1584/2*Loma	114.9	59.7	176.4	33.1	19.9	12.1
20	MTS1941	MTS1584*2/Loma	114.3	62.4	177.4	33.9	23.2	12.0
48	MTS1969	Loma*2/Warhorse	114.2	61.5	178.6	30.9	20.2	12.2
32	MTS1953	MTS1584*2/Loma	114.1	61.9	175.9	32.9	24.3	12.1
12	MTS1933	MTS1584/2*Loma	113.9	61.2	179.5	32.9	19.4	11.7
26	MTS1947	MTS1584*2/Loma	113.8	62.5	176.9	32.7	23.6	12.0
29	MTS1950	MTS1584*2/Loma	113.4	60.0	179.1	31.5	23.9	11.9
28	MTS1949	MTS1584*2/Loma	112.9	60.6	177.6	31.7	22.1	11.5
8	MTS1929	MTS1584/2*Loma	112.7	61.5	179.6	33.7	18.0	12.7
41	MTS1962	MTS1584*2/Loma	112.2	61.3	179.3	33.7	22.0	13.3
43	MTS1964	Loma*2/AAC Gateway	112.2	61.6	177.8	33.1	19.4	11.6
44	MTS1965	Loma*2/AAC Gateway	112.1	61.0	181.5	33.5	20.2	12.1
30	MTS1951	MTS1584*2/Loma	111.9	59.8	177.0	32.3	21.4	12.0
40	MTS1961	MTS1584*2/Loma	111.5	62.4	179.9	32.7	22.4	12.0
46	MTS1967	MTS1585//Loma/AAC Gateway	111.2	61.9	179.2	35.0	23.6	12.4
17	MTS1938	MTS1584/2*Loma	110.9	59.7	180.8	33.9	17.6	12.6
37	MTS1958	MTS1584*2/Loma	110.7	61.3	179.0	32.3	23.5	12.2
16	MTS1937	MTS1584/2*Loma	109.7	61.0	179.5	33.5	20.1	11.5
47	MTS1968	MTS1585//Loma/AAC Gateway	109.3	61.1	177.5	31.3	19.4	11.7
7	MTS1928	MTS1584/2*Loma	108.8	58.6	178.5	35.6	23.0	13.0
21	MTS1942	MTS1584*2/Loma	108.6	63.0	178.1	32.7	23.1	11.5
18	MTS1939	MTS1584/2*Loma	107.9	59.5	181.7	33.5	18.5	13.6
27	MTS1948	MTS1584*2/Loma	104.6	62.2	179.5	30.3	23.4	11.9
31	MTS1952	MTS1584*2/Loma	104.5	62.8	179.9	32.7	23.5	12.7
42	MTS1963	MTS1584*2/Loma	103.6	59.3	176.7	32.3	23.1	12.7
11	MTS1932	MTS1584/2*Loma	101.5	60.2	182.7	30.3	22.6	12.1
10	MTS1931	MTS1584/2*Loma	98.5	60.2	178.9	30.3	22.2	12.3
34	MTS1955	MTS1584*2/Loma	96.7	59.9	178.7	31.7	23.7	12.6
Average			113.9	61.4	178.8	33.1	21.3	12.1
LSD (0.05)			13.1	1.6	1.3	1.9	1.8	
C.V. (%)			5.2	1.2	0.3	2.8	4.0	
P-value (Varieties)			0.0132	<.0001	<.0001	<.0001	<.0001	

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 134. 2019 Preliminary C Sawfly Test: Big Sandy

					Stem infestation = 64%				
Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Plant height in	Stem solid (5-25)	Stems infested (0-5)	Sawfly cutting %	Protein %
d = SDS discard			LAT	LAT	LAT	LAT	RCB	LAT	LAT
			151%	126%	115%	123%		356%	178%
4	Bobcat	check	84.0	61.1	29.7	24.7	0.5	25	13.2
28	MTS1949	MTS1584*2/Loma	82.8	59.1	29.6	23.6	3.5	48	12.7
15	MTS1936	MTS1584/2*Loma	81.1	60.7	32.3	23.5	3.0	43	13.4
13	MTS1934	MTS1584/2*Loma	79.8	60.1	28.6	23.4	4.5	40	13.4
2	Warhorse	check	77.8	60.5	31.9	22.8	2.0	14	13.7
37	MTS1958	MTS1584*2/Loma	77.6	60.5	28.3	24.5	3.5	30	13.1
12	MTS1933	MTS1584/2*Loma	77.6	59.3	27.9	24.1	1.5	40	13.2
14	MTS1935	MTS1584/2*Loma	77.5	58.1	29.3	20.1	4.5	79	13.7
24 a	MTS1945	MTS1584*2/Loma	77.2	59.6	27.6	24.4	2.5	31	13.1
33 a	MTS1954	MTS1584*2/Loma	76.6	60.3	29.1	23.3	2.5	21	13.4
32	MTS1953	MTS1584*2/Loma	76.5	60.6	29.6	23.9	4.0	28	13.2
22 a	MTS1943	MTS1584*2/Loma	76.3	59.9	28.7	24.0	4.5	34	12.3
9	MTS1930	MTS1584/2*Loma	75.6	59.5	30.8	22.6	4.0	68	13.4
48	MTS1969	Loma*2/Warhorse	75.1	59.5	25.5	22.2	3.5	59	14.0
47	MTS1968	MTS1585//Loma/AAC Gateway	74.9	58.9	25.3	24.6	3.5	45	13.8
44	MTS1965	Loma*2/AAC Gateway	74.8	59.4	28.4	22.0	3.0	42	13.8
10	MTS1931	MTS1584/2*Loma	74.7	59.6	28.1	23.2	3.0	37	13.6
11	MTS1932	MTS1584/2*Loma	74.6	59.1	28.3	22.5	1.5	35	13.5
29	MTS1950	MTS1584*2/Loma	74.4	59.0	28.7	24.2	2.5	37	13.0
7	MTS1928	MTS1584/2*Loma	74.2	58.3	31.3	23.3	3.5	47	13.4
20	MTS1941	MTS1584*2/Loma	73.6	60.2	29.7	24.0	3.0	23	13.4
45	MTS1966	Loma*2/AAC Gateway	73.1	61.2	26.6	20.4	4.0	71	13.4
3	Loma	check	73.0	59.0	32.2	24.4	3.5	53	13.7
30	MTS1951	MTS1584*2/Loma	72.7	59.1	27.9	24.5	3.5	36	12.8
1	Yellowstone	check	72.6	59.1	29.9	10.5	2.5	94	13.5
42	MTS1963	MTS1584*2/Loma	72.2	59.2	26.8	24.3	3.5	31	12.5
49	MTS1970	Loma*2/Warhorse	71.9	59.2	29.0	23.8	2.5	46	14.4
43	MTS1964	Loma*2/AAC Gateway	71.9	59.4	25.5	21.3	4.0	75	14.5
34	MTS1955	MTS1584*2/Loma	71.9	59.9	25.6	23.8	3.5	25	13.3
21	MTS1942	MTS1584*2/Loma	71.3	61.0	29.0	24.8	3.5	47	13.0
41	MTS1962	MTS1584*2/Loma	71.1	59.3	29.1	24.3	4.0	29	12.9
38	MTS1959	MTS1584*2/Loma	71.0	60.6	29.2	23.7	3.0	20	12.7
23	MTS1944	MTS1584*2/Loma	70.3	60.0	29.7	22.3	4.5	36	12.7
8	MTS1929	MTS1584/2*Loma	69.0	59.9	29.0	22.7	4.0	60	14.1
40	MTS1961	MTS1584*2/Loma	68.2	60.2	27.3	23.8	3.0	39	13.3
27	MTS1948	MTS1584*2/Loma	68.2	59.7	29.4	24.5	3.5	41	13.6
26	MTS1947	MTS1584*2/Loma	67.8	60.3	30.1	24.2	2.5	36	13.0
18	MTS1939	MTS1584/2*Loma	67.8	58.5	29.1	23.7	2.5	31	14.0
16	MTS1937	MTS1584/2*Loma	66.5	59.1	29.2	24.2	2.5	41	13.3
35	MTS1956	MTS1584*2/Loma	66.3	60.5	31.5	24.3	3.5	40	13.1
6	MTS1927	MTS1584/2*Loma	66.1	60.8	28.7	21.5	4.0	39	13.7
19	MTS1940	MTS1584/2*Loma	65.8	60.1	29.1	24.5	2.5	32	14.0
5	MTS1926	MTS1584/2*Loma	65.8	58.4	29.9	23.7	2.5	29	13.3
17	MTS1938	MTS1584/2*Loma	65.6	57.9	29.6	22.9	4.5	22	14.0
25	MTS1946	MTS1584*2/Loma	65.0	59.5	29.8	24.3	3.5	35	12.7
31	MTS1952	MTS1584*2/Loma	64.4	60.4	29.2	24.3	1.5	31	13.7
46	MTS1967	MTS1585//Loma/AAC Gateway	64.2	59.3	31.1	24.0	3.5	32	14.0
39	MTS1960	MTS1584*2/Loma	64.1	61.1	28.4	24.5	3.5	28	13.6
36	MTS1957	MTS1584*2/Loma	63.7	60.1	29.7	24.0	2.0	27	12.7
Average			72.2	59.7	29.0	23.3	3.2	39.8	13.4
LSD (0.05)			8.7	0.8	3.5	1.8	ns	25.5	0.4
C.V. (%)			5.5	0.6	5.5	3.6	41.8	28.5	1.3
P-value (Varieties)			<.0001	<.0001	0.0323	<.0001	0.6757	<.0001	<.0001

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 135. 2019 Preliminary C Sawfly Test: 2 location Stem Solidness (5-25)

Entry #	ID d = SDS discard	Pedigree	Bozeman solid LAT	Big Sandy LAT	2 Location average
		Sawfly Infestation (tunneling)	11%	64%	
24 a	MTS1945	MTS1584*2/Loma	23.9	24.4	24.2
29	MTS1950	MTS1584*2/Loma	23.9	24.2	24.1
32	MTS1953	MTS1584*2/Loma	24.3	23.9	24.1
21	MTS1942	MTS1584*2/Loma	23.1	24.8	24.0
27	MTS1948	MTS1584*2/Loma	23.4	24.5	24.0
37	MTS1958	MTS1584*2/Loma	23.5	24.5	24.0
26	MTS1947	MTS1584*2/Loma	23.6	24.2	23.9
31	MTS1952	MTS1584*2/Loma	23.5	24.3	23.9
22 a	MTS1943	MTS1584*2/Loma	23.5	24.0	23.8
34	MTS1955	MTS1584*2/Loma	23.7	23.8	23.8
46	MTS1967	MTS1585//Loma/AAC Gateway	23.6	24.0	23.8
19	MTS1940	MTS1584/2*Loma	22.9	24.5	23.7
42	MTS1963	MTS1584*2/Loma	23.1	24.3	23.7
4	Bobcat	check	22.5	24.7	23.6
20	MTS1941	MTS1584*2/Loma	23.2	24.0	23.6
38	MTS1959	MTS1584*2/Loma	23.5	23.7	23.6
39	MTS1960	MTS1584*2/Loma	22.7	24.5	23.6
36	MTS1957	MTS1584*2/Loma	22.8	24.0	23.4
7	MTS1928	MTS1584/2*Loma	23.0	23.3	23.2
41	MTS1962	MTS1584*2/Loma	22.0	24.3	23.2
40	MTS1961	MTS1584*2/Loma	22.4	23.8	23.1
25	MTS1946	MTS1584*2/Loma	21.7	24.3	23.0
30	MTS1951	MTS1584*2/Loma	21.4	24.5	23.0
28	MTS1949	MTS1584*2/Loma	22.1	23.6	22.9
49	MTS1970	Loma*2/Warhorse	21.8	23.8	22.8
2	Warhorse	check	22.6	22.8	22.7
10	MTS1931	MTS1584/2*Loma	22.2	23.2	22.7
11	MTS1932	MTS1584/2*Loma	22.6	22.5	22.6
13	MTS1934	MTS1584/2*Loma	21.1	23.4	22.3
5	MTS1926	MTS1584/2*Loma	20.6	23.7	22.2
16	MTS1937	MTS1584/2*Loma	20.1	24.2	22.2
35	MTS1956	MTS1584*2/Loma	20.1	24.3	22.2
33 a	MTS1954	MTS1584*2/Loma	20.9	23.3	22.1
47	MTS1968	MTS1585//Loma/AAC Gateway	19.4	24.6	22.0
23	MTS1944	MTS1584*2/Loma	21.4	22.3	21.9
12	MTS1933	MTS1584/2*Loma	19.4	24.1	21.8
3	Loma	check	19.0	24.4	21.7
15	MTS1936	MTS1584/2*Loma	19.5	23.5	21.5
48	MTS1969	Loma*2/Warhorse	20.2	22.2	21.2
18	MTS1939	MTS1584/2*Loma	18.5	23.7	21.1
44	MTS1965	Loma*2/AAC Gateway	20.2	22.0	21.1
6	MTS1927	MTS1584/2*Loma	20.3	21.5	20.9
9	MTS1930	MTS1584/2*Loma	18.8	22.6	20.7
8	MTS1929	MTS1584/2*Loma	18.0	22.7	20.4
43	MTS1964	Loma*2/AAC Gateway	19.4	21.3	20.4
17	MTS1938	MTS1584/2*Loma	17.6	22.9	20.3
14	MTS1935	MTS1584/2*Loma	19.9	20.1	20.0
45	MTS1966	Loma*2/AAC Gateway	19.2	20.4	19.8
1	Yellowstone	check	9.7	10.5	10.1
Average			21.3	23.3	22.3
LSD (0.05)			1.8	1.8	2.3
C.V. (%)			4.0	3.6	5.2
P-value (Varieties)			<.0001	<.0001	<.0001

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =

Table 136. 2019 Preliminary D Sawfly Test: All location Summary

Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Stem solid (5-25)	Protein %
d = SDS discard								
		locations	2	2	1	1	2	2
36 a	MTS19102	MTS1412*2/Warhorse	90.4	61.6	175.5	34.4	16.5	13.0
21	MTS1987	Loma*2/MTS1574	90.1	59.7	181.5	32.9	19.2	12.5
6	MTS1972	Loma*2/MTS1574	88.5	60.7	179.0	37.6	20.3	11.7
18	MTS1984	Loma*2/MTS1574	87.2	60.2	181.5	32.3	21.0	12.2
9	MTS1975	Loma*2/MTS1574	87.1	60.6	181.0	33.3	16.9	12.4
1	Yellowstone	check	86.9	60.0	179.5	37.1	8.9	12.2
11	MTS1977	Loma*2/MTS1574	86.2	59.2	178.5	33.5	17.5	11.9
12	MTS1978	Loma*2/MTS1574	85.7	60.5	181.5	31.2	16.0	12.9
3	Loma	check	85.7	59.7	181.0	33.4	18.2	12.3
27	MTS1993	Loma*2/MTS1574	85.4	59.4	179.5	35.2	16.6	12.2
5 a	MTS1971	Loma*2/MTS1574	85.2	60.1	182.0	31.9	17.1	12.5
20	MTS1986	Loma*2/MTS1574	85.2	58.8	180.0	30.4	18.6	12.2
10 a	MTS1976	Loma*2/MTS1574	85.1	60.6	181.0	31.3	23.7	12.9
24	MTS1990	Loma*2/MTS1574	84.7	60.0	181.0	33.7	19.8	12.6
31	MTS1997	Loma*2/MTS1574	84.0	60.3	181.0	30.7	16.4	12.5
32	MTS1998	Loma*2/MTS1574	83.8	58.8	179.0	33.2	16.0	12.9
25	MTS1991	Loma*2/MTS1574	83.5	60.7	181.5	30.1	22.1	13.4
35	MTS19101	Loma*2/MTS1574	83.3	58.7	179.5	34.4	16.1	12.3
14	MTS1980	Loma*2/MTS1574	83.0	60.2	182.0	32.8	22.7	12.4
2	Warhorse	check	82.9	60.5	177.5	35.5	19.4	12.9
16	MTS1982	Loma*2/MTS1574	82.4	60.7	180.5	33.3	20.5	12.4
26	MTS1992	Loma*2/MTS1574	82.3	60.5	182.0	28.7	18.4	12.4
29	MTS1995	Loma*2/MTS1574	81.3	61.3	182.0	34.0	21.9	12.2
4	Bobcat	check	80.9	61.1	178.5	31.8	22.0	12.5
15	MTS1981	Loma*2/MTS1574	80.6	58.0	182.5	29.2	21.3	12.8
33	MTS1999	Loma*2/MTS1574	80.4	60.8	181.5	29.4	20.6	12.9
30	MTS1996	Loma*2/MTS1574	80.3	58.2	180.5	31.9	19.4	12.5
34	MTS19100	Loma*2/MTS1574	79.5	58.3	182.0	32.5	18.7	13.2
28	MTS1994	Loma*2/MTS1574	79.3	57.9	180.5	33.4	18.2	13.2
23	MTS1989	Loma*2/MTS1574	78.6	58.7	179.5	33.1	18.8	12.9
8	MTS1974	Loma*2/MTS1574	78.5	60.7	181.0	32.9	23.0	12.8
19	MTS1985	Loma*2/MTS1574	78.4	61.2	182.0	28.6	21.2	12.4
17	MTS1983	Loma*2/MTS1574	78.3	58.2	182.0	30.5	22.1	12.5
22	MTS1988	Loma*2/MTS1574	77.2	59.8	181.5	29.5	23.4	12.9
13	MTS1979	Loma*2/MTS1574	76.6	59.7	181.5	28.9	23.4	13.7
7	MTS1973	Loma*2/MTS1574	75.4	58.2	181.0	30.8	17.3	12.3
Average			82.9	59.8	180.6	32.3	19.2	12.6
LSD (0.05)			ns	1.3	1.5	2.0	3.0	0.7
C.V. (%)			6.6	1.1	0.4	2.9	7.8	2.5

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 137. 2019 Preliminary D Sawfly Test: Bozeman

Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Stem solid (5-25)	Protein %
	d = SDS discard		RCB	LAT	RCB	LAT	RCB	bulk
		lattice efficiency relative to RCB	100%	151%	103%	106%	95%	
9	MTS1975	Loma*2/MTS1574	127.1	62.7	181.0	33.3	18.3	11.6
1	Yellowstone	check	125.9	62.4	179.5	37.1	10.4	11.3
6	MTS1972	Loma*2/MTS1574	125.9	62.6	179.0	37.6	21.5	11.1
36 a	MTS19102	MTS1412*2/Warhorse	125.7	62.7	175.5	34.4	15.6	12.8
21	MTS1987	Loma*2/MTS1574	124.6	61.7	181.5	32.9	20.3	11.5
32	MTS1998	Loma*2/MTS1574	124.3	61.7	179.0	33.2	15.0	11.9
11	MTS1977	Loma*2/MTS1574	123.9	60.9	178.5	33.5	19.3	11.0
20	MTS1986	Loma*2/MTS1574	123.2	59.9	180.0	30.4	22.5	11.2
3	Loma	check	123.0	61.9	181.0	33.4	20.8	11.3
31	MTS1997	Loma*2/MTS1574	122.7	62.3	181.0	30.7	16.6	11.5
27	MTS1993	Loma*2/MTS1574	122.6	61.5	179.5	35.2	17.0	11.4
12	MTS1978	Loma*2/MTS1574	121.4	62.4	181.5	31.2	16.2	12.3
35	MTS19101	Loma*2/MTS1574	121.1	61.1	179.5	34.4	16.9	11.1
5 a	MTS1971	Loma*2/MTS1574	120.0	61.7	182.0	31.9	16.7	11.5
24	MTS1990	Loma*2/MTS1574	118.2	61.8	181.0	33.7	20.9	11.8
14	MTS1980	Loma*2/MTS1574	116.3	61.9	182.0	32.8	23.6	11.7
16	MTS1982	Loma*2/MTS1574	116.3	62.1	180.5	33.3	23.3	11.6
18	MTS1984	Loma*2/MTS1574	116.3	62.0	181.5	32.3	23.2	11.3
29	MTS1995	Loma*2/MTS1574	116.0	62.8	182.0	34.0	24.1	11.5
10 a	MTS1976	Loma*2/MTS1574	115.9	61.5	181.0	31.3	24.4	12.5
2	Warhorse	check	115.7	62.5	177.5	35.5	21.2	12.4
25	MTS1991	Loma*2/MTS1574	114.8	61.5	181.5	30.1	23.8	12.9
15	MTS1981	Loma*2/MTS1574	112.6	59.5	182.5	29.2	23.2	12.1
7	MTS1973	Loma*2/MTS1574	111.9	60.4	181.0	30.8	17.6	11.2
26	MTS1992	Loma*2/MTS1574	111.8	62.0	182.0	28.7	19.5	11.5
28	MTS1994	Loma*2/MTS1574	111.5	60.1	180.5	33.4	19.1	12.2
30	MTS1996	Loma*2/MTS1574	110.6	59.6	180.5	31.9	20.6	11.5
33	MTS1999	Loma*2/MTS1574	110.4	62.2	181.5	29.4	23.6	11.9
17	MTS1983	Loma*2/MTS1574	110.3	60.1	182.0	30.5	23.2	11.5
4	Bobcat	check	109.2	62.8	178.5	31.8	23.2	11.9
22	MTS1988	Loma*2/MTS1574	108.9	61.4	181.5	29.5	24.7	12.0
8	MTS1974	Loma*2/MTS1574	108.3	62.0	181.0	32.9	23.7	12.1
23	MTS1989	Loma*2/MTS1574	108.2	60.2	179.5	33.1	20.6	12.1
34	MTS19100	Loma*2/MTS1574	107.1	59.2	182.0	32.5	18.0	12.8
13	MTS1979	Loma*2/MTS1574	106.8	61.1	181.5	28.9	23.9	12.9
19	MTS1985	Loma*2/MTS1574	104.0	63.0	182.0	28.6	23.2	11.3
Average			116.5	61.5	180.6	32.3	20.4	11.8
LSD (0.05)			ns	0.8	1.5	2.0	2.4	
C.V. (%)			6.2	0.6	0.4	2.9	5.8	
P-value (Varieties)			0.0898	<.0001	<.0001	<.0001	<.0001	

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 138. 2019 Preliminary D Sawfly Test: Northern Seeds Carter/Fort Benton

Stem infestation = 29%								
Entry #	ID	Pedigree	Yield bu/ac	Test weight lb/bu	Stem solid (5-25)	Sawfly cutting/ Lodging %		Protein %
						29-Jul	4-Aug	
d = SDS discard			RCB	RCB	RCB	RCB	RCB	RCB
18	MTS1984	Loma*2/MTS1574	58.0	58.3	18.7	20	45	13.1
21	MTS1987	Loma*2/MTS1574	55.5	57.7	18.0	18	50	13.4
36 a	MTS19102	MTS1412*2/Warhorse	55.0	60.4	17.4	4	30	13.1
10 a	MTS1976	Loma*2/MTS1574	54.2	59.7	22.9	5	30	13.3
19	MTS1985	Loma*2/MTS1574	52.8	59.3	19.2	1	8	13.4
26	MTS1992	Loma*2/MTS1574	52.8	59.0	17.3	4	23	13.3
4	Bobcat	check	52.6	59.4	20.7	11	23	13.0
25	MTS1991	Loma*2/MTS1574	52.2	59.8	20.4	9	45	13.8
34	MTS19100	Loma*2/MTS1574	51.8	57.3	19.4	3	33	13.5
24	MTS1990	Loma*2/MTS1574	51.1	58.2	18.6	13	50	13.3
6	MTS1972	Loma*2/MTS1574	51.0	58.8	19.1	30	55	12.3
33	MTS1999	Loma*2/MTS1574	50.4	59.3	17.5	4	28	13.9
5 a	MTS1971	Loma*2/MTS1574	50.3	58.4	17.4	2	20	13.4
2	Warhorse	check	50.1	58.5	17.5	1	23	13.4
12	MTS1978	Loma*2/MTS1574	50.0	58.6	15.7	5	45	13.5
30	MTS1996	Loma*2/MTS1574	49.9	56.8	18.1	3	23	13.4
14	MTS1980	Loma*2/MTS1574	49.6	58.4	21.7	15	30	13.0
23	MTS1989	Loma*2/MTS1574	49.0	57.2	17.0	5	45	13.6
8	MTS1974	Loma*2/MTS1574	48.7	59.3	22.2	10	40	13.5
16	MTS1982	Loma*2/MTS1574	48.5	59.2	17.7	28	60	13.1
15	MTS1981	Loma*2/MTS1574	48.5	56.4	19.3	10	50	13.4
11	MTS1977	Loma*2/MTS1574	48.4	57.4	15.7	28	70	12.7
3	Loma	check	48.3	57.5	15.6	30	50	13.2
27	MTS1993	Loma*2/MTS1574	48.1	57.3	16.1	30	55	12.9
1	Yellowstone	check	47.8	57.5	7.3	80	80	13.0
20	MTS1986	Loma*2/MTS1574	47.2	57.7	14.7	5	35	13.1
28	MTS1994	Loma*2/MTS1574	47.1	55.6	17.2	4	55	14.1
9	MTS1975	Loma*2/MTS1574	47.0	58.4	15.5	23	55	13.1
29	MTS1995	Loma*2/MTS1574	46.6	59.7	19.7	20	45	12.9
13	MTS1979	Loma*2/MTS1574	46.3	58.2	22.9	2	38	14.4
17	MTS1983	Loma*2/MTS1574	46.2	56.2	20.9	6	50	13.4
35	MTS19101	Loma*2/MTS1574	45.5	56.2	15.2	23	50	13.4
22	MTS1988	Loma*2/MTS1574	45.5	58.2	22.1	13	53	13.7
31	MTS1997	Loma*2/MTS1574	45.2	58.2	16.1	3	45	13.5
32	MTS1998	Loma*2/MTS1574	43.3	55.9	16.9	4	53	13.9
7	MTS1973	Loma*2/MTS1574	38.9	55.9	17.0	15	40	13.4
Average			49.3	58.1	18.0	13.4	42.4	13.3
LSD (0.05)			ns	1.6	5.0	15.0	20.3	0.4
C.V. (%)			8.6	1.3	13.8	55.1	23.7	1.5
P-value (Varieties)			0.1183	<.0001	0.0018	<.0001	<.0001	<.0001

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 139. 2019 Preliminary D Sawfly Test: 2 location Stem Solidness

Entry #	ID d = SDS discard	Pedigree	Bozeman RCB	Fort Benton RCB	2 Location average
Sawfly Infestation (tunneling)					
10 a	MTS1976	Loma*2/MTS1574	24.4	22.9	23.7
13	MTS1979	Loma*2/MTS1574	23.9	22.9	23.4
22	MTS1988	Loma*2/MTS1574	24.7	22.1	23.4
8	MTS1974	Loma*2/MTS1574	23.7	22.2	23.0
14	MTS1980	Loma*2/MTS1574	23.6	21.7	22.7
17	MTS1983	Loma*2/MTS1574	23.2	20.9	22.1
25	MTS1991	Loma*2/MTS1574	23.8	20.4	22.1
4	Bobcat	check	23.2	20.7	22.0
29	MTS1995	Loma*2/MTS1574	24.1	19.7	21.9
15	MTS1981	Loma*2/MTS1574	23.2	19.3	21.3
19	MTS1985	Loma*2/MTS1574	23.2	19.2	21.2
18	MTS1984	Loma*2/MTS1574	23.2	18.7	21.0
33	MTS1999	Loma*2/MTS1574	23.6	17.5	20.6
16	MTS1982	Loma*2/MTS1574	23.3	17.7	20.5
6	MTS1972	Loma*2/MTS1574	21.5	19.1	20.3
24	MTS1990	Loma*2/MTS1574	20.9	18.6	19.8
2	Warhorse	check	21.2	17.5	19.4
30	MTS1996	Loma*2/MTS1574	20.6	18.1	19.4
21	MTS1987	Loma*2/MTS1574	20.3	18.0	19.2
23	MTS1989	Loma*2/MTS1574	20.6	17.0	18.8
34	MTS19100	Loma*2/MTS1574	18.0	19.4	18.7
20	MTS1986	Loma*2/MTS1574	22.5	14.7	18.6
26	MTS1992	Loma*2/MTS1574	19.5	17.3	18.4
3	Loma	check	20.8	15.6	18.2
28	MTS1994	Loma*2/MTS1574	19.1	17.2	18.2
11	MTS1977	Loma*2/MTS1574	19.3	15.7	17.5
7	MTS1973	Loma*2/MTS1574	17.6	17.0	17.3
5 a	MTS1971	Loma*2/MTS1574	16.7	17.4	17.1
9	MTS1975	Loma*2/MTS1574	18.3	15.5	16.9
27	MTS1993	Loma*2/MTS1574	17.0	16.1	16.6
36 a	MTS19102	MTS1412*2/Warhorse	15.6	17.4	16.5
31	MTS1997	Loma*2/MTS1574	16.6	16.1	16.4
35	MTS19101	Loma*2/MTS1574	16.9	15.2	16.1
12	MTS1978	Loma*2/MTS1574	16.2	15.7	16.0
32	MTS1998	Loma*2/MTS1574	15.0	16.9	16.0
1	Yellowstone	check	10.4	7.3	8.9
Average			20.4	18.0	19.2
LSD (0.05)			2.4	5.0	3.0
C.V. (%)			5.8	13.8	7.8
P-value (Varieties)			<.0001	0.0018	<.0001

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p

Table 146. Winter Wheat Clearfield Qualification Trial , Bozeman, MT (Exp. CLQ1) for 2019. MSU Fort Ellis site.

Shaded lines are in 2020 Intrastate or Advanced Tests

Treatment	Yield	Test weight	% Injury rating		Stand %	Heading date	Plant height	Protein
			day 12	day 27				
<u>By Rate:</u>	- bu/a -	- lb/bu -	11-Jun	26-Jun		from 1-Jan	- in -	- % -
OX	135.8	59.1	0	0		181.9	33.7	12.0
2XMSO	123.7	59.0	2	1		181.1	32.0	12.0
Rate PLSD (0.05)	ns	ns	ns	1		ns	0.4	
Rate CV%	4.7	0.5	236	307		0.5	3.1	
Rate*ID interactions	0.0884	0.0095	0.1561	0.3916		0.0623	0.3572	
<u>By ID:</u>								
SY Clearstone 2CL	130.8	58.6	0	0		181.3	37.0	12.0
MTCS1601R	125.8	60.2	0	0		181.3	34.3	12.4
MTCL1732	127.7	58.0	3	2		180.7	31.4	11.7
MTCL1737	135.7	57.9	2	3		183.8	31.9	11.8
MTCS18195	126.7	59.5	0	0		180.8	33.6	11.6
MTCS18211	130.7	60.6	0	0		181.8	34.1	12.6
MTCS18222	125.0	60.4	2	2		179.6	34.0	11.9
MTCS1901	115.6	60.3	3	1		183.5	31.5	12.5
MTCL19148	123.6	58.6	1	0		183.5	33.3	12.1
MTCL19149	135.5	57.6	0	0		181.1	33.6	11.7
MTCL19150	126.9	57.9	0	0		185.2	32.8	12.8
MTCL19151	140.3	58.3	0	0		178.7	31.4	11.7
MTCL19152	141.4	59.1	3	2		179.0	30.9	11.7
MTCL19153	130.3	59.3	2	1		181.0	29.5	12.1
ID PLSD (0.05)	7.5	0.4	ns	ns		1.1	1.2	0.4
ID CV%	5.0	0.6	247	309		0.5	3.1	1.5
Grand Mean	129.7	59.0	1.0	0.7		181.5	32.8	12.0

Planted: October 12, 2018

Beyond Application: May 30, 2019

Harvested: September 16, 2019

Table 147. Winter Wheat Clearfield Qualification Trial ,Huntley, MT (Exp. CLQ8)

Shaded lines are in 2020 Intrastate or Advanced Tests

Treatment	Yield	Test weight	% Injury rating		Heading date	Plant height	Lodging (0-9)	Moisture (%)	Protein
			day 20	day 29					
	- bu/a -	- lb/bu -	14-May	23-May		- in -			- % -
<u>By Rate:</u>									
OX	111.3	62.2	0	0	168.4	38.6	1.0	8.8	12.1
2XMSO	110.0	62.3	0	0	168.1	38.3	0.4	8.8	11.8
Rate PLSD (0.05)	ns	ns			ns	ns	ns	ns	ns
Rate CV%	5.1	0.8			0.5	2.9	149.8	2.3	3.9
Rate*ID interactions	0.1889	0.4026			0.8612	0.4407	0.4672	0.8075	0.9952
<u>By ID:</u>									
SY Clearstone 2CL	112.5	60.6			168.3	43.4	1.3	8.7	12.0
MTCS1601R	110.5	62.8			166.7	39.1	1.2	9.3	12.3
MTCL1732	108.2	60.0			166.5	38.3	0.0	8.7	12.0
MTCL1737	111.8	61.5			170.7	38.4	0.0	8.6	12.1
MTCS18195	106.0	61.8			168.2	39.4	1.0	9.0	11.7
MTCS18211	103.0	64.6			169.2	38.3	1.7	9.2	12.4
MTCS18222	103.3	63.3			166.3	38.9	0.7	9.1	11.5
MTCS1901	106.0	63.3			170.8	37.2	0.0	9.0	12.5
MTCL19148	108.7	61.2			169.8	40.8	0.0	8.6	12.0
MTCL19149	110.5	61.9			168.3	37.6	3.3	8.4	11.4
MTCL19150	115.2	63.1			173.0	39.2	0.0	8.9	12.1
MTCL19151	118.2	62.2			165.3	36.3	0.0	9.0	11.5
MTCL19152	117.6	62.0			164.5	36.1	0.3	8.7	11.9
MTCL19153	117.5	63.2			167.8	35.3	0.0	8.9	11.7
ID PLSD (0.05)	6.8	0.6			0.9	1.3	1.2	0.2	0.5
ID CV%	5.3	0.8			0.5	2.9	149.7	2.3	3.6
Grand Mean	110.6	62.2			168.3	38.5	0.7	8.8	11.9

Planted: September 26, 2018
 Beyond Application: April 24, 2019
 Harvested: August 7, 2019

Table 148. 2019 Clearfield Qualification Test (Exp. CLQ): Means of lines across all locations and treatments
 Shaded lines are in 2020 Intrastate or Advanced Tests

Line	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date 1-Jan	Plant height in	Protein %
	n =	12	12	12	12	8
MTCL19152	MT0871/(06X445B1-2, SY Clearstone sib)	129.5	60.6	171.8	33.5	11.8
MTCL19151	MT0871/(06X445B1-2, SY Clearstone sib)	129.3	60.2	172.0	33.9	11.6
MTCL19153	MT0871/(06X445B1-2, SY Clearstone sib)	123.9	61.3	174.4	32.4	11.8
MTCL1737	YLL-2CL/3YLL*2/Pelsart//PROM/3*YLL	123.8	59.7	177.3	35.1	12.0
MTCL19149	MTCL1125/MT1091	123.0	59.7	174.7	35.6	11.5
SY Clearstone 2CL	genetic standard	121.7	59.6	174.8	40.2	12.0
MTCL19150	MTCL1125/MT10128	121.0	60.5	179.1	36.0	12.3
MTCS1601R	MTS0531/7/MTS0532/6/96X17E69/3/MTCL0309/CDC Teal 11A/MTW011	118.2	61.5	174.0	36.7	12.3
MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/MTCL01158/CDC Teal 11A/JAG	118.0	59.0	173.6	34.8	11.9
MTCS18211	MTS1597//MTCS1301/MTS1412	116.9	62.6	175.5	36.2	12.4
MTCS18195	MTCS1204*4/MT1138	116.3	60.7	174.5	36.5	11.6
MTCL19148	MTCL1125/Northern	116.1	59.9	176.7	37.1	12.0
MTCS18222	Judee//Warhorse/MTCS1204	114.2	61.8	173.0	36.5	11.6
MTCS1901	Judee*2/MTCS1301	110.8	61.8	177.2	34.4	12.5
Average		120.2	60.6	174.9	35.6	11.9
LSD (0.05)		5.3	0.5	0.8	0.9	0.4
C.V. (%)		5.5	1.1	0.6	3.2	3.3
P-value (Varieties)		<.0001	<.0001	<.0001	<.0001	<.0001

Table 143. 2019 Conal Allele Study (J. Cook): All location Summary

Entry #	ID	Pedigree	Solidness		Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Stem Solidness (5-25)		Sawfly cutting %	Protein %
			H = hollow C = Conan All R= Rescue All.	locations					'Early'	Late'		
1	17WMAB1004	Yellowstone*3/Conan	H	2	79.4	59.1	180.0	34.2	5.0	7.2	37	12.8
2	17WMAB1005	Yellowstone*3/Conan	C	2	77.9	59.9	180.0	33.0	14.3	9.3	34	13.0
3	17WMAB1006	Yellowstone*3/Conan	C	2	78.9	59.4	179.4	35.5	12.0	8.8	43	13.0
4	17WMAB1017	Yellowstone*3/Conan	H	2	93.8	61.4	176.3	36.6	5.9	7.6	60	12.4
5	17WMAB1018	Yellowstone*3/Conan	C	2	78.9	60.1	179.1	36.0	11.5	9.2	77	12.6
6	17WMAB1019	Yellowstone*3/Conan	H	2	86.1	60.5	176.9	37.2	5.4	8.2	86	12.5
7	17WMAB1020	Yellowstone*3/Conan	C	2	83.8	60.5	176.1	34.6	13.9	10.7	50	12.4
8	17WMAB1026	Yellowstone*3/Conan	C	2	82.4	60.1	176.6	34.3	15.7	9.0	72	12.4
9	17WMAB1027	Yellowstone*3/Conan	C	2	89.2	60.4	177.0	37.0	15.0	8.3	56	12.3
10	17WMAB1028	Yellowstone*3/Conan	C	2	94.2	58.9	175.6	36.8	14.4	7.6	73	12.5
11	17WMAB1030	Yellowstone*3/Conan	C	2	84.4	59.9	177.0	36.6	13.0	10.7	93	12.1
12	17WMAB1035	Yellowstone*3/Conan	C	2	81.8	60.8	177.0	35.2	12.6	9.0	74	12.5
13	17WMAB1036	Yellowstone*3/Conan	H	2	83.5	60.2	176.8	36.3	5.6	6.1	86	12.6
14	17WMAB1037	Yellowstone*3/Conan	H	2	77.4	60.6	177.9	36.8	5.0	6.1	56	12.8
15	17WMAB1038	Yellowstone*3/Conan	C	2	82.5	60.0	177.4	35.2	10.6	7.4	61	12.9
16	17WMAB1039	Yellowstone*3/Conan	C	2	80.7	60.4	177.0	35.1	7.4	8.7	46	12.8
17	17WMAB1040	Yellowstone*3/Conan	H	2	84.3	60.3	178.9	35.8	5.2	6.4	43	12.6
18	17WMAB1042	Yellowstone*3/Conan	H	2	82.8	60.7	175.9	35.2	7.4	8.1	67	12.2
19	17WMAB1044	Yellowstone*3/Conan	C	2	77.4	60.2	176.3	33.8	13.7	8.0	40	12.6
20	17WMAB1045	Yellowstone*3/Conan	C	2	74.6	60.1	178.0	31.8	11.1	6.8	69	12.3
21	17WMAB1046	Yellowstone*3/Conan	H	2	85.0	59.7	176.1	34.9	5.7	7.1	79	12.4
22	17WMAB1049	Yellowstone*3/Conan	C	2	79.6	60.5	178.2	35.1	14.6	7.8	57	12.5
23	17WMAB1050	Yellowstone*3/Conan	C	2	83.1	60.2	179.1	35.7	9.6	7.8	35	12.1
24	17WMAB1051	Yellowstone*3/Conan	H	2	78.9	59.6	180.3	34.6	5.4	6.5	59	12.6
25	17WMAB1058	Yellowstone*3/Conan	H	2	83.9	60.1	179.1	34.5	5.7	6.7	62	12.8
26	17WMAB1059	Yellowstone*3/Conan	C	2	82.3	60.0	179.0	34.6	11.5	7.7	67	12.6
27	17WMAB1067	Judee*3/Conan	C	2	85.6	62.0	175.0	36.7	5.6	9.2	27	12.7
28	17WMAB1068	Judee*3/Conan	R	2	81.3	62.4	174.9	36.1	13.2	20.2	23	12.5
29	17WMAB1079	Judee*3/Conan	C	2	78.0	61.6	174.0	38.0	5.4	7.3	59	13.0
30	17WMAB1080	Judee*3/Conan	R	2	79.3	60.7	175.1	37.9	6.9	15.8	19	13.5
31	17WMAB1087	Judee*3/Conan	R	2	82.8	62.1	175.3	37.2	9.6	19.9	15	13.0
32	17WMAB1088	Judee*3/Conan	C	2	77.7	61.3	175.6	37.1	5.5	7.8	59	13.0
33	17WMAB1101	Judee*3/Conan	C	2	73.6	61.8	176.2	46.2	5.9	6.8	66	13.6
34	17WMAB1103	Judee*3/Conan	R	2	81.4	61.7	175.9	37.2	11.0	19.1	25	12.7
35	17WMAB1104	Judee*3/Conan	R	2	81.7	62.5	170.6	41.5	11.5	16.4	18	12.9
36	17WMAB1105	Judee*3/Conan	C	2	73.6	62.0	173.1	41.7	8.0	7.2	55	13.3
37	17WMAB1110	Judee*3/Conan	C	2	78.5	62.4	170.8	45.1	5.4	6.9	59	13.9
38	17WMAB1111	Judee*3/Conan	R	2	80.3	61.3	171.2	36.9	11.3	19.0	19	12.8
39	17WMAB1115	Judee*3/Conan	R	2	85.0	62.0	169.8	32.4	8.5	18.9	19	12.5
40	17WMAB1116	Judee*3/Conan	C	2	80.1	62.0	170.9	35.5	5.2	7.3	58	12.5
41	17WMAB1123	Judee*3/Conan	C	2	73.4	62.2	170.9	43.6	5.4	7.7	56	13.7
42	17WMAB1124	Judee*3/Conan	R	2	83.0	61.4	175.9	36.4	10.6	17.6	12	13.2
43	17WMAB1126	Judee*3/Conan	R	2	76.5	62.6	171.2	43.6	13.2	17.5	37	13.8
44	17WMAB1129	Judee*3/Conan	C	2	80.8	62.1	171.1	42.5	8.5	10.7	44	13.1
45	17WMAB1133	Judee*3/Conan	C	2	80.6	62.0	171.3	35.8	5.0	6.8	39	12.8
46	17WMAB1134	Judee*3/Conan	R	2	82.2	61.8	176.0	39.6	9.1	18.6	30	12.8
47	Judee	check	Check	2	82.5	61.8	176.4	36.5	11.3	20.4	18	12.7
48	Yellowstone	check	Check	2	88.8	60.6	178.4	38.4	5.6	7.1	79	12.5
49	Warhorse	check	Check	2	81.1	61.1	176.9	35.3	17.2	19.5	2	13.1
Average					81.5	60.9	175.9	36.9	9.3	10.5	49.4	12.7
LSD (0.05)					ns	1.1	1.0	1.7	3.6	3.7	24.4	0.4
C.V. (%)					7.0	0.9	2.9	2.6	23.8	17.7	29.2	1.7

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 144. 2019 Conan Allele Study (J.Cook): Bozeman

Entry #	ID	Pedigree	Solidness H = hollow C = Conan All R = Rescue All.	Yield bu/ac RCB	Test weight lb/bu RCB	Heading date Julian LAT	Plant height in LAT	Stem Solidness (5-25)		Protein % bulk
								'Early' LAT	Late' RCB	
		lattice efficiency relative to RCB		103%	100%	111%	117%	105%	96%	
10	17WMAB1028	Yellowstone*3/Conan	C	141.4	61.2	175.6	36.8	14.4	6.5	11.6
4	17WMAB1017	Yellowstone*3/Conan	H	134.9	62.8	176.3	36.6	5.9	5.4	11.6
48	Yellowstone	check	Check	132.8	62.6	178.4	38.4	5.6	5.3	11.8
9	17WMAB1027	Yellowstone*3/Conan	C	128.2	61.6	177.0	37.0	15.0	6.2	11.3
13	17WMAB1036	Yellowstone*3/Conan	H	127.5	62.3	176.8	36.3	5.6	5.4	11.9
27	17WMAB1067	Judee*3/Conan	C	125.9	64.0	175.0	36.7	5.6	9.9	11.7
7	17WMAB1020	Yellowstone*3/Conan	C	123.2	62.2	176.1	34.6	13.9	7.7	11.6
11	17WMAB1030	Yellowstone*3/Conan	C	122.8	61.8	177.0	36.6	13.0	10.8	11.5
21	17WMAB1046	Yellowstone*3/Conan	H	122.3	61.5	176.1	34.9	5.7	5.4	11.8
6	17WMAB1019	Yellowstone*3/Conan	H	121.6	62.2	176.9	37.2	5.4	5.1	12.0
46	17WMAB1134	Judee*3/Conan	R	121.4	63.5	176.0	39.6	9.1	18.6	12.0
17	17WMAB1040	Yellowstone*3/Conan	H	120.0	61.9	178.9	35.8	5.2	5.6	12.1
15	17WMAB1038	Yellowstone*3/Conan	C	119.2	61.9	177.4	35.2	10.6	6.4	12.4
12	17WMAB1035	Yellowstone*3/Conan	C	118.8	62.6	177.0	35.2	12.6	6.3	11.8
8	17WMAB1026	Yellowstone*3/Conan	C	118.6	61.5	176.6	34.3	15.7	6.9	11.7
23	17WMAB1050	Yellowstone*3/Conan	C	118.3	62.3	179.1	35.7	9.6	5.8	11.2
28	17WMAB1068	Judee*3/Conan	R	118.1	63.0	174.9	36.1	13.2	19.8	11.8
1	17WMAB1004	Yellowstone*3/Conan	H	117.6	61.1	180.0	34.2	5.0	5.1	12.0
18	17WMAB1042	Yellowstone*3/Conan	H	117.4	62.7	175.9	35.2	7.4	5.5	11.5
25	17WMAB1058	Yellowstone*3/Conan	H	117.3	62.1	179.1	34.5	5.7	5.3	12.4
47	Judee	check	Check	116.8	63.2	176.4	36.5	11.3	21.1	11.9
24	17WMAB1051	Yellowstone*3/Conan	H	116.6	61.5	180.3	34.6	5.4	5.0	11.9
22	17WMAB1049	Yellowstone*3/Conan	C	116.5	61.8	178.2	35.1	14.6	5.8	11.5
5	17WMAB1018	Yellowstone*3/Conan	C	116.5	61.9	179.1	36.0	11.5	6.4	11.8
16	17WMAB1039	Yellowstone*3/Conan	C	116.5	61.9	177.0	35.1	7.4	6.2	12.3
30	17WMAB1080	Judee*3/Conan	R	116.1	62.3	175.1	37.9	6.9	15.9	12.7
49	Warhorse	check	Check	115.9	62.4	176.9	35.3	17.2	20.8	12.7
26	17WMAB1059	Yellowstone*3/Conan	C	114.8	61.2	179.0	34.6	11.5	6.0	12.1
39	17WMAB1115	Judee*3/Conan	R	114.8	63.0	169.8	32.4	8.5	19.0	12.0
40	17WMAB1116	Judee*3/Conan	C	114.6	63.6	170.9	35.5	5.2	6.4	11.7
3	17WMAB1006	Yellowstone*3/Conan	C	114.6	60.9	179.4	35.5	12.0	6.2	12.4
44	17WMAB1129	Judee*3/Conan	C	114.4	63.8	171.1	42.5	8.5	9.5	12.6
14	17WMAB1037	Yellowstone*3/Conan	H	114.4	62.5	177.9	36.8	5.0	5.4	12.2
34	17WMAB1103	Judee*3/Conan	R	114.2	62.7	175.9	37.2	11.0	17.9	11.9
31	17WMAB1087	Judee*3/Conan	R	114.1	63.3	175.3	37.2	9.6	19.5	12.4
29	17WMAB1079	Judee*3/Conan	C	113.8	62.5	174.0	38.0	5.4	5.7	12.3
45	17WMAB1133	Judee*3/Conan	C	113.0	63.4	171.3	35.8	5.0	5.8	12.1
2	17WMAB1005	Yellowstone*3/Conan	C	112.8	61.1	180.0	33.0	14.3	7.3	12.3
32	17WMAB1088	Judee*3/Conan	C	112.6	62.8	175.6	37.1	5.5	5.4	12.0
19	17WMAB1044	Yellowstone*3/Conan	C	112.3	61.1	176.3	33.8	13.7	6.6	12.0
42	17WMAB1124	Judee*3/Conan	R	110.3	62.7	175.9	36.4	10.6	19.7	12.7
37	17WMAB1110	Judee*3/Conan	C	110.1	63.7	170.8	45.1	5.4	6.6	13.3
38	17WMAB1111	Judee*3/Conan	R	109.7	62.6	171.2	36.9	11.3	20.6	11.9
35	17WMAB1104	Judee*3/Conan	R	109.2	63.8	170.6	41.5	11.5	19.1	12.1
36	17WMAB1105	Judee*3/Conan	C	109.1	63.7	173.1	41.7	8.0	7.0	12.7
20	17WMAB1045	Yellowstone*3/Conan	C	108.1	61.1	178.0	31.8	11.1	5.6	11.6
43	17WMAB1126	Judee*3/Conan	R	105.6	63.8	171.2	43.6	13.2	17.4	13.3
41	17WMAB1123	Judee*3/Conan	C	104.6	63.3	170.9	43.6	5.4	6.4	13.1
33	17WMAB1101	Judee*3/Conan	C	103.1	63.7	176.2	46.2	5.9	5.8	13.1
Average				117.0	62.4	175.9	36.9	9.3	21.4	12.1
LSD (0.05)				11.6	0.7	1.0	1.7	3.6	3.3	
C.V. (%)				6.1	0.7	2.9	2.6	23.8	21.4	
P-value (Varieties)				<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Table 145. 2019 Conan Allele Study (J. Cook): Northern Seeds - Carter/Fort Benton

Entry #	ID	Pedigree	Solidness H = hollow C = Conan All R= Rescue All.	Yield bu/ac LAT	Test weight lb/bu RCB	Stem solid (5-25) RCB	Lodging/ cutting 7/29 % LAT	Protein % LAT
		lattice efficiency relative to RCB		136%	92%	100%	105%	112%
42	17WMAB1124	Judee*3/Conan	R	55.6	60.1	15.5	12	13.6
39	17WMAB1115	Judee*3/Conan	R	55.2	61.0	18.7	19	13.0
35	17WMAB1104	Judee*3/Conan	R	54.2	61.1	13.6	18	13.6
4	17WMAB1017	Yellowstone*3/Conan	H	52.7	59.9	9.8	60	13.1
31	17WMAB1087	Judee*3/Conan	R	51.4	60.9	20.3	15	13.6
38	17WMAB1111	Judee*3/Conan	R	50.8	60.0	17.3	19	13.7
6	17WMAB1019	Yellowstone*3/Conan	H	50.6	58.7	11.3	86	13.0
25	17WMAB1058	Yellowstone*3/Conan	H	50.5	58.0	8.1	62	13.1
9	17WMAB1027	Yellowstone*3/Conan	C	50.1	59.2	10.3	56	13.2
26	17WMAB1059	Yellowstone*3/Conan	C	49.8	58.7	9.3	67	13.1
34	17WMAB1103	Judee*3/Conan	R	48.6	60.6	20.3	25	13.4
17	17WMAB1040	Yellowstone*3/Conan	H	48.5	58.6	7.1	43	13.1
45	17WMAB1133	Judee*3/Conan	C	48.2	60.5	7.8	39	13.5
18	17WMAB1042	Yellowstone*3/Conan	H	48.1	58.7	10.6	67	12.9
47	Judee	check	Check	48.1	60.3	19.7	18	13.4
23	17WMAB1050	Yellowstone*3/Conan	C	47.9	58.1	9.7	35	12.9
21	17WMAB1046	Yellowstone*3/Conan	H	47.7	57.8	8.7	79	12.9
43	17WMAB1126	Judee*3/Conan	R	47.4	61.4	17.6	37	14.2
44	17WMAB1129	Judee*3/Conan	C	47.2	60.4	11.8	44	13.6
10	17WMAB1028	Yellowstone*3/Conan	C	47.0	56.6	8.7	73	13.3
37	17WMAB1110	Judee*3/Conan	C	46.9	61.1	7.2	59	14.4
49	Warhorse	check	Check	46.3	59.7	18.2	2	13.4
8	17WMAB1026	Yellowstone*3/Conan	C	46.2	58.6	11.1	72	13.0
11	17WMAB1030	Yellowstone*3/Conan	C	46.0	58.0	10.6	93	12.7
15	17WMAB1038	Yellowstone*3/Conan	C	45.7	58.0	8.4	61	13.3
40	17WMAB1116	Judee*3/Conan	C	45.6	60.3	8.1	58	13.3
27	17WMAB1067	Judee*3/Conan	C	45.2	59.9	8.5	27	13.6
16	17WMAB1039	Yellowstone*3/Conan	C	44.8	58.8	11.2	46	13.3
48	Yellowstone	check	Check	44.8	58.6	8.8	79	13.1
12	17WMAB1035	Yellowstone*3/Conan	C	44.8	58.9	11.7	74	13.1
28	17WMAB1068	Judee*3/Conan	R	44.5	61.8	20.6	23	13.2
7	17WMAB1020	Yellowstone*3/Conan	C	44.4	58.8	13.6	50	13.2
33	17WMAB1101	Judee*3/Conan	C	44.0	59.9	7.8	66	14.1
3	17WMAB1006	Yellowstone*3/Conan	C	43.1	57.9	11.3	43	13.5
2	17WMAB1005	Yellowstone*3/Conan	C	43.0	58.7	11.3	34	13.6
46	17WMAB1134	Judee*3/Conan	R	42.9	60.0	18.6	30	13.5
32	17WMAB1088	Judee*3/Conan	C	42.8	59.8	10.2	59	13.9
22	17WMAB1049	Yellowstone*3/Conan	C	42.7	59.2	9.8	57	13.4
19	17WMAB1044	Yellowstone*3/Conan	C	42.5	59.2	9.3	40	13.2
30	17WMAB1080	Judee*3/Conan	R	42.4	59.0	15.6	19	14.3
41	17WMAB1123	Judee*3/Conan	C	42.1	61.0	8.9	56	14.2
29	17WMAB1079	Judee*3/Conan	C	42.1	60.6	8.9	59	13.7
5	17WMAB1018	Yellowstone*3/Conan	C	41.3	58.2	11.9	77	13.3
24	17WMAB1051	Yellowstone*3/Conan	H	41.2	57.6	7.9	59	13.3
1	17WMAB1004	Yellowstone*3/Conan	H	41.2	57.1	9.2	37	13.5
20	17WMAB1045	Yellowstone*3/Conan	C	41.0	59.1	7.9	69	13.0
14	17WMAB1037	Yellowstone*3/Conan	H	40.3	58.6	6.8	56	13.3
13	17WMAB1036	Yellowstone*3/Conan	H	39.4	58.0	6.8	86	13.2
36	17WMAB1105	Judee*3/Conan	C	38.1	60.2	7.4	55	13.9
Average				46.0	59.3	11.5	49.4	13.4
LSD (0.05)				8.8	1.5	5.7	24.4	0.5
C.V. (%)				11.0	1.6	30.6	29.2	2.0
P-value (Varieties)				0.0166	<.0001	<.0001	<.0001	<.0001

a = lines in 2020 Advanced Test (all other MT lines dropped from testing)

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Table 146. Winter Wheat Zinc Study , Bozeman, MT (Exp. ZN01) for 2019. MSU Post Farm site.

Treatment	Yield	Test weight	Heading date	Plant height	Protein
By Rate:	- bu/a -	- lb/bu -	from 1-Jan	- in -	- % -
untreated	109.9	62.8	176.3	35.1	11.9
treated	131.0	62.7	176.3	35.1	12.0
Rate PLSD (0.05)	ns	ns	ns	ns	ns
Rate CV%	6.0	0.9	0.7	2.5	3.4
Rate*ID interactions	0.8074	0.9544	0.2669	0.3041	0.9382
By ID:					
Yellowstone	124.8	62.4	177.0	37.3	11.7
Judee	124.3	63.1	176.2	35.9	12.6
Warhorse	114.7	62.3	177.3	34.4	12.6
BrawlCLP	108.6	64.2	168.7	31.8	12.5
Decade	117.0	62.0	175.0	35.4	11.9
Northern	133.9	62.6	177.3	37.1	11.7
Loma	116.5	62.1	180.7	33.5	11.5
MT1265	121.2	62.3	179.3	38.1	11.8
FourOsix	120.0	62.8	175.7	32.9	11.6
MTW1491	133.3	63.1	178.8	38.3	11.3
Flathead	120.4	63.4	171.5	34.3	11.7
Bobcat	110.8	62.8	178.0	32.0	12.2
ID PLSD (0.05)	8.0	0.6	1.4	1.0	0.4
ID CV%	5.8	0.8	0.7	2.5	3.2
Grand Mean	120.5	62.7	176.3	35.1	11.9

Planted: October 2, 2018
Zinc Application: June 17, 2019
Harvested: August 28, 2019

Yield	Treated	Untrt	Diff	%Diff
Yellowstone	132.9	116.7	16.2	13.9
Judee	136.2	112.3	23.9	21.3
Warhorse	125.5	103.9	21.6	20.8
BrawlCLP	118.8	98.4	20.4	20.7
Decade	131.9	102.0	29.9	29.3
Northern	145.9	121.9	24.0	19.7
Loma	126.9	106.0	20.9	19.7
MT1265	130.7	111.7	19.0	17.0
FourOsix	125.9	114.1	11.8	10.3
MTW1491	145.6	121.0	24.6	20.3
Flathead	132.2	108.6	23.6	21.7
Bobcat	119.9	101.8	18.1	17.8
	131.0	109.9		19.4

Table 147. 2019 Sawfly Observation Nursery (SFO): Lines harvested at the Post Farm, Bozeman

Plot #	2020 ID	ID	Pedigree	Yield bu/a	Test weight bu/a	Heading date from 1-Jan	Plant height in	Stem solidness	2018 HR data		
									Prot- ein	PPO	SDS
34	MTCS2061	12X159E19	Warhorse/MTCS1203	143.3	62.5	177	32.7	20.7	11.6	4	3.2
41	MTCS2062	12X159E93	Warhorse/MTCS1203	133.1	63.0	177	33.9	21.3	10.5	3	3.8
2	Warhorse		Yellowstone at FE	111.4	62.0	171	33.1	21.6			
48	12X23cE25		MTCS1203//MTS1021/MTCL1003	110.7		176	31.9	20.5	10.6	4	3.4
49	12X23cE38		MTCS1203//MTS1021/MTCL1003	122.5	61.8	177	32.7	20.1	10.2	4	3.1
57	12X23cE65		MTCS1203//MTS1021/MTCL1003	113.0	62.1	177	32.3	23.0	10.4	4	3.2
58	12X23cE67		MTCS1203//MTS1021/MTCL1003	121.1	62.0	177	31.9		11.1	4	3.7
60	MTCS2063	12X23cE72	MTCS1203//MTS1021/MTCL1003	128.4	61.6	178	32.7		11.2	4	3.2
63	12X23cE101		MTCS1203//MTS1021/MTCL1003	109.3		177	33.5	20.7	12.0	4	3.6
64	12X23cE102		MTCS1203//MTS1021/MTCL1003	109.7		177	32.3		12.1	4	4.4
202	Warhorse		check	115.5	62.2	178	35.8	19.9			
228	12X47cE24		(Judee sib, MTS0819-98)//MTS1017/MTS1177	116.9	62.8	178	34.6		13.7	5	3.9
229	MTS2064	12X47cE36	(Judee sib, MTS0819-98)//MTS1017/MTS1177	122.3	64.6	172	31.5	21.1	13.4	4	3.5
242	12X50cE33		MTS0832/Spur/Warhorse	100.8		178	31.9		14.2	5	4.4
245	12X50cE61		MTS0832/Spur/Warhorse	107.8		177	33.1		14.2	4	4.5
250	12X50cE97		MTS0832/Spur/Warhorse	106.7		176	32.7		13.7	4	4.6
256	12X57cE18		Warhorse//MTS1028/MTS1030	121.8	60.7	177	33.5	19.5	13.2	2	5.0
259	MTS2065	12X57cE26	Warhorse//MTS1028/MTS1030	126.9	61.6	179	34.3	19.2	12.7	2	4.4
262	12X57cE57		Warhorse//MTS1028/MTS1030	111.8		178	33.1	18.8	13.0	2	3.4
315	12X71cE13		(Judee sib, MTS0819-98)//MTS1166/03X185cE32	121.9	61.8	178	34.6	19.6	12.6	4	3.8
320	12X71cE56		(Judee sib, MTS0819-98)//MTS1166/03X185cE32	119.0	61.8	179	34.6	18.9	12.8	4	3.7
321	12X71cE61		(Judee sib, MTS0819-98)//MTS1166/03X185cE32	126.7		179	34.3	20.6	12.7	3	3.4
327	12X71cE86		(Judee sib, MTS0819-98)//MTS1166/03X185cE32	110.1		177	34.3	17.7	13.1	2	3.9
357	12X85E5		(Judee sib, MTS0819)//MTS0832/HV9W07-1914	121.4	61.6	178	32.3		14.8	5	4.1
369	12X85E87		(Judee sib, MTS0819)//MTS0832/HV9W07-1914	124.1	62.9	172	35.8		13.2	5	4.6
402	Warhorse		check	110.4	62.1	178	34.3	20.5			
465	13X194-DH72		Warhorse/MT1078	110.2		177	35.4	19.0	14.2	4	3.6
466	13X194-DH76		Warhorse/MT1078	104.0		172	31.1		14.0	4	3.6
468	13X194-DH81		Warhorse/MT1078	115.8	62.2	176	34.6		14.3	4	4.2
469	13X194-DH87		Warhorse/MT1078	123.0	63.3	175	34.6	21.8	13.3	4	3.5
471	13X194-DH92		Warhorse/MT1078	119.8	63.2	176	33.9	20.8	-	4	4.0
489	16X12-DH90		MTS1584/07x76cF90	126.6	61.0	177	31.9	18.6	13.6	3	4.4
496	15X180B38		Warhorse*2/Loma	120.0	61.7	177	31.5		12.0	4	2.8
499	15X180B60		Warhorse*2/Loma	111.9		178	33.9	22.8	12.2	4	3.5

Table 147. 2019 Sawfly Observation Nursery (SFO): Lines harvested at the Post Farm, Bozeman

Plot #	2020 ID	ID	Pedigree	Yield bu/a	Test weight bu/a	Heading date from 1-Jan	Plant height in	Stem solidness	2018 HR data	
									Prot- ein	PPO SDS
503	MTS2066	15X180B71	Warhorse*2/Loma	127.7	61.7	176	35.4	20.5	12.8	4 3.6
507	MTS2067	15X184cB5	Warhorse/Loma/MTS1594	147.6	61.4	177	33.5	19.0	12.3	5 3.6
524		15X187cB24	Loma*2/MTS1404	128.0	61.2	179	31.9	23.9	11.7	5 4.0
541	MTS2068	11X1cE117-4	(Judee sib, MTS0819)/08X350-A6/Warhorse	130.8	62.0	180	35.8		10.5	1 4.2
558		11X17cE83-2	MT10105/Warhorse/MTS1011	109.2		177	31.5	19.0	13.5	3 4.0
560		11X17cE97-4	MT10105/Warhorse/MTS1011	117.6	63.0	177	33.1	18.0	13.0	4 3.6
584	MTS2069	11X53cE44-4	(Judee sib, MTS0819)/MV17-04/Judee	126.2	63.3	178	31.9	21.5	12.5	5 4.3
587		11X206cE1-1	Decade/(MTS0819, Judee sib)	131.5	60.4	182	33.1		13.8	2 4.3
588	MTS2070	11X206cE5-3	Decade/(MTS0819, Judee sib)	131.8	62.7	178	32.3	21.7	12.9	5 4.6
591	MTS2071	11X206cE24-3	Decade/(MTS0819, Judee sib)	127.6	62.8	178	34.6	20.3	13.7	5 4.0
592		11X206cE35-1	Decade/(MTS0819, Judee sib)	118.7	63.6	178	33.1	19.1	14.1	5 4.0
594		11X206cE88-1	Decade/(MTS0819, Judee sib)	117.2	63.3	177	34.3	18.3	13.2	5 4.2
596		11X206cE107-2	Decade/(MTS0819, Judee sib)	133.5	61.2	180	33.9		13.4	5 4.8
598	MTS2072	11X216cE40-3	MTS0832/Spur	124.4	63.3	179	35.8	21.4	12.8	5 4.8
599		11X216cE90-2	MTS0832/Spur	114.9	62.9	178	35.8	20.2	12.9	5 4.8
602	Warhorse		check	117.5	62.4	178	35.0	23.2		
604		11X1cE134-4	(Judee sib, MTS0819)/08X350-A6/Warhorse	128.7	61.2	180	32.7	21.0	13.7	2 3.8
611	MTS2073	11X6cE205-4	MTS1054/Warhorse/MTS1008	127.9	63.0	175	33.9	21.5	13.2	4 3.5
613	MTS2074	11X13cE147-4	(Colter sib, MT08177)/MTS0916/MTS0826	122.3	64.7	180	31.5	24.1	12.4	5 3.8
614		11X13cE169-1	(Colter sib, MT08177)/MTS0916/MTS0826	113.2	63.2	182	29.9		13.3	5 3.3
615		11X13cE179-2	(Colter sib, MT08177)/MTS0916/MTS0826	121.9	61.5	182	28.0		12.7	4 3.8
618		11X17cE156-3	MT10105/Warhorse/MTS1011	109.5		178	33.5	18.0	12.9	5 3.4
619	MTS2075	11X17cE161-2	MT10105/Warhorse/MTS1011	126.6	63.6	177	34.3		13.0	5 3.8
623		11X17cE195-4	MT10105/Warhorse/MTS1011	119.4	63.4	176	34.3	18.6	13.0	5 3.6
624		11X17cE199-3	MT10105/Warhorse/MTS1011	120.1	63.1	176	32.7	22.4	13.2	5 3.8
626		11X17cE222-2	MT10105/Warhorse/MTS1011	104.5		178	30.3		13.0	5 3.6
627	MTS2076	11X17cE229-1	MT10105/Warhorse/MTS1011	132.1	63.3	178	34.6		13.1	5 3.9
628		11X17cE230-2	MT10105/Warhorse/MTS1011	117.6	62.5	178	30.7	19.0	13.6	5 3.8
632		11X20cE86-3	Judee/3/(Paul/6*Choteau, 469-15)/(07gh374-9, MT0414/PI591)	110.0		179	33.1	23.4	12.9	4 3.4
639		11X37cE193-4	(Judee sib, MTS0819)/TCI981055/Genou	115.1	62.5	176	30.3		12.4	5 4.6
640		11X37cE199-2	(Judee sib, MTS0819)/TCI981055/Genou	128.1	61.1	177	32.7		12.7	5 3.7
645	MTS2077	11X49cE143-1	Judee/(16FAWWON-Irr-87)/(MT0977, Northern sib)	132.8	63.7	178	30.3		12.7	2 3.8
647	MTS2078	11X51cE221-2	Judee/MTS1023/16FAWWON-Irr-87	123.2	63.0	178	31.9		12.6	5 4.2
649	MTS2079	11X53cE158-2	(Judee sib, MTS0819)/MV17-04/Judee	131.4	63.6	178	32.3	20.9	12.9	5 4.6

Table 147. 2019 Sawfly Observation Nursery (SFO): Lines harvested at the Post Farm, Bozeman

Plot #	2020 ID	ID	Pedigree	Yield bu/a	Test weight bu/a	Heading date from	Plant height in	Stem solidness	2018 HR data		
									Prot- ein	PPO	SDS
658		11X206cE222-3	Decade/(MTS0819, Judee sib)	130.9	59.0	180	33.1	21.7	14.2	3	4.6
659	MTS2080	11X206cE229-1	Decade/(MTS0819, Judee sib)	135.3	63.2	178	34.3	19.8	13.4	5	3.4
663	MTS2081	11X210cE190-2	Judee/MTS1014	129.0	63.8	175	34.6	22.5	12.9	4	3.4
674		11X232cE163-2	03X273cE8/MTS0826	123.2	63.1	179	34.6	17.4	13.6	3	3.8
697		10X119E3-3	Warhorse*2/Accipiter	123.5	63.2	177	34.3	19.7	12.7	4	3.4
698		10X119E7-4	Warhorse*2/Accipiter	123.9	62.4	178	34.3		13.0	4	4.0
699		10X119E13-3	Warhorse*2/Accipiter	119.0	63.0	178	34.3	21.4	13.1	4	4.5
703	MTS2082	10X119E28-1	Warhorse*2/Accipiter	130.4	62.5	178	34.6	22.3	13.9	4	3.7
704	MTS2083	10X119E35-2	Warhorse*2/Accipiter	127.2	62.9	178	33.5	23.0	13.0	4	4.6
706		10X119E39-4	Warhorse*2/Accipiter	118.2	62.3	175	30.7	19.3	14.5	4	3.8
712	MTS2084	10X119E68-1	Warhorse*2/Accipiter	128.1	62.7	177	33.1		14.0	4	3.8
714		10X119E76-3	Warhorse*2/Accipiter	114.3	63.3	178	33.9	22.9	13.5	4	4.0
717		10X119E102-2	Warhorse*2/Accipiter	103.5		175	31.9	20.0	14.6	5	3.5
718		10X119E118-3	Warhorse*2/Accipiter	100.2		172	31.5	19.3	14.4	5	3.7
Average All				120.6	62.5	177.3	33.2	20.6	13.0	4.1	3.9
Average MTS20xx lines				129.8	62.9	177.5	33.5	21.2	12.7	4.1	3.9

Table 148. 2019 Sawfly Observation Nursery (SFO): All Locations

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID Pedigree	Heading date BZ	Plant height BZ	Stem solid- ness BZ	Agronomic Scores (0-9)												Stripe Rust%		2018 HR data		
						BZ-SFO		BS-1000r		CD-1000r		FE-CLO		FE-Sr		Avg.	BZ	24-Jul	2-Aug	FE-Sr >5%	Prot- ein	PPO SDS
						PLB	JEB	PLB	JEB	PLB	JEB	PLB	JEB	PLB	JEB							
1	1	Rampart	check (SY Clearstonein CLO)	176	39.0	5-25	19-Jul	1-Aug	25-Jul	29-Jul	24-Jul	30-Jul	2-Aug	5-Aug								
2	h	Warhorse	Yellowstone at FE	171	33.1	21.6	6	7	6	6	7	6	6	5	4	4.6	tr	5	5			
3		12X3cE2	Spur/MTS1014//MTCS1205	176	32.7		6	6	6	5	6	5	6	6	5	5.7				12.4	4	3.2
4		12X3cE7	Spur/MTS1014//MTCS1205	176	34.3		6	6	6	6	4	5	6	6	6	5.7		tr		12.1	4	3.8
5		12X3cE14	Spur/MTS1014//MTCS1205	177	33.5		6	7	5	5	5	6	6	7	5	5.8				13.3	4	4.1
6		12X3cE19	Spur/MTS1014//MTCS1205	176	30.3		4	5	5	6	4	5	5	5	5	4.9				12.0	4	4.3
7		12X3cE31	Spur/MTS1014//MTCS1205	177	33.1		6	6	5	6	6	6	6	6	6	5.9		tr		13.1	4	4.0
8		12X3cE33	Spur/MTS1014//MTCS1205	176	32.7		6	6	5	5	5	6	7	7	7	6.0				13.3	4	4.0
9		12X3cE37	Spur/MTS1014//MTCS1205	177	33.1		5	5	6	5	5	5	5	5	5	5.1		tr		13.1	4	3.8
10		12X3cE44	Spur/MTS1014//MTCS1205	177	33.5		5	6	6	6	6	7	6	6	6	6.0				11.6	4	3.4
11		12X3cE48	Spur/MTS1014//MTCS1205	177	33.1		6	6	5	5	6	5	5	5	7	5.6				11.9	4	3.8
12	w4 d	12X3cE51	Spur/MTS1014//MTCS1205	177	32.3		6	7	7	6	5	6	7	6	7	6.3				12.2	4	3.2
13		12X3cE68	Spur/MTS1014//MTCS1205	176	33.1		6	6	7	6	5	5	6	5	5	5.7				11.9	4	3.4
14		12X3cE76	Spur/MTS1014//MTCS1205	176	33.1		5	7	6	6	6	5	6	6	6	5.9				11.5	4	3.1
15		12X3cE88	Spur/MTS1014//MTCS1205	175	31.9		6	6	7	7	5	5	5	5	5	5.7				12.7	3	3.7
16		12X3cE92	Spur/MTS1014//MTCS1205	175	32.7	15.2	6	8	7	7	6	6	6	6	6	6.4				12.4	4	3.2
17		12X3cE95	Spur/MTS1014//MTCS1205	176	31.5		5	6	5	5	5	5	5	5	5	5.1	tr			13.0	4	3.8
18		12X3cE99	Spur/MTS1014//MTCS1205	177	33.5		6	5	5	7	5	5	6	6	7	5.8				12.0	4	3.4
19		12X157E5	MTCS1205/MTS1211	178	33.1		6	6	6	5	5	7	5	6	7	5.9		tr		12.5	4	3.6
20		12X157E7	MTCS1205/MTS1211	178	35.4		5	7	5	5	5	5	6	7	5	5.6		tr		11.3	4	3.4
21	w4 d	12X157E23	MTCS1205/MTS1211	178	33.5		6	6	6	6	7	6	7	6	6	6.2	tr			11.2	4	3.4
22	w4 d	12X157E36	MTCS1205/MTS1211	178	32.7		5	5	6	6	7	7	6	5	5	5.8				10.8	4	3.0
23		12X157E41	MTCS1205/MTS1211	182	31.9		4	5	5	5	3	4	5	4	5	4.4	tr			10.6	3	2.9
24		12X157E45	MTCS1205/MTS1211	177	33.9		5	4	5	6	4	6	5	5	6	5.1				13.5	4	3.5
25	w4 d	12X157E54	MTCS1205/MTS1211	178	31.5		5	6	7	7	6	6	5	6	6	6.0				11.6	4	3.7
26	w5 d	12X157E63	MTCS1205/MTS1211	177	31.1		6	7	7	6	6	7	5	5	6	6.1				12.8	5	3.6
27	w5 d	12X157E69	MTCS1205/MTS1211	178	30.7		6	7	6	7	5	6	5	6	5	5.9				12.3	5	3.6
28	w5 d	12X157E72	MTCS1205/MTS1211	178	30.7		5	6	6	5	5	6	5	5	5	5.3				12.5	5	3.0
29		12X157E78	MTCS1205/MTS1211	178	32.3		5	6	5	5	4	6	5	6	5	5.2				11.5	4	3.0
30		12X159E2	Warhorse/MTCS1203	179	35.0		4	5	5	7	5	5	5	6	6	5.3				10.3	3	2.8
31		12X159E6	Warhorse/MTCS1203	178	35.0		6	5	8	6	4	6	6	6	6	6.0				10.7	4	2.8
32	w4 d	12X159E7	Warhorse/MTCS1203	178	30.3		7	7	5	5	6	5	6	7	6	6.0				10.2	4	3.8
33		12X159E18	Warhorse/MTCS1203	179	33.5		5	6	6	7	5	5	5	6	6	5.7				10.7	3	3.0
34	h	12X159E19	Warhorse/MTCS1203	177	32.7	20.7	7	7	7	6	6	7	7	8	7	6.9				11.6	4	3.2
35		12X159E26	Warhorse/MTCS1203	180	34.6		5	6	6	6	5	5	5	6	7	5.7				11.2	3	2.8
36		12X159E28	Warhorse/MTCS1203	177	33.9		4	5	5	5	4	5	6	7	6	5.2				12.8	4	3.0
37	w4 d	12X159E35	Warhorse/MTCS1203	176	32.3		7	6	6	6	5	6	7	7	6	6.2				10.6	4	3.2
38	w4 d	12X159E42	Warhorse/MTCS1203	177	31.9		5	6	7	7	6	6	5	6	6	6.0				11.5	4	3.8
39		12X159E48	Warhorse/MTCS1203	176	34.6		4	4	7	6	6	7	5	6	6	5.7				11.7	4	3.1
40		12X159E76	Warhorse/MTCS1203	179	32.3		5	6	5	5	4	6	6	6	6	5.4				10.4	3	3.2
41	h	12X159E93	Warhorse/MTCS1203	177	33.9	21.3	7	7	6	6	6	6	7	7	7	6.6				10.5	3	3.8
42	w3	12X159E94	Warhorse/MTCS1203	176	32.3	16.3	6	7	7	6	6	5	7	8	5	6.3				10.2	3	3.2
43		12X159E99	Warhorse/MTCS1203	177	39.4		4	4	5	6	4	5	5	5	5	4.8				10.3	3	3.1
44		12X159E103	Warhorse/MTCS1203	176	35.8		6	6	5	5	4	6	6	7	6	5.7				10.6	3	3.0

Table 148. 2019 Sawfly Observation Nursery (SFO): All Locations

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date BZ	Plant height BZ	Stem solid- ness 5-25	Agronomic Scores (0-9)										Stripe Rust%		2018 HR data			
							BZ-SFO		BS-1000r		CD-1000r		FE-CLO		FE-Sr JEB	Avg.	BZ	FE-Sr >5%	Prot- ein	PPO SDS		
							PLB	JEB	PLB	JEB	PLB	JEB	PLB	JEB								
45	w4 d	12X22E1	MTCS1203//Accipiter/MTCL1003	179	37.4	5-25	19-Jul	1-Aug	25-Jul	29-Jul	24-Jul	30-Jul	2-Aug	5-Aug		22-Jul	24-Jul	2-Aug	10.1	4	3.0	
46		12X22E45	MTCS1203//Accipiter/MTCL1003	178	35.4	20.5	5	4	5	5	4	6	5	5	4.7				10.7	4	3.2	
47		12X23cE20	MTCS1203//MTS1021/MTCL1003	176	33.9		5	6	6	6	5	5	6	6	6	5.3		tr		10.7	4	3.4
48	h	12X23cE25	MTCS1203//MTS1021/MTCL1003	176	31.9		6	6	7	7	7	6	6	7	6	6.4				10.6	4	3.4
49	h	12X23cE38	MTCS1203//MTS1021/MTCL1003	177	32.7		7	7	7	7	7	7	7	7	7	7.0				10.2	4	3.1
50		12X23cE39	MTCS1203//MTS1021/MTCL1003	182	33.1		5	6	6	5	6	4	5	6	6	5.3				10.0	4	3.0
51		Rampart	SY Clearstone 2CL at FE	177	40.6	23	5	4	4	4	4	4	6	5	4.4							
52		Warhorse	Yellowstone at FE	177	35.0		5	6	6	6	6	6	6		6	5.9						
53	w4 d	12X23cE43	MTCS1203//MTS1021/MTCL1003	176	35.4		5	6	6	5	6	4	5	6	6	5.4				10.1	4	3.6
54	w4 d	12X23cE50	MTCS1203//MTS1021/MTCL1003	176	35.4		5	7	6	7	6	5	6	6	6	6.0				10.5	4	3.3
55		12X23cE56	MTCS1203//MTS1021/MTCL1003	178	32.3		6	7	7	7	6	5	5	7	7	6.2				10.9	4	2.8
56		12X23cE62	MTCS1203//MTS1021/MTCL1003	176	33.1	20.7	5	6	4	5	4	5	6	6	5.1				10.9	4	3.6	
57	h	12X23cE65	MTCS1203//MTS1021/MTCL1003	177	32.3		6	7	7	6	7	6	6	7	6	6.4				10.4	4	3.2
58	h	12X23cE67	MTCS1203//MTS1021/MTCL1003	177	31.9		5	6	6	6	6	7	6	7	6	6.1				11.1	4	3.7
59	w4 d	12X23cE71	MTCS1203//MTS1021/MTCL1003	177	31.9		6	7	5	6	7	7	7	6	7	6.4				10.8	4	3.3
60	h	12X23cE72	MTCS1203//MTS1021/MTCL1003	178	32.7		5	6	6	7	7	6	6	7	6	6.2				11.2	4	3.2
61	w4 d	12X23cE90	MTCS1203//MTS1021/MTCL1003	180	32.3	20.7	5	6	6	6	5	5	6	6	5.6				12.5	4	4.4	
62		12X23cE97	MTCS1203//MTS1021/MTCL1003	179	34.6		4	6	4	5	4	6	6	5	4	4.9		tr		12.8	4	4.2
63	h	12X23cE101	MTCS1203//MTS1021/MTCL1003	177	33.5		7	6	8	7	7	6	7	6	7	6.8				12.0	4	3.6
64	h	12X23cE102	MTCS1203//MTS1021/MTCL1003	177	32.3		6	6	7	6	7	5	7	5	6	6.1				12.1	4	4.4
65	w5 d	12X28cE2	MTCS1205//MTCL1161/MTS1180	177	34.3		5	6	5	6	6	6	5	6	5	5.6		3	5	10.8	5	4.0
66	w5 d	12X28cE8	MTCS1205//MTCL1161/MTS1180	177	34.6	20.7	5	7	6	5	6	6	5	5	5.6	3	10	15	11.8	5	3.4	
67	w5 d	12X28cE15	MTCS1205//MTCL1161/MTS1180	176	35.0		5	7	6	6	5	5	6	5	6	5.7				11.2	5	4.2
68	w5 d	12X28cE20	MTCS1205//MTCL1161/MTS1180	178	36.6		5	5	5	5	5	5	5	5	5	5.1				12.2	5	3.6
69	w5 d	12X28cE38	MTCS1205//MTCL1161/MTS1180	177	37.0		5	5	5	6	5	5	5	6	6	5.3				11.5	5	3.6
70	w5 d	12X28cE48	MTCS1205//MTCL1161/MTS1180	177	37.0		5	5	5	5	6	6	5	7	5	5.4		5	10	12.7	5	3.1
71	w4 d	12X28cE50	MTCS1205//MTCL1161/MTS1180	178	35.8	20.7	5	5	5	7	5	5	5	6	5.3		3	10	10.6	4	3.2	
72	w4 d	12X28cE55	MTCS1205//MTCL1161/MTS1180	177	34.6		5	6	5	6	5	5	6	6	5	5.4	tr	5	20	11.3	4	3.2
73		12X28cE60	MTCS1205//MTCL1161/MTS1180	176	33.1		6	7	6	7	5	6	6	7	6	6.2		tr	5	11.5	4	4.6
74		12X28cE75	MTCS1205//MTCL1161/MTS1180	176	35.4		6	6	6	6	6	7	6	6	5	6.0		3	10	11.4	4	3.0
75	w4 d	12X28cE81	MTCS1205//MTCL1161/MTS1180	177	36.2		5	5	5	5	6	4	5	5	4	4.9	3	10	25	10.4	4	3.3
76		12X28cE94	MTCS1205//MTCL1161/MTS1180	176	33.9	20.7	5	7	7	6	6	6	5	6	5.9		5	10	10.9	4	4.0	
77		15X39C1	Judee//Warhorse/MTCS1204	176	35.0		5	6	5	5	7	7	5	6	6	5.8				11.0	4	2.8
78		15X39C7	Judee//Warhorse/MTCS1204	177	35.0		4	5	5	6	4	5	5	7	6	5.2				11.6	4	3.2
79		15X39C9	Judee//Warhorse/MTCS1204	179	35.4		4	5	5	5	4	5	5	6	5	4.9				11.2	4	3.2
80		15X39C12	Judee//Warhorse/MTCS1204	176	36.2		5	5	5	3	5	5	5	6	6	5.1				12.1	4	3.2
81		15X39C19	Judee//Warhorse/MTCS1204	176	34.6	16.9	6	7	7	6	5	6	7	8	6.3				12.2	4	4.0	
82		15X39C22	Judee//Warhorse/MTCS1204	172	35.8	20.7	5	5	5	6	4	5	5	6	5.1				11.8	4	3.4	
83		15X39C28	Judee//Warhorse/MTCS1204	176	34.3		4	6	6	6	4	6	6	5	6	5.6				11.8	4	4.2
84		15X39C33	Judee//Warhorse/MTCS1204	176	34.3		5	6	6	6	5	5	6	6	7	5.8				11.8	3	3.2
85	w4 d	15X39C48	Judee//Warhorse/MTCS1204	176	35.8		4	5	5	5	3	4	5	6	6	4.8				11.7	4	3.4
86		15X39C52	Judee//Warhorse/MTCS1204	177	36.2			5	5	6	6	4	5	5	6	5.4				11.2	4	3.0
87		15X39C57	Judee//Warhorse/MTCS1204	177	37.0	20.7	5	5	5		4	5	5	6	5.0		tr		12.8	4	3.2	
88	w4 d	15X39C73	Judee//Warhorse/MTCS1204	175	35.4		5	6	6	6	4	5	5	6	6	5.4	tr			11.8	4	3.8

Table 148. 2019 Sawfly Observation Nursery (SFO): All Locations

Row/ wPPO ID		Pedigree	Heading date	Plant height BZ	Stem solidness 5-25	Agronomic Scores (0-9)										Stripe Rust%		2018 HR data					
h = harvested line d = low SDS and/or high PPO white, possible discard						BZ-SFO		BS-1000r		CD-1000r		FE-CLO		FE-Sr JEB	Avg.	BZ	FE-Sr >5%	Prot- ein	PPO SDS				
Plot						19-Jul	1-Aug	25-Jul	29-Jul	24-Jul	30-Jul	2-Aug	5-Aug										
89	w4 d 15X39C78	Judee//Warhorse/MTCS1204	176	34.6	5-25	5	6	7		5	6	5	7	5.9	22-Jul	24-Jul	2-Aug	12.6	4	3.2			
90	15X39C85	Judee//Warhorse/MTCS1204	175	35.8		5	5	5		5	5	6	5.0	10.9				3	3.4				
91	15X39C98	Judee//Warhorse/MTCS1204	176	34.6		4	5	6		4	6	6	5	5.0				11.2	3	2.9			
92	15X40B17	Warhorse*2/MTCS1204	178	37.8		4	5	5		4	5	5	5	4.8				12.1	4	4.0			
93	15X40B37	Warhorse*2/MTCS1204	178	36.2		5	6	6		4	5	6	7	5.5				11.7	3	3.7			
94	15X40B41	Warhorse*2/MTCS1204	176	37.0		6	6	5		7	7	6	6	6.3				tr	5	5	11.6	4	3.8
95	15X39B13-3	Judee//Warhorse/MTCS1204	176	35.4		5	6	5		5	5	5	5	5.1				1	5	5	11.3	4	4.2
96	15X39B15-2	Judee//Warhorse/MTCS1204	179	38.2		4	5	5		4	5	5	5	4.8							11.4	3	3.8
97	15X39B24-3	Judee//Warhorse/MTCS1204	179	36.2		4	5	6		4	5	6	6	5.0							11.8	4	3.6
98	15X39B29-3	Judee//Warhorse/MTCS1204	177	35.8		5	6	6		6	6	6	5	5.8							11.2	4	3.2
99	w4 d 15X39B37-1	Judee//Warhorse/MTCS1204	176	36.2	5	6	6		5	5	5	5	5.3				12.4	4	3.6				
100	15X39B55-2	Judee//Warhorse/MTCS1204	177	35.4	5	7	6		5	5	6	6	5.8				11.6	4	3.0				
101	Rampart	SY Clearstone 2CL at FE	177	39.8	5-25	4	4	5		4	4	6	5	4.5	tr	3	5						
102	Warhorse	Yellowstone at FE	178	33.9		6	6	6		6	6		6	6.0							13.9	4	3.6
103	15X39B64-2	Judee//Warhorse/MTCS1204	178	33.1		4	5	6		4	5	5	5	5.0							11.9	3	3.4
104	11X274E60-1	Judee/MTCL1162	177	33.5		6	6	7		5	5	6	7	6.0							11.5	3	3.6
105	11X274E117-1	Judee/MTCL1162	177	36.6		4	5	5		4	5	6	5	5.0							11.5	5	3.8
106	11X275E7-2	Accipiter/MTCL1003	176	31.5		6	7	6		7	6	6	6	6.3							11.6	5	3.6
107	11X275E31-1	Accipiter/MTCL1003	177	30.3		7	7	6		7	6	6	7	6.5							12.2	1	3.6
108	15X21-A4-1-3	Loma*2/(MTCL1131, SY Clearstone sib)	179	30.7		7	6	7		7	6	8	5	7				6.6			10.6	1	3.8
109	15X21-A4-2-4	Loma*2/(MTCL1131, SY Clearstone sib)	179	31.9		7	6	6		6	5	7	5	6				6.0			12.1	1	3.2
110	15X21-A4-4-3	Loma*2/(MTCL1131, SY Clearstone sib)	180	30.3		6	6	7		6	6	6	6	6.1							10.8	1	3.8
111	15X21-A16-2-3	Loma*2/(MTCL1131, SY Clearstone sib)	180	31.5	7	6	6		6	6	7	5	6	6.1			13.9	5	3.8				
112	w5 d 15X40-A1-3-4	Warhorse*2/MTCS1204	177	35.8	5	7	6		5	6	5	6	5.6				12.7	4	3.9				
113	15X40-A1-5-1	Warhorse*2/MTCS1204	178	35.0	6	6	6		6	6	6	6	6.0				13.9	4	3.6				
114	15X40-A6-2-4	Warhorse*2/MTCS1204	177	37.4	5	5	5		7	5	5	5	5.3				13.9	4	3.6				
115	15X40-A7-5-1	Warhorse*2/MTCS1204	179	39.4	4	5	5		5	6	4	5	4.9				13.9	4	3.7				
116	15X40-A10-2-1	Warhorse*2/MTCS1204	176	36.6	6	5	5		5	6	6	6	5.6				13.9	4	4.0				
117	15X50-A4-2-1	Judee*2/MTCS1301	178	33.5	4	6	6		5	6	5	6	5.5				12.5	3	4.2				
118	15X50-A4-4-1	Judee*2/MTCS1301	177	36.6	5	6	7		6	7	6	6	6.1				11.4	4	3.6				
119	15X50-A7-1-3	Judee*2/MTCS1301	177	34.6	6	6	6		6	7	5	6	6.0		tr		12.4	4	3.8				
120	16X3-DH40	Bobcat//MTCS1204/MTS1597	179	34.3	5	6	5		4	5	5	6	5.1				13.0	4	4.0				
121	16X3-DH42	Bobcat//MTCS1204/MTS1597	177	35.4	6	7	7		7	7	3	3	7	5.9		2	5	12.7	4	3.2			
122	w1 d 12X36E29	(Judee sib, MTS0819-98)//10K1734w/W	179	33.5	4	6	4		4	5			6	4.8			13.2	1	2.4				
123	12X36E34	(Judee sib, MTS0819-98)//10K1734w/W	175	37.0	7	7	7		6	6			5	6.3		10	25	13.1	5	3.6			
124	12X36E78	(Judee sib, MTS0819-98)//10K1734w/W	175	35.4	6	6	6		6	5			5	5.7	tr	5	15	12.5	5	3.4			
125	12X36E84	(Judee sib, MTS0819-98)//10K1734w/W	172	35.4	7	6	6		4	4			4	5.2		5	40	12.5	5	3.4			
126	w5 d 12X36E90	(Judee sib, MTS0819-98)//10K1734w/W	178	32.3	4	6	4		4	6			6	5.0		tr	5	12.8	5	3.5			
127	12X37E2	MTS1227//MT1143/Bearpaw	175	31.5	4	7	7		6	5			5	5.7		tr	40	12.9	4	3.5			
128	12X37E15	MTS1227//MT1143/Bearpaw	175	29.9	5	6	6		5	5			6	5.5		tr	10	13.2	5	3.4			
129	12X37E25	MTS1227//MT1143/Bearpaw	172	33.5	7	7	6		7	5			5	6.2		3	25	13.7	1	3.4			
130	d 12X37E39	MTS1227//MT1143/Bearpaw	175	34.6	7	6	6		6	4			5	5.7		10	30	13.1	1	3.0			
131	12X37E49	MTS1227//MT1143/Bearpaw	172	34.6	7	7	6		7	6			6	6.5		5	15	12.6	1	3.2			
132	d 12X37E55	MTS1227//MT1143/Bearpaw	177	34.3	6	6	6		4	4			5	5.2		2	5	12.5	0	2.8			

Table 148. 2019 Sawfly Observation Nursery (SFO): All Locations

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height BZ	Stem solid- ness	Agronomic Scores (0-9)										Stripe Rust%		2018 HR data			
				BZ	date			BZ-SFO		BS-1000r		CD-1000r		FE-CLO		FE-Sr JEB	Avg.	BZ	FE-Sr >5%	Prot- ein	PPO SDS		
								PLB	JEB	PLB	JEB	PLB	JEB	PLB	JEB							22-Jul	24-Jul
133	12X37E64		MTS1227//MT1143/Bearpaw	176	5-25	35.8	5-25	19-Jul	1-Aug	25-Jul	29-Jul	24-Jul	30-Jul	2-Aug	5-Aug			22-Jul	24-Jul	2-Aug	13.2	4	3.6
134	12X37E66		MTS1227//MT1143/Bearpaw	172		32.7		5	5	5		6	5		5	5.2		1	5		13.2	4	3.6
135	d 12X37E75		MTS1227//MT1143/Bearpaw	177		34.6		6	7	6		5	6		7	5.8					13.4	4	3.8
136	d 12X37E88		MTS1227//MT1143/Bearpaw	175		33.9		7	6	5		5	5		6	5.8	tr				12.6	4	2.8
137	d 12X37E96		MTS1227//MT1143/Bearpaw	179		35.0		6	6	6		5	6		5	5.5	2	5	10		13.0	1	2.8
138	12X37E101		MTS1227//MT1143/Bearpaw	175		31.9		5	6	6		6	6		5	5.7	3				12.5	4	2.8
139	12X37E107		MTS1227//MT1143/Bearpaw	176		32.3		6	6	6		6	7		6	5.8	3				13.0	4	3.6
140	12X38CE12		Decade*2/(MTS0819, Judee sib)	177		34.3		6	4	6		5	4		5	6.0	1	10	40		13.6	4	3.2
141	12X38CE17		Decade*2/(MTS0819, Judee sib)	177		33.1		6	4	6		5	5		4	4.8	15	20	50		12.6	4	4.6
142	12X38CE29		Decade*2/(MTS0819, Judee sib)	176		31.5		5	5	5		5	6		4	5.0	10	15	30		12.8	4	4.4
143	d 12X38CE33		Decade*2/(MTS0819, Judee sib)	176		32.7		6	6	6		6	6		5	5.3	5	5	20		14.7	4	3.8
144	12X38CE40		Decade*2/(MTS0819, Judee sib)	176		33.9		5	6	6		4	4		6	6.5	5	tr	15		13.4	4	3.0
145	12X38CE47		Decade*2/(MTS0819, Judee sib)	170		28.0		7	4	6	5	8	7		5	5.0	tr	5	5		12.9	4	4.0
146	12X38CE56		Decade*2/(MTS0819, Judee sib)	178		31.5		5	6	5	6	5	7		4	5.9	25	15	60		13.0	4	3.6
147	12X38CE61		Decade*2/(MTS0819, Judee sib)	172		32.3		6	6	6	5	6	6		5	5.6	30	3	15		14.0	4	3.6
148	12X38CE62		Decade*2/(MTS0819, Judee sib)	175		31.5		6	7	7	6	5	6		6	5.9	10	tr	5		12.4	4	3.2
149	d 12X38CE66		Decade*2/(MTS0819, Judee sib)	171		29.5		5	6	5	4	7	7		5	6.0	5	3	10		12.7	4	3.8
150	12X38CE80		Decade*2/(MTS0819, Judee sib)	171		33.9		6	7	5	6	7	6		5	5.6		5	5		13.0	4	3.1
151	Rampart		check	177		39.8		5	4	4	4	4	5		7	6.3	3				13.8	5	4.8
152	Warhorse		check	178		34.6		6	6	6	5	6	6		4	4.3		5	5				
153	12X38CE84		Decade*2/(MTS0819, Judee sib)	171		30.7		7	4	6	5	7	5		6	5.9							
154	d 12X38CE87		Decade*2/(MTS0819, Judee sib)	177		34.3		5	5	5	5	4	5		5	5.6	25	2	10		13.2	4	3.6
155	12X38CE91		Decade*2/(MTS0819, Judee sib)	171		33.9		6	5	6	5	8	6		6	5.0	tr				12.6	4	3.0
156	12X38CE95		Decade*2/(MTS0819, Judee sib)	172		35.0		6	6	7	6	5	4		7	6.1	20	5	5		13.9	5	3.8
157	12X38CE101		Decade*2/(MTS0819, Judee sib)	179		32.7		6	6	5	5	4	5		6	5.7	10	tr			14.0	5	4.6
158	12X38CE105		Decade*2/(MTS0819, Judee sib)	176		31.9		7	5	6	5	8	6		5	5.1	tr	5	10		12.4	5	3.4
159	12X38CE106		Decade*2/(MTS0819, Judee sib)	175		32.3	16	7	6	6	6	7	7		6	6.1	5	tr	10		12.4	4	3.8
160	d 12X40CE42		(Judee sib, MTS0819)*2/Decade	178		37.8		4	4	4	4	4	5		6	6.4					13.1	4	3.4
161	12X40CE65		(Judee sib, MTS0819)*2/Decade	178		34.3		6	5	5	5	5	6		5	4.3					13.7	4	3.0
162	d 12X40CE89		(Judee sib, MTS0819)*2/Decade	175		33.1		7	6	6	5	5	6		5	5.3	3	5	15		13.7	5	4.0
163	12X40CE106		(Judee sib, MTS0819)*2/Decade	178		35.4		5	6	6	6	7	7		6	5.9	5	tr	10		13.2	4	3.0
164	d 12X40CE109		(Judee sib, MTS0819)*2/Decade	176		34.3		6	5	5	5	5	5		6	6.1					13.2	5	3.8
165	w4 d 12X42CE23		MTS1227//Accipiter/MTS0832	178		32.3		6	5	5	5	8	8		6	5.3					13.0	4	2.8
166	d 12X42CE28		MTS1227//Accipiter/MTS0832	178		32.3		6	6	6	5	5	8		5	6.0	10	5	10		12.9	4	3.5
167	d 12X42CE33		MTS1227//Accipiter/MTS0832	180		31.9		5	6	6	5	5	6		5	5.6	tr				13.4	5	2.6
168	12X42CE36		MTS1227//Accipiter/MTS0832	181		31.9		6	5	5	5	4	5		5	5.4	3	3	20		13.9	4	2.7
169	12X42CE72		MTS1227//Accipiter/MTS0832	176		32.3		7	7	6	6	5	7		6	5.1		2			14.4	4	4.0
170	12X42CE83		MTS1227//Accipiter/MTS0832	175		34.3		4	5	6	5	4	5		6	6.3		5	10		13.5	4	4.1
171	d 12X42CE96		MTS1227//Accipiter/MTS0832	180		32.7		4	5	6	5	7	7		5	4.9		2	5		13.1	4	3.6
172	12X42CE104		MTS1227//Accipiter/MTS0832	179		36.2		5	6	6	7	4	6		4	5.6	tr	10	30		13.5	5	3.1
173	12X42CE113		MTS1227//Accipiter/MTS0832	176		35.0		5	4	5	5	4	3		5	4.7		5	5		13.0	4	3.8
174	12X43E14		Accipiter/MTS0832/MT1105	182		29.9		5	7	5	5	5	5		3	4.9	5	60	100		13.2	4	4.1
175	12X43E57		Accipiter/MTS0832/MT1105	180		32.7		5	6	6	5	6	6		4	5.0	tr	15	70		14.0	4	4.0
176	12X43E104		Accipiter/MTS0832/MT1105	182		31.5		6	5	5	5	5	5		5	5.6	tr	3	10		12.8	4	3.5

Table 148. 2019 Sawfly Observation Nursery (SFO): All Locations

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date	Plant height	Stem solid- ness	Agronomic Scores (0-9)												Stripe Rust%		2018 HR data			
							BZ-SFO			BS-1000r			CD-1000r			FE-CLO			FE-Sr JEB	Avg.	BZ	FE-Sr >5%	Prot- ein	PPO SDS
							PLB	JEB	PLB	JEB	PLB	JEB	PLB	JEB	PLB	JEB	PLB	JEB						
177	12X43E110		Accipiter/MTS0832/MT1105	183	32.7	5-25	19-Jul	1-Aug	25-Jul	29-Jul	24-Jul	30-Jul	2-Aug	5-Aug	5	5.4	22-Jul	24-Jul	2-Aug	13.7	3	3.7		
178	12X44cE7		Judee/MTS0925/MTS1055	172	35.4		6	6	5	6	5	5		5	5	5.4	tr	10	5	13.3	4	4.4		
179	12X44cE15		Judee/MTS0925/MTS1055	178	32.3		5	7	6	6	5	6		5	5	5.7		tr	15	13.4	4	4.3		
180	12X44cE18		Judee/MTS0925/MTS1055	176	35.8		4	5	5	5	5	5		3	3	4.6	2	20	25	13.7	4	4.3		
181	12X44cE24		Judee/MTS0925/MTS1055	175	33.9		6	5	6	6	6	6		3	3	5.4	5	15	50	14.0	4	3.9		
182	12X44cE30		Judee/MTS0925/MTS1055	178	31.9		5	7	6	6	5	5		4	4	5.4		5	10	13.6	4	4.4		
183	w4 d 12X44cE38		Judee/MTS0925/MTS1055	178	34.6		6	6	5	7	5	6		5	5	5.7		5		13.1	4	3.7		
184	12X44cE43		Judee/MTS0925/MTS1055	177	33.9		6	6	7	6	6	6		6	6	6.1				12.9	4	4.1		
185	d 12X44cE50		Judee/MTS0925/MTS1055	177	34.6		5	7	4	5	4	5		5	5	5.0				14.4	4	3.0		
186	12X44cE58		Judee/MTS0925/MTS1055	178	33.9		6	7	5	6	5	5		6	6	5.7				13.0	4	3.5		
187	w4 d 12X44cE65		Judee/MTS0925/MTS1055	178	34.6		5	6	6	5	5	6		5	5	5.4		10	20	13.3	4	4.0		
188	12X44cE76		Judee/MTS0925/MTS1055	178	33.5		5	6	5	6	5	5		4	4	5.1		20	35	14.1	4	3.2		
189	w4 d 12X44cE81		Judee/MTS0925/MTS1055	178	33.9		5	7	6	5	5	6		6	6	5.7		5	5	13.1	4	4.0		
190	d 12X44cE86		Judee/MTS0925/MTS1055	178	33.5		5	8	6	6	5	6		7	7	6.1		5		13.5	4	2.9		
191	12X44cE89		Judee/MTS0925/MTS1055	178	34.3		6	6	5	6	5	6		6	6	5.7				13.7	4	4.0		
192	12X45cE9		(Judee sib, MTS0819)*2/MTS1011	177	32.3		7	7	6	5	6	6		5	5	6.0				13.3	4	3.5		
193	12X45cE10		(Judee sib, MTS0819)*2/MTS1011	180	32.3		6	5	6	6	6	6		5	5	5.7	tr	5	20	13.1	4	4.0		
194	d 12X45cE17		(Judee sib, MTS0819)*2/MTS1011	177	31.9		6	6	5	5	5	6		6	6	5.6	tr			13.6	4	2.5		
195	d 12X45cE19		(Judee sib, MTS0819)*2/MTS1011	177	30.3		7	7	6	7	6	7		7	7	6.7				12.5	4	3.0		
196	12X45cE32		(Judee sib, MTS0819)*2/MTS1011	177	32.3		5	6	5	5	5	6		6	6	5.4				12.8	4	3.7		
197	12X45cE36		(Judee sib, MTS0819)*2/MTS1011	177	32.3		6	7	6	5	6	6		7	7	6.1				13.8	4	3.6		
198	12X45cE38		(Judee sib, MTS0819)*2/MTS1011	178	31.9		7	6	6	6	7	5		6	6	6.1				13.7	4	4.0		
199	12X45cE42		(Judee sib, MTS0819)*2/MTS1011	178	32.7	16.7	7	6	7	7	7	7		6	6	6.7				12.8	4	3.3		
200	12X45cE47		(Judee sib, MTS0819)*2/MTS1011	177	32.7		5	6	6	5	6	6		5	5	5.6	tr	3	10	13.6	4	3.4		
201	Rampart		check	178	40.6		5	4	4	4	4	4		4	4	4.1	tr	1	5					
202	Warhorse		check	178	35.8	19.9	6	6	6	5	6	6		6	6	5.9								
203	12X45cE55		(Judee sib, MTS0819)*2/MTS1011	177	31.1		5	5	6	6	6	6		5	5	5.6				13.5	4	4.0		
204	12X45cE59		(Judee sib, MTS0819)*2/MTS1011	179	34.3		5	6	6	5	5	7		6	6	5.7				13.7	4	3.8		
205	12X45cE60		(Judee sib, MTS0819)*2/MTS1011	177	33.9		7	6	6	6	5	6		6	6	6.0				13.0	2	3.6		
206	12X45cE63		(Judee sib, MTS0819)*2/MTS1011	176	34.6		7	6	5	5	6	6		5	5	5.7	tr	10	20	13.2	4	4.0		
207	12X45cE67		(Judee sib, MTS0819)*2/MTS1011	176	34.6		6	7	5	5	7	7		6	6	6.1				13.2	4	3.4		
208	12X45cE82		(Judee sib, MTS0819)*2/MTS1011	177	35.0		6	7	6	5	7	5		7	7	6.1				13.5	4	3.5		
209	d 12X45cE85		(Judee sib, MTS0819)*2/MTS1011	178	33.1		7	6	5	5	7	7		7	7	6.3				13.4	4	3.1		
210	12X45cE90		(Judee sib, MTS0819)*2/MTS1011	177	31.1		6	7	6	5	5	5		6	6	5.7				13.7	5	3.6		
211	12X45cE92		(Judee sib, MTS0819)*2/MTS1011	177	32.3		6	7	6	5	6	6		6	6	6.0				13.5	4	4.0		
212	12X45cE102		(Judee sib, MTS0819)*2/MTS1011	177	35.0		5	5	7	6	6	6		6	6	5.9	tr	10	20	12.9	4	4.1		
213	12X46cE4		Judee*2/MTS1014	179	33.5		6	6	5	6	7	6		7	7	6.1		2		13.9	4	3.8		
214	12X46cE11		Judee*2/MTS1014	179	32.3		5	6	5	5	6	5		7	7	5.6		tr		13.5	4	3.6		
215	12X46cE17		Judee*2/MTS1014	176	34.6		6	5	6	7	7	6		6	6	6.1				13.4	5	4.6		
216	12X46cE19		Judee*2/MTS1014	176	33.1		6	6	6	5	5	5		6	6	5.6				12.8	5	4.4		
217	12X46cE23		Judee*2/MTS1014	179	34.6		5	6	6	6	5	5		5	5	5.4				13.3	4	3.6		
218	w5 d 12X46cE58		Judee*2/MTS1014	177	33.5		5	7	7	7	7	7		7	7	6.7				14.3	5	5.0		
219	12X46cE62		Judee*2/MTS1014	178	38.2		6	6	5	6	5	5		5	5	5.4				12.9	3	4.0		
220	12X46cE70		Judee*2/MTS1014	178	33.1		6	6	6	6	6	6		6	6	6.0		3	5	13.7	4	3.4		

Table 148. 2019 Sawfly Observation Nursery (SFO): All Locations

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height BZ	Stem solid-ness 5-25	Agronomic Scores (0-9)										Stripe Rust%		2018 HR data	
				BZ	date			BZ-SFO		BS-1000r		CD-1000r		FE-CLO		FE-Sr JEB	Avg.	BZ	FE-Sr >5%	Prot- ein	PPO SDS
								PLB	JEB	PLB	JEB	PLB	JEB	PLB	JEB						
Plot				19-Jul	1-Aug	25-Jul	29-Jul	24-Jul	30-Jul	2-Aug	5-Aug										
221		12X46cE74	Judee*2/MTS1014	177	32.3			5	6	5	5	6		5	5.3		5	13.6	4	3.5	
222	w4	12X46cE75	Judee*2/MTS1014	176	33.1			6	6	6	6	7	7	5	6.1	t	15	14.1	4	4.2	
223		12X46cE88	Judee*2/MTS1014	176	33.9			4	5	6	5	4	6	4	4.9	1	30	13.4	4	3.8	
224		12X46cE91	Judee*2/MTS1014	177	33.5			6	7	5	5	5	5	6	5.6		tr	13.5	4	3.2	
225	d	12X46cE97	Judee*2/MTS1014	177	35.4			6	6	5	6	4	6	6	5.6			13.7	4	3.1	
226	d	12X47cE2	(Judee sib, MTS0819-98)/MTS1017/MT	179	33.5			5	6	6	7	6	7	7	6.3			13.5	5	2.8	
227		12X47cE18	(Judee sib, MTS0819-98)/MTS1017/MT	172	32.7	19.2		7	7	6	5	8	6	6	6.4			13.2	4	4.0	
228	h	12X47cE24	(Judee sib, MTS0819-98)/MTS1017/MT	178	34.6			5	6	7	7	6	5	6	6.0			13.7	5	3.9	
229	h	12X47cE36	(Judee sib, MTS0819-98)/MTS1017/MT	172	31.5	21.1		7	7	6	5	7	7	7	6.6		5	13.4	4	3.5	
230		12X47cE49	(Judee sib, MTS0819-98)/MTS1017/MT	176	28.7			5	6	5	6	5	5	6	5.4	5	40	13.7	4	3.8	
231	d	12X47cE66	(Judee sib, MTS0819-98)/MTS1017/MT	179	34.6			5	6	7	7	7	6	6	6.3	3	tr	13.9	5	3.0	
232		12X47cE69	(Judee sib, MTS0819-98)/MTS1017/MT	178	34.6			4	4	5	6	5	5	5	4.9	50	20	13.4	3	3.8	
233		12X47cE96	(Judee sib, MTS0819-98)/MTS1017/MT	172	28.0			4	3	3	4	5	5	4	4.0	60	10	13.3	4	3.3	
234		12X47cE100	(Judee sib, MTS0819-98)/MTS1017/MT	179	36.6			5	6	5	5	7	6	6	5.7	15		14.1	5	3.7	
235		12X47cE107	(Judee sib, MTS0819-98)/MTS1017/MT	177	35.0			5	6	7	5	5	5	6	5.6			13.5	4	3.9	
236		12X47cE113	(Judee sib, MTS0819-98)/MTS1017/MT	176	29.5			7	5	4	4	7	7	4	5.4		10	13.6	4	3.4	
237		12X47cE119	(Judee sib, MTS0819-98)/MTS1017/MT	172	34.6			6	7	5	5	6	7	5	5.9			14.3	4	3.9	
238		12X50cE10	MTS0832/Spur/Warhorse	179	35.8			5	5	4	6	4	6	5	5.0			12.6	4	4.0	
239		12X50cE12	MTS0832/Spur/Warhorse	172	29.9			5	5	6	5	6	6	5	5.4	tr	10	13.5	4	4.0	
240		12X50cE13	MTS0832/Spur/Warhorse	177	31.9			6	5	6	6	6	6	5	5.7	5	15	12.8	4	4.2	
241		12X50cE18	MTS0832/Spur/Warhorse	178	33.1			5	6	5	6	5	6	5	5.4	tr	20	13.2	4	4.1	
242	h	12X50cE33	MTS0832/Spur/Warhorse	178	31.9			6	6	6	6	5	5	5	5.7	tr	5	14.2	5	4.4	
243		12X50cE34	MTS0832/Spur/Warhorse	177	32.3			5	4	5	5	5	5	4	4.7	10	70	12.7	4	3.8	
244		12X50cE46	MTS0832/Spur/Warhorse	175	32.3			7	6	5	5	5	6	6	5.7		5	13.8	4	4.4	
245	h	12X50cE61	MTS0832/Spur/Warhorse	177	33.1			6	7	6	5	7	7	4	6.0		5	14.2	4	4.5	
246		12X50cE69	MTS0832/Spur/Warhorse	179	34.6			5	6	4	6	4	5	5	5.0		5	13.2	4	4.5	
247		12X50cE75	MTS0832/Spur/Warhorse	178	33.5			4	5	7	5	6	6	3	5.1	tr	25	12.9	4	4.9	
248		12X50cE87	MTS0832/Spur/Warhorse	177	31.9			6	6	5	5	6	6	4	5.4		10	13.4	4	3.8	
249		12X50cE93	MTS0832/Spur/Warhorse	178	35.4			5	5	5	6	5	5	4	5.0	10	40	13.3	4	3.8	
250	h	12X50cE97	MTS0832/Spur/Warhorse	176	32.7			5	6	6	5	6	6	6	5.7			13.7	4	4.6	
251		Rampart	check	177	40.6			5	4	4	4	4	4	4	4.1	tr	3				
252		Warhorse	check	178	34.6			6	6	6	6	6	4	6	5.7						
253		12X50cE109	MTS0832/Spur/Warhorse	176	32.7			5	6	6	5	3	4	5	4.9	3	10	13.7	4	3.6	
254	w2	12X57cE4	Warhorse/MTS1028/MTS1030	177	34.6			6	6	5	5	3	3	6	4.9		5	12.6	2	4.0	
255		12X57cE9	Warhorse/MTS1028/MTS1030	179	36.2			5	6	6	6	3	4	5	5.0			13.8	4	4.0	
256	h	12X57cE18	Warhorse/MTS1028/MTS1030	177	33.5	19.5		7	7	6	6	8	5	6	6.4		5	13.2	2	5.0	
257		12X57cE23	Warhorse/MTS1028/MTS1030	180	34.6			6	6	5	5	4	5	5	5.1	tr	tr	12.6	2	5.1	
258		12X57cE24	Warhorse/MTS1028/MTS1030	179	36.6			7	6	5	5	6	6	5	5.7	1	3	12.4	2	4.6	
259	h	12X57cE26	Warhorse/MTS1028/MTS1030	179	34.3	19.2		7	7	7	6	7	6	6	6.6	tr	2	12.7	2	4.4	
260	d	12X57cE40	Warhorse/MTS1028/MTS1030	180	33.5			5	4	5	5	4	5	5	4.7	10	15	13.5	4	3.1	
261		12X57cE49	Warhorse/MTS1028/MTS1030	182	35.0			6	6	4	5	4	5	5	5.0		tr	12.7	3	3.9	
262	h	12X57cE57	Warhorse/MTS1028/MTS1030	178	33.1	18.8		6	6	6	6	6	7	7	6.3	3		13.0	2	3.4	
263		12X57cE61	Warhorse/MTS1028/MTS1030	179	35.4	19.3		7	7	5	6	7	7	6	6.4			12.4	2	4.8	
264		12X57cE83	Warhorse/MTS1028/MTS1030	179	37.8			6	5	4	5	4	5	5	4.9		5	12.5	1	4.3	

Table 148. 2019 Sawfly Observation Nursery (SFO): All Locations

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height BZ	Stem solid-ness 5-25	Agronomic Scores (0-9)										Stripe Rust%		2018 HR data			
				BZ	date			BZ-SFO		BS-1000r		CD-1000r		FE-CLO		FE-Sr JEB	Avg.	BZ	FE-Sr >5%	Prot- ein	PPO SDS		
								PLB	JEB	PLB	JEB	PLB	JEB	PLB	JEB							22-Jul	24-Jul
265		12X57cE86	Warhorse//MTS1028/MTS1030	176	30.3		5-25	19-Jul	1-Aug	25-Jul	29-Jul	24-Jul	30-Jul	2-Aug	5-Aug			22-Jul	24-Jul	2-Aug	13.9	3	3.9
266		12X57cE98	Warhorse//MTS1028/MTS1030	178	34.6			5	5	6		5	6		5	5.3	5	5	10	20	13.8	4	3.8
267		12X58E1	MTW1251//MTS1029/MTS1011	180	35.4			7	6	6		5	7		6	6.2					13.9	2	3.5
268	w1	12X58E19	MTW1251//MTS1029/MTS1011	178	34.3			5	5	6		4	5		6	5.2		tr			13.9	2	3.5
269		12X58E27	MTW1251//MTS1029/MTS1011	180	34.3			4	4	7		4	4		5	4.7	10	2	10		12.6	1	3.8
270		12X58E31	MTW1251//MTS1029/MTS1011	180	35.0			6	7	5		5	5		5	5.5	tr				13.9	2	3.8
271	w2	12X58E47	MTW1251//MTS1029/MTS1011	180	35.0			7	5	7		5	6		7	6.2	tr				13.0	1	3.8
272	w1	12X58E56	MTW1251//MTS1029/MTS1011	178	31.9			3	6	6		5	5		6	5.2	tr				13.0	2	3.6
273		12X58E72	MTW1251//MTS1029/MTS1011	177	34.3			8	5	6		5	5		5	5.7	15	10	30		12.6	1	4.1
274		12X58E79	MTW1251//MTS1029/MTS1011	180	32.7			6	5	6		5	6		6	5.7	tr	2			13.0	2	4.2
275		12X58E84	MTW1251//MTS1029/MTS1011	177	35.4			6	5	6		6	5		6	5.7	3	5	20		12.6	2	3.6
276		12X67cE1	(Judee sib, MT S0819-98)//03X273cE8/M	178	31.9			6	5	7		6	6		6	6.0	5	tr			12.9	2	4.2
277		12X67cE4	(Judee sib, MT S0819-98)//03X273cE8/M	180	38.2			5	5	6		4	4		5	4.8		tr			13.0	3	3.7
278		12X67cE8	(Judee sib, MT S0819-98)//03X273cE8/M	179	35.0			6	4	7		5	6		5	5.5	10	10			13.7	4	4.4
279		12X67cE12	(Judee sib, MT S0819-98)//03X273cE8/M	180	29.5			6	6	6		5	5		7	5.8	tr	tr			12.7	2	4.0
280		12X67cE21	(Judee sib, MT S0819-98)//03X273cE8/M	179	36.6			4	5	7		4	5		6	5.2	10	3	5		13.4	4	4.0
281		12X67cE29	(Judee sib, MT S0819-98)//03X273cE8/M	178	35.8			6	5	6		4	6		6	5.5	1	3			13.3	4	3.6
282		12X67cE33	(Judee sib, MT S0819-98)//03X273cE8/M	179	37.8			5	4	6		4	5		5	4.8	10	5	5		13.9	5	3.6
283		12X67cE38	(Judee sib, MT S0819-98)//03X273cE8/M	179	37.0			6	4	7		5	5		6	5.5	10	1	5		14.1	5	4.2
284		12X67cE41	(Judee sib, MT S0819-98)//03X273cE8/M	180	37.0			4	6	6		4	6		6	5.3					13.3	4	3.6
285		12X67cE47	(Judee sib, MT S0819-98)//03X273cE8/M	179	35.4			5	4	7		5	5		7	5.5	30	tr			13.5	5	4.2
286		12X67cE57	(Judee sib, MT S0819-98)//03X273cE8/M	177	33.5			6	6	5		5	5		6	5.5					13.1	5	3.3
287		12X67cE81	(Judee sib, MT S0819-98)//03X273cE8/M	179	36.2			5	6	6		4	4		6	5.2	1		5		13.4	4	3.5
288		12X67cE98	(Judee sib, MT S0819-98)//03X273cE8/M	179	35.0			6	4	7		5	5		7	5.7	10	tr			13.8	5	3.9
289		12X68cE2	WB-Quake//03X261cE56/Accipiter	180	39.0			5	5	6		4	5		5	5.0					14.3	4	3.9
290		12X68cE5	WB-Quake//03X261cE56/Accipiter	176	38.2			7	6	6	5	6	6		6	6.0	1				13.3	4	3.9
291		12X68cE12	WB-Quake//03X261cE56/Accipiter	178	38.2			5	5	4	5	4	5		6	4.9	tr	tr			13.2	4	3.6
292		12X68cE21	WB-Quake//03X261cE56/Accipiter	176	38.2			5	5	5		5	5		6	5.1		tr			12.5	5	3.5
293		12X68cE23	WB-Quake//03X261cE56/Accipiter	179	35.4			4	4	5		4	4		5	4.4	3				13.0	4	3.6
294		12X68cE40	WB-Quake//03X261cE56/Accipiter	180	35.8			6	5	4		4	6		7	5.3					12.4	4	3.6
295		12X68cE46	WB-Quake//03X261cE56/Accipiter	179	37.8			5	4	5		6	6		6	5.3	tr				12.9	4	3.7
296	w4	12X68cE62	WB-Quake//03X261cE56/Accipiter	178	35.0			6	6	5	7	5	7		7	6.1					12.8	4	3.2
297		12X68cE71	WB-Quake//03X261cE56/Accipiter	179	34.3			5	5	5		4	5		7	5.1	tr				13.1	4	3.7
298		12X68cE83	WB-Quake//03X261cE56/Accipiter	177	33.1	18.4		7	7	6		6	6		6	6.3		5	5		12.4	4	3.4
299	d	12X68cE102	WB-Quake//03X261cE56/Accipiter	180	32.7			6	5	6		4	5		6	5.4	10	tr			12.9	4	3.8
300	w4	12X69cE6	MTS1227//03X261cE56/MTS1014	172	36.6			5	5	4		5	5		6	5.0	15	tr			12.5	4	3.0
301	Rampart		check	180	35.8			5	6	5	5	5	6		7	5.6	tr				13.0	4	3.3
302	Warhorse		check	177	40.6			5	4	4		4	4		4	4.1	tr		5				
303	d	12X69cE11	MTS1227//03X261cE56/MTS1014	177	34.3			6	6	6		6	6		6	5.9		tr					
304	d	12X69cE25	MTS1227//03X261cE56/MTS1014	179	33.1			7	7	5	6	5	7		4	5.9	tr	20	35		13.7	4	3.1
305		12X69cE32	MTS1227//03X261cE56/MTS1014	178	35.8			5	4	7		5	5		3	5.0	60	80	100		13.1	4	2.9
306		12X69cE40	MTS1227//03X261cE56/MTS1014	176	35.8			6	5	5		5	5		5	5.1	tr	20	40		12.6	4	3.2
307		12X69cE42	MTS1227//03X261cE56/MTS1014	176	35.4			5	4	6		4	5		4	4.9	40	50	70		13.4	4	3.6
308		12X69cE61	MTS1227//03X261cE56/MTS1014	175	35.4			7	5	7		5	6		4	5.6	5	30	50		12.7	4	3.5
			MTS1227//03X261cE56/MTS1014	179	34.3			5	7	4		4	5		6	5.0		5			12.5	4	4.3

Table 148. 2019 Sawfly Observation Nursery (SFO): All Locations

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Stem solid- ness	Plant height BZ	Heading date BZ	Agronomic Scores (0-9)										Stripe Rust%		2018 HR data		
							BZ-SFO		BS-1000r		CD-1000r		FE-CLO		FE-Sr JEB	Avg.	BZ	FE-Sr >5%	Prot- ein	PPO	SDS
							PLB	JEB	PLB	JEB	PLB	JEB	PLB	JEB							
				5-25			19-Jul	1-Aug	25-Jul	29-Jul	24-Jul	30-Jul	2-Aug		22-Jul	24-Jul	2-Aug				
353	12X81cE89		WB-Quake/MTS1055/MTS1211		37.8	176	6	5	4	5	4	5		5				12.8	4	4.0	
354	12X81cE97		WB-Quake/MTS1055/MTS1211		33.1	172	5	5	3	5	6	6		5				13.0	4	4.1	
355	12X81cE98		WB-Quake/MTS1055/MTS1211		35.0	180	5	6	5	5	5	5		5	30	25		12.4	4	3.8	
356	12X85E1		(Judee sib, MTS0819)/MTS0832/HV9W		34.6	179	6	6	4	5	6	6		6				12.9	4	3.6	
357	12X85E5	h	(Judee sib, MTS0819)/MTS0832/HV9W		32.3	178	5	6	6	6	7	6		7				14.8	5	4.1	
358	12X85E16		(Judee sib, MTS0819)/MTS0832/HV9W		31.1	170	7	7	5	5	6	6		6	tr	10		13.7	4	4.6	
359	d 12X85E17		(Judee sib, MTS0819)/MTS0832/HV9W		33.1	171	8	6	5	6	7	7		7		5		12.6	4	3.0	
360	d 12X85E22		(Judee sib, MTS0819)/MTS0832/HV9W		34.6	179	6	6	6	5	4	6		6				13.1	4	3.0	
361	12X85E28		(Judee sib, MTS0819)/MTS0832/HV9W		33.9	179	7	6	7	6	5	7		6				13.3	4	3.7	
362	12X85E56		(Judee sib, MTS0819)/MTS0832/HV9W		33.1	179	6	6	6	6	5	6		6				13.3	4	3.5	
363	d 12X85E57		(Judee sib, MTS0819)/MTS0832/HV9W		36.6	177	5	5	5	5	5	5		6				13.9	4	3.0	
364	12X85E62		(Judee sib, MTS0819)/MTS0832/HV9W		36.6	177	5	5	6	5	6	6		6				13.7	4	4.2	
365	12X85E64		(Judee sib, MTS0819)/MTS0832/HV9W		34.3	179	6	6	5	5	5	6		6				13.1	4	3.4	
366	12X85E66		(Judee sib, MTS0819)/MTS0832/HV9W		34.6	179	6	7	4	5	6	6		6				13.2	5	3.4	
367	12X85E74		(Judee sib, MTS0819)/MTS0832/HV9W		34.6	179	7	6	6	6	6	7		6				13.3	5	3.6	
368	12X85E81		(Judee sib, MTS0819)/MTS0832/HV9W		37.0	175	7	6	6	6	5	5		5				13.3	5	4.0	
369	12X85E87	h	(Judee sib, MTS0819)/MTS0832/HV9W		35.8	172	6	6	7	6	7	6		5	tr			13.2	5	4.6	
370	12X85E88		(Judee sib, MTS0819)/MTS0832/HV9W		36.2	175	7	7	6	7	7	5		5				12.8	4	3.7	
371	12X85E91		(Judee sib, MTS0819)/MTS0832/HV9W		34.6	179	6	6	5	5	6	6		6				13.0	4	3.2	
372	12X142cE3		MTS1227/MTCL1127/MTS1017		35.0	176	6	6	7	6	6	5		5	3			13.1	4	3.3	
373	12X142cE8		MTS1227/MTCL1127/MTS1017		34.6	177	6	5	6	5	5	5		5				13.0	4	3.3	
374	12X142cE16		MTS1227/MTCL1127/MTS1017		34.6	175	7	5	6	6	5	6		6	5			12.9	4	3.2	
375	12X142cE21		MTS1227/MTCL1127/MTS1017		35.8	176	7	6	6	5	5	5		5	3			12.6	4	3.6	
376	12X142cE29		MTS1227/MTCL1127/MTS1017		35.0	176	7	6	7	6	5	5		6	tr			12.8	4	3.2	
377	12X142cE32		MTS1227/MTCL1127/MTS1017		35.4	175	6	5	6	5	5	5		6				12.6	4	3.4	
378	12X142cE37		MTS1227/MTCL1127/MTS1017		35.8	175	7	5	4	5	5	5		6				12.6	4	3.4	
379	12X142cE43		MTS1227/MTCL1127/MTS1017		35.8	175	7	6	7	5	5	6		5	tr			12.8	4	3.4	
380	d 12X142cE69		MTS1227/MTCL1127/MTS1017		33.9	175	6	5	6	6	5	5		6	tr			12.8	4	3.1	
381	12X142cE73		MTS1227/MTCL1127/MTS1017		34.6	175	7	5	6	6	5	5		5	tr	5		12.8	4	3.4	
382	12X142cE83		MTS1227/MTCL1127/MTS1017		35.0	175	7	5	7	5	5	5		5	tr	15		12.7	4	3.3	
383	d 12X142cE86		MTS1227/MTCL1127/MTS1017		34.3	175	7	6	6	5	5	5		6		2		12.8	4	3.1	
384	d 12X161E4		Overland/MTS1211		35.0	172	6	7	4	5	6	5		7	1	3		13.2	4	2.6	
385	12X161E9		Overland/MTS1211		33.1	171	7	6	5	5	5	5		6	tr	tr		12.5	4	3.2	
386	12X161E10		Overland/MTS1211		32.7	171	6	5	6	5	6	6		5	3	10		13.2	4	4.3	
387	12X161E12		Overland/MTS1211		33.9	171	7	6	6	6	6	5		6	1	5		13.0	4	3.2	
388	d 12X161E17		Overland/MTS1211		36.2	174	5	6	5	5	4	5		5	tr	15		13.5	4	2.6	
389	d 12X161E27		Overland/MTS1211		37.0	174	4	4	4	5	4	5		5	5	10		14.4	4	2.6	
390	12X161E37		Overland/MTS1211		33.1	171	7	6	4	5	6	6		6	tr	5		12.8	4	3.4	
391	d 12X161E40		Overland/MTS1211		32.3	171	8	7	6	6	7	7		6		15		13.5	4	3.0	
392	d 12X161E59		Overland/MTS1211		32.3	172	7	6	5	5	5	5		6				12.4	4	3.1	
393	12X161E68		Overland/MTS1211		32.7	172	6	6	5	6	5	6		5		10		12.7	4	3.6	
394	12X161E87		Overland/MTS1211		32.7	171	6	6	4	6	6	6		5		5		13.0	4	4.0	
395	d 12X161E90		Overland/MTS1211		35.8	175	5	5	5	5	5	7		4	5	5		13.7	4	3.0	
396	12X161E99		Overland/MTS1211		33.1	170	7	7	7	5	6	6		6		3		13.5	4	3.2	

Table 148. 2019 Sawfly Observation Nursery (SFO): All Locations

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date	Plant height	Stem solid- ness	Agronomic Scores (0-9)										Stripe Rust%		2018 HR data			
							BZ-SFO		BS-1000r		CD-1000r		FE-CLO		FE-Sr JEB	Avg.	BZ	FE-Sr >5%	Prot- ein	PPO SDS		
							PLB	JEB	PLB	JEB	PLB	JEB	PLB	JEB								
397	12X162E1	MT1078/MTS1226		175	33.5	5-25	19-Jul	1-Aug	25-Jul	29-Jul	24-Jul	30-Jul	2-Aug	5-Aug		6.0	22-Jul	24-Jul	2-Aug	12.7	3	3.6
398	12X162E9	MT1078/MTS1226		176	33.9	16.8	7	6	6	6	5	6		6		6.3				12.4	3	3.7
399	12X162E17	MT1078/MTS1226		177	32.3		4	6	6	6	6	6		7		5.9				12.9	4	3.8
400	12X162E55	MT1078/MTS1226		176	33.1		4	5	6	5	5	5		5		5.0				12.5	4	4.4
401	Rampart	check		177	39.8		5	4	4	4	4	4		4		4.1	tr	tr	10			
402	Warhorse	check		178	34.3	20.5	6	6	6	5	6	6		6		5.9						
403	12X162E63	MT1078/MTS1226		177	31.9		5	6	7	5	4	6		6		5.6	5		5	13.2	5	4.0
404	12X162E66	MT1078/MTS1226		176	32.3		7	5	5	5	5	5		6		5.4				13.0	4	4.0
405	12X162E72	MT1078/MTS1226		179	30.3		5	6	5	5	4	5		6		5.1	tr			13.3	4	3.8
406	12X162E81	MT1078/MTS1226		176	37.0		5	7	5	5	5	5		5		5.3				13.0	5	4.2
407	12X162E94	MT1078/MTS1226		177	33.1	18	7	6	7	6	6	6		6		6.3				12.4	4	4.1
408	12X162E95	MT1078/MTS1226		178	33.1		6	6	6	5	5	5		6		5.6				12.9	4	4.0
409	12X162E97	MT1078/MTS1226		178	32.3		6	6	7	5	6	6		7		6.1				12.6	4	3.6
410	12X165cE8	Yellowstone/Spur		179	37.0		4	5	4	5	4	5		6		4.7	tr			12.6	5	3.9
411	12X165cE30	Yellowstone/Spur		178	35.4		7	7	7	6	6	7		7		6.7	5	2	10	12.7	4	3.6
412	d 12X165cE69	Yellowstone/Spur		178	33.5		5	5	6	6	6	5		5		5.4	25	5	40	14.2	5	2.8
413	12X165cE80	Yellowstone/Spur		179	31.9		3	4	4	4	4	6		5		4.3	2	5	30	12.4	4	3.8
414	12X165cE99	Yellowstone/Spur		179	34.6		7	6	6	5	5	7		6		6.0	3	10	25	13.1	5	3.2
415	12X166E8	Judee/Spur		179	33.5		5	6	7	6	4	6		6		5.7				13.0	2	4.6
416	12X166E12	Judee/Spur		180	35.0		6	5	5	6	4	5		6		5.3	tr	3	5	12.6	5	4.6
417	12X166E19	Judee/Spur		179	35.0		5	6	6	6	5	6		5		5.6		10		12.4	4	4.4
418	12X166E21	Judee/Spur		176	33.1		7	7	7	5	5	6		6		6.1		tr		12.4	3	3.8
419	12X166E27	Judee/Spur		180	34.6		6	5	6	7	4	5		6		5.6				12.9	4	4.1
420	12X166E30	Judee/Spur		178	32.3		6	7	6	6	5	5		7		6.0				13.0	2	3.2
421	12X166E32	Judee/Spur		179	33.9		6	6	6	7	5	5		6		5.9				13.2	1	4.7
422	12X166E39	Judee/Spur		179	33.9		6	7	6	6	4	6		6		5.9				12.4	4	4.0
423	12X166E48	Judee/Spur		180	34.3		6	6	6	6	5	6		7		6.0		5		12.6	4	4.3
424	12X166E72	Judee/Spur		179	31.1		5	6	5	5	4	6		6		5.3		5		13.0	4	3.7
425	12X166E76	Judee/Spur		180	34.3		7	7	6	5	4	6		6		5.9	tr		5	12.6	4	3.8
426	12X166E78	Judee/Spur		179	35.0		6	7	7	6	4	6		6		6.0	tr	3		12.5	4	4.2
427	12X166E84	Judee/Spur		180	32.7		4	6	6	5	4	5		5		5.0		2	5	13.2	5	4.5
428	12X166E91	Judee/Spur		177	34.3		7	6	7	6	4	6		6		6.0		5		12.7	4	4.2
429	12X166E102	Judee/Spur		178	34.3		7	8	6	5	4	5		6		5.9				12.5	4	4.4
430	12X167cE11	(Judee sib, MTS0819)/MTS1226		176	33.1	17.6	6	6	6	6	7	7		6		6.3				13.0	4	3.4
431	12X167cE13	(Judee sib, MTS0819)/MTS1226		176	32.3		5	5	5	5	6	6		6		5.4				13.2	5	3.6
432	12X167cE26	(Judee sib, MTS0819)/MTS1226		175	37.8		5	6	5	5	5	5		6		5.3		5		13.5	4	3.4
433	d 12X167cE29	(Judee sib, MTS0819)/MTS1226		175	36.2		8	7	5	6	6	6		7		6.4				14.0	5	3.0
434	12X167cE31	(Judee sib, MTS0819)/MTS1226		175	35.4		5	6	6	5	5	6		6		5.6				13.1	4	3.4
435	12X167cE41	(Judee sib, MTS0819)/MTS1226		175	35.0		5	6	7	6	4	5		6		5.6		2	5	12.4	4	3.4
436	12X167cE47	(Judee sib, MTS0819)/MTS1226		175	31.1		5	6	6	5	7	7		5		5.9		2	5	12.9	4	3.2
437	12X167cE55	(Judee sib, MTS0819)/MTS1226		175	35.4		5	7	6	6	5	6		6		5.9			-		4	3.5
438	12X167cE62	(Judee sib, MTS0819)/MTS1226		179	34.6		6	5	6	6	4	5		5		5.3				13.5	5	3.7
439	12X167cE66	(Judee sib, MTS0819)/MTS1226		178	33.5		6	7	6	5	5	7		6		6.0				12.0	2	3.4
440	12X167cE75	(Judee sib, MTS0819)/MTS1226		176	34.3		5	6	7	6	4	5		6		5.6				12.5	4	3.6

Table 148. 2019 Sawfly Observation Nursery (SFO): All Locations

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date	Plant height	Stem solid- ness	Agronomic Scores (0-9)										Stripe Rust%		2018 HR data	
							BZ-SFO		BS-1000r		CD-1000r		FE-CLO		FE-Sr JEB	Avg.	BZ	FE-Sr >5%	Prot- ein	PPO SDS
							PLB	JEB	PLB	JEB	PLB	JEB	PLB	JEB						
				19-Jul	1-Aug	25-Jul	29-Jul	24-Jul	30-Jul	2-Aug	5-Aug			22-Jul	24-Jul	2-Aug				
441	12X167cE80	(Judee sib, MTS0819)/MTS1226		176	35.4	20		7	7	5	6				tr		13.3	4	3.2	
442	12X167cE81	(Judee sib, MTS0819)/MTS1226		177	36.6			5	5	5	6						12.7	4	3.4	
443	d 12X167cE87	(Judee sib, MTS0819)/MTS1226		175	32.7			5	4	6	7	5		5		5	12.4	4	2.7	
444	12X167cE98	(Judee sib, MT S0819)/MTS1226		175	34.3			7	6	6	5	5				5	12.7	4	3.4	
445	12X188E2	Yellowstone/04X38cE70		180	33.1			5	5	6	4	5				5	12.8	4	3.6	
446	12X188E13	Yellowstone/04X38cE70		177	37.0			6	6	5	6	5					12.5	1	3.8	
447	12X188E17	Yellowstone/04X38cE70		177	33.9			5	5	6	5	7			5	20	13.0	1	4.0	
448	12X188E27	Yellowstone/04X38cE70		175	33.5			5	5	6	6	6		1	10	30	13.9	4	3.2	
449	12X188E35	Yellowstone/04X38cE70		176	37.0			6	6	6	5	6			tr	5	12.9	1	4.0	
450	12X188E46	Yellowstone/04X38cE70		176	36.2			7	7	5	6	7			5		12.9	1	3.8	
451	Rampart	check		177	39.8			5	4	4	4	4		tr						
452	Warhorse	check		177	35.4			6	6	5	6	6								
453	12X188E62	Yellowstone/04X38cE70		178	35.4			5	6	6	4	5			5	10	12.8	1	3.3	
454	12X188E92	Yellowstone/04X38cE70		176	36.6			5	4	7	5	5		80	75	85	12.8	4	3.6	
455	12X188E93	Yellowstone/04X38cE70		176	35.4			7	6	6	5	5			5		12.8	1	4.2	
456	15X11-DH5	Warhorse*2/MT1117		177	35.4			6	6	7	6	6					13.4	5	4.0	
457	15X11-DH6	Warhorse*2/MT1117		176	36.2			7	7	6	7	7					13.7	5	4.6	
458	15X11-DH10	Warhorse*2/MT1117		176	35.0			6	6	5	5	7	6				14.0	5	4.0	
459	15X12-DH5	MTS1597//AAC Gateway/MTS1415		179	33.1			5	5	6	6	5	5		10	30	12.8	5	3.2	
460	15X12-DH17	MTS1597//AAC Gateway/MTS1415		176	37.4			6	6	6	5	5			tr	15	12.5	5	3.7	
461	d 13X194-DH64	Warhorse/MT1078		172	30.3			7	6	4	5	6	5		tr	10	13.9	4	2.8	
462	w4 d 13X194-DH66	Warhorse/MT1078		179	22.4			4	4	3	4	3	4			5	13.7	4	3.2	
463	13X194-DH67	Warhorse/MT1078		176	32.3			6	6	7	6	7	6		tr	20	14.7	4	3.5	
464	w4 d 13X194-DH69	Warhorse/MT1078		176	33.5			7	7	3	4	6	5				14.5	4	3.9	
465	h 13X194-DH72	Warhorse/MT1078		177	35.4	19		7	7	7	6	7	6				14.2	4	3.6	
466	h 13X194-DH76	Warhorse/MT1078		172	31.1			6	6	6	5	7	6				14.0	4	3.6	
467	13X194-DH77	Warhorse/MT1078		179	24.4			4	4	5	4	4	4		tr	30	12.7	4	3.3	
468	h 13X194-DH81	Warhorse/MT1078		176	34.6			7	7	5	6	5	7				14.3	4	4.2	
469	h 13X194-DH87	Warhorse/MT1078		175	34.6	21.8		7	6	6	7	7	6				13.3	4	3.5	
470	d 13X194-DH90	Warhorse/MT1078		177	35.4			6	6	5	5	6	6		tr	10	13.8	4	3.0	
471	h 13X194-DH92	Warhorse/MT1078		176	33.9	20.8		7	7	7	6	6	6				-	4	4.0	
472	16X7-DH80	MT1332//Loma/MTS1574		179	32.7			7	6	5	5	5	5		5	5	13.6	5	3.7	
473	16X7-DH86	MT1332//Loma/MTS1574		179	32.3			5	5	4	4	5	6		5	10	13.7	4	3.4	
474	d 16X7-DH90	MT1332//Loma/MTS1574		178	35.8			6	5	4	5	4	5		3		12.4	4	3.1	
475	16X7-DH91	MT1332//Loma/MTS1574		176	33.5	14.2		6	7	6	6	7	7		tr		14.4	2	3.5	
476	16X7-DH100	MT1332//Loma/MTS1574		177	37.8			6	6	5	5	4	5		5	10	12.1	4	4.0	
477	16X7-DH101	MT1332//Loma/MTS1574		179	35.8			5	5	6	6	4	5				12.7	4	3.8	
478	16X7-DH103	MT1332//Loma/MTS1574		177	34.3			7	7	6	5	5	4		3	10	12.7	4	4.0	
479	d 16X7-DH110	MT1332//Loma/MTS1574		177	36.2			6	7	5	6	5	5		5	5	13.5	4	3.0	
480	16X7-DH116	MT1332//Loma/MTS1574		178	35.0			5	6	6	5	5	5		10	15	12.9	3	3.4	
481	16X7-DH122	MT1332//Loma/MTS1574		178	37.0			6	5	5	6	5	5		20	10	12.4	2	4.2	
482	16X7-DH134	MT1332//Loma/MTS1574		178	36.6			7	6	6	6	6	5		tr		12.4	4	3.6	
483	16X7-DH141	MT1332//Loma/MTS1574		178	37.0			5	5	6	7	7	6				12.3	4	3.8	
484	16X12-DH75	MTS1584/07x76cF90		178	32.3			7	6	6	5	5	6				13.0	1	3.8	

Table 148. 2019 Sawfly Observation Nursery (SFO): All Locations

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date	Plant height	Stem solid- ness	Agronomic Scores (0-9)										Stripe Rust%		2018 HR data	
							BZ-SFO		BS-1000r		CD-1000r		FE-CLO		FE-Sr JEB	Avg.	BZ	FE-Sr >5%	Prot- ein	PPO SDS
							PLB	JEB	PLB	JEB	PLB	JEB	PLB	JEB						
485	16X12-DH84		MTS1584/07x76cF90	178	34.3	5-25	19-Jul	1-Aug	25-Jul	29-Jul	24-Jul	30-Jul	2-Aug	5-Aug	22-Jul	24-Jul	2-Aug	13.7	3	3.7
486	16X12-DH85		MTS1584/07x76cF90	177	23.6		3	4	3	4	3	4		4	10	5	5	12.9	1	3.8
487	16X12-DH87		MTS1584/07x76cF90	179	34.3		7	7	5	6	5	6		6				13.6	3	3.6
488	16X12-DH88		MTS1584/07x76cF90	178	25.6		3	4	4	5	6	5		4		5	5	13.0	1	3.6
489	16X12-DH90	h	MTS1584/07x76cF90	177	31.9	18.6	6	7	7	6	6	6		6				13.6	3	4.4
490	d 16X12-DH92		MTS1584/07x76cF90	176	31.1		5	7	6	5	5	5		6		5	5	13.4	3	3.0
491	16X12-DH96		MTS1584/07x76cF90	180	31.9		5	6	4	5	4	5		6				12.8	4	3.7
492	16X12-DH97		MTS1584/07x76cF90	176	35.0	16.4	7	8	7	6	5	6		7				13.5	1	4.2
493	16X12-DH100		MTS1584/07x76cF90	175	32.3		6	5	6	6	5	5		5	tr	15	40	12.9	3	3.6
494	15X180B8		Warhorse*2/Loma	176	33.1		6	6	6	5	6	6		6				11.8	4	3.8
495	15X180B10		Warhorse*2/Loma	179	32.3		5	6	5	5	5	5		5				11.9	4	4.4
496	15X180B38	h	Warhorse*2/Loma	177	31.5		6	7	6	6	5	6		7				12.0	4	2.8
497	15X180B39		Warhorse*2/Loma	177	34.6		7	7	5	5	6	6		6				12.2	5	3.6
498	15X180B50		Warhorse*2/Loma	178	35.0		6	6	5	5	5	5		5				11.7	5	3.9
499	15X180B60	h	Warhorse*2/Loma	178	33.9	22.8	5	6	7	6	7	7		6				12.2	4	3.5
500	15X180B66		Warhorse*2/Loma	178	36.6		6	5	6	5	4	5		4				11.8	5	3.8
501	Rampart		check	177	39.8		5	4	4	4	4	4		4	5	5				
502	Warhorse		check	177	35.8		6	6	6	7	6	7		6						
503	15X180B71	h	Warhorse*2/Loma	176	35.4	20.5	7	6	7	6	6	6		6				12.8	4	3.6
504	15X180B73		Warhorse*2/Loma	177	36.2		7	6	7	7	6	5		6				12.1	5	3.6
505	15X180B81		Warhorse*2/Loma	176	37.0		5	5	6	6	6	7		6				12.3	4	3.5
506	15X184cB4		Warhorse/Loma//MTS1594	179	34.3		5	6	5	5	5	6		6				11.4	4	3.1
507	15X184cB5	h	Warhorse/Loma//MTS1594	177	33.5	19	7	6	6	6	6	7		6				12.3	5	3.6
508	15X184cB7		Warhorse/Loma//MTS1594	175	33.9	16.7	7	6	7	6	7	6		6				12.0	5	4.6
509	15X184cB20		Warhorse/Loma//MTS1594	172	36.2		6	7	4	4	7	6		7				11.4	5	4.0
510	15X184cB26		Warhorse/Loma//MTS1594	177	35.4		5	5	5	5	5	5		6	tr			12.3	3	4.0
511	d 15X184cB63		Warhorse/Loma//MTS1594	179	33.9		5	5	5	5	5	6		6	tr	2		12.7	4	2.4
512	d 15X184cB66		Warhorse/Loma//MTS1594	180	33.9		5	5	5	5	6	5		7	tr			11.8	4	2.4
513	15X184cB68		Warhorse/Loma//MTS1594	177	33.1	17	7	6	8	6	6	5		6				10.3	5	3.2
514	15X184cB71		Warhorse/Loma//MTS1594	176	32.3		6	6	7	6	6	6		6				10.0	4	3.3
515	15X184cB81		Warhorse/Loma//MTS1594	177	35.4		6	6	5	5	5	6		6		2		11.6	3	3.9
516	15X184cB85		Warhorse/Loma//MTS1594	176	35.8		6	6	6	6	5	5		6				11.3	4	4.1
517	15X184cB94		Warhorse/Loma//MTS1594	177	34.3		6	6	6	5	5	6		6				12.1	5	3.2
518	15X187cB1		Loma*2/MTS1404	179	32.7		6	5	6	5	7	5		6				12.3	3	4.1
519	15X187cB12		Loma*2/MTS1404	176	31.1		7	6	6	5	6	6		6		5		10.7	3	3.2
520	15X187cB14		Loma*2/MTS1404	180	32.3		6	6	7	5	6	6		6				11.6	3	4.2
521	15X187cB17		Loma*2/MTS1404	176	31.5		7	7	4	4	6	5		6				11.0	5	3.5
522	15X187cB21		Loma*2/MTS1404	179	37.8		6	6	4	5	6	7		5				11.3	3	4.0
523	15X187cB23		Loma*2/MTS1404	177	31.9		6	6	7	6	5	5		6		10		12.0	3	3.4
524	15X187cB24	h	Loma*2/MTS1404	179	31.9	23.9	7	7	6	6	6	6		6		5		11.7	5	4.0
525	15X187cB26		Loma*2/MTS1404	180	33.5		7	6	6	5	6	6		5				10.4	3	3.8
526	15X187cB27		Loma*2/MTS1404	181	32.3	17.8	6	6	6	6	7	7		6				11.6	3	3.4
527	15X187cB30		Loma*2/MTS1404	181	34.3		7	6	7	6	6	5		6				10.2	2	3.4
528	15X187cB34		Loma*2/MTS1404	181	33.9	20.5	6	6	7	6	7	6		7				10.2	2	3.4

Table 148. 2019 Sawfly Observation Nursery (SFO): All Locations

Row/ Plot	wPPO ID	Pedigree	Heading date	Plant height	Stem solid- ness	Agronomic Scores (0-9)										Stripe Rust%		2018 HR data			
						BZ-SFO		BS-1000r		CD-1000r		FE-CLO		FE-Sr JEB	Avg.	BZ	FE-Sr >5%	Prot- ein	PPO SDS		
						PLB	JEB	PLB	JEB	PLB	JEB	PLB	JEB							PLB	JEB
529	15X187cB38	Loma*2/MTS1404	182	34.3	5-25	19-Jul	1-Aug	25-Jul	29-Jul	24-Jul	30-Jul	2-Aug	5-Aug			22-Jul	24-Jul	2-Aug	10.5	2	3.7
530	15X187cB39	Loma*2/MTS1404	180	35.4		6	5	6	6	6	6		6	6.0					10.6	3	3.6
531	15X187cB45	Loma*2/MTS1404	180	35.8		6	5	7	6	6	5		6	5.9					10.8	2	3.1
532	15X187cB63	Loma*2/MTS1404	182	34.6		7	5	5	5	5	5		6	5.4					10.2	2	3.7
533	15X187cB70	Loma*2/MTS1404	181	34.3		7	6	6	6	5	5		6	5.9			tr		11.5	1	4.3
534	11X1cE4-3	(Judee sib, MTS0819)/08X350-A6/Warff	181	35.8		6	6	6	6	5	6		7	6.0					10.5	1	3.9
535	11X1cE17-4	(Judee sib, MTS0819)/08X350-A6/Warff	182	32.7		7	7	6	5	5	5		7	6.0					10.7	2	4.0
536	11X1cE20-4	(Judee sib, MTS0819)/08X350-A6/Warff	180	32.3		5	6	4	5	4	5		6	5.0		tr	tr		10.8	2	3.2
537	11X1cE31-3	(Judee sib, MTS0819)/08X350-A6/Warff	180	31.9		7	7	5	5	5	6		7	6.0					12.9	2	4.6
538	11X1cE40-3	(Judee sib, MTS0819)/08X350-A6/Warff	182	33.9		5	7	4	4	5	5		6	5.1					12.6	2	4.4
539	11X1cE74-4	(Judee sib, MTS0819)/08X350-A6/Warff	180	37.0		6	5	5	5	5	6		7	5.6					11.4	2	4.0
540	11X1cE82-3	(Judee sib, MTS0819)/08X350-A6/Warff	179	36.2		6	6	5	5	4	5		6	5.3					11.6	2	4.0
541	11X1cE117-4	(Judee sib, MTS0819)/08X350-A6/Warff	180	35.8		6	5	7	6	5	5		6	5.7					10.5	1	4.2
542	11X6cE27-4	MTS1054/Warhorse/MTS1008	179	36.2		5	6	6	5	5	6		7	5.7					12.5	1	3.6
543	11X6cE31-2	MTS1054/Warhorse/MTS1008	180	36.6		5	5	5	5	5	5		5	5.0					10.7	3	3.0
544	11X15cE32-3	MT10121/MTS0827/MTS0832	177	35.8		5	6	6	5	5	5		6	5.4					13.0	2	3.3
545	11X17cE6-1	MT10105/Warhorse/MTS1011	176	32.7		7	7	4	4	6	7		7	6.0					13.8	5	4.4
546	11X17cE8-4	MT10105/Warhorse/MTS1011	177	33.5		6	6	4	5	7	6		6	5.7					13.6	4	4.2
547	11X17cE15-4	MT10105/Warhorse/MTS1011	177	33.9	15.3	7	6	6	6	7	7		7	6.6					14.4	4	3.8
548	11X17cE18-2	MT10105/Warhorse/MTS1011	178	33.9		6	7	4	5	5	6		6	5.6					12.6	4	3.5
549	11X17cE20-3	MT10105/Warhorse/MTS1011	178	32.3	12.9	7	7	6	6	6	6		6	6.3					14.3	4	3.4
550	11X17cE28-2	MT10105/Warhorse/MTS1011	178	33.9		6	6	4	5	6	7		6	5.7					12.8	4	3.8
551	Rampart	check	177	40.6		5	4	4	4	4	4		4	4.1		tr	5				
552	Warhorse	check	178	35.4		6	6	6	5	6	5		6	5.7							
553	11X17cE41-3	MT10105/Warhorse/MTS1011	175	33.9		6	7	5	5	6	6		7	6.0					13.3	4	4.4
554	11X17cE47-1	MT10105/Warhorse/MTS1011	177	32.3		5	6	4	5	5	5		6	5.1					12.9	4	3.4
555	11X17cE60-2	MT10105/Warhorse/MTS1011	177	32.3		6	6	5	6	7	7		6	6.1			tr		12.7	4	3.6
556	11X17cE62-4	MT10105/Warhorse/MTS1011	177	33.1	16.6	7	7	7	6	7	6		7	6.7					13.3	3	3.7
557	d 11X17cE77-2	MT10105/Warhorse/MTS1011	176	31.9		4	5	7	6	8	7		5	6.0		50	20		13.4	3	3.0
558	11X17cE83-2	MT10105/Warhorse/MTS1011	177	31.5	19	7	6	7	6	6	6		6	6.3					13.5	3	4.0
559	11X17cE84-2	MT10105/Warhorse/MTS1011	178	33.5		6	6	6	5	6	6		6	5.9					12.5	4	3.6
560	11X17cE97-4	MT10105/Warhorse/MTS1011	177	33.1	18	7	6	6	5	7	6		7	6.3					13.0	4	3.6
561	11X17cE100-1	MT10105/Warhorse/MTS1011	177	33.5	19.6	7	7	7	7	7	6		6	6.7					13.8	4	3.8
562	11X17cE105-2	MT10105/Warhorse/MTS1011	177	31.1		7	6	6	5	6	6		7	6.1					13.3	4	4.0
563	11X17cE137-3	MT10105/Warhorse/MTS1011	178	33.5		6	6	5	5	7	7		7	6.1					13.1	4	4.5
564	11X17cE138-4	MT10105/Warhorse/MTS1011	178	33.1	19	7	7	7	7	6	6		7	6.7					12.9	4	4.0
565	11X17cE147-1	MT10105/Warhorse/MTS1011	178	33.1		6	6	6	6	5	5		6	5.7					12.8	4	3.8
566	11X17cE150-1	MT10105/Warhorse/MTS1011	178	33.5	21.4	7	7	7	6	7	6		7	6.7					15.1	4	3.6
567	11X23cE87-2	Judee/3/Genou// (469-15, Paul/6*Chotea	176	36.2		6	7	6	5	5	5		6	5.7					12.4	4	4.2
568	11X29cE72-2	Judee/5/(Jag/3/Yis/MT9882/MTS0222, 0	177	33.1		5	6	5	5	5	6		6	5.4					12.8	4	3.5
569	11X37cE2-4	(Judee sib, MTS0819)/TC1981055/Geno	180	31.1		6	6	4	5	5	6		6	5.4		tr			12.7	5	3.2
570	d 11X37cE8-1	(Judee sib, MTS0819)/TC1981055/Geno	176	32.3		7	7	6	5	6	7		6	6.3					12.9	5	2.4
571	11X37cE37-4	(Judee sib, MTS0819)/TC1981055/Geno	171	30.3		5	5	4	5	6	6		6	5.3					14.5	4	4.3
572	11X49cE12-4	Judee//16FAWWON-Irr-87/(MT0977, No	176	34.3		6	6	4	5	4	5		5	5.0					15.5	4	3.4

Table 148. 2019 Sawfly Observation Nursery (SFO): All Locations

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date	Plant height	Stem solid- ness	Agronomic Scores (0-9)										Stripe Rust%		2018 HR data				
							BZ-SFO		BS-1000r		CD-1000r		FE-CLO		FE-Sr JEB	Avg.	BZ	FE-Sr >5%	22-Jul	24-Jul	2-Aug	Prot- ein	PPO SDS
							PLB	JEB	PLB	JEB	PLB	JEB	PLB	JEB									
573		11X210cE27-3	Judee/MTS1014	178	33.1	5-25	19-Jul	1-Aug	25-Jul	29-Jul	24-Jul	30-Jul	2-Aug	5-Aug							12.4	4	3.9
574		11X210cE64-4	Judee/MTS1014	177	33.1		6	5	7	6	5	5		6	5.7	10					12.9	5	3.8
575		11X210cE83-3	Judee/MTS1014	177	34.6		6	7	5	5	5	6		7	5.9	tr					12.5	4	4.0
576		11X210cE111-3	Judee/MTS1014	176	33.1		6	7	5	5	5	5		6	5.6						12.9	4	3.9
577		11X51cE7-3	Judee//MTS1023/16FAWWON-Irr-87	177	35.4		6	6	7	6	6	6		6	6.1						12.6	4	3.8
578		11X51cE10-2	Judee//MTS1023/16FAWWON-Irr-87	176	30.7		5	5	7	6	4	3		6	5.1						12.5	4	3.8
579		11X51cE38-3	Judee//MTS1023/16FAWWON-Irr-87	175	30.3		5	6	6	6	5	5		7	5.7	tr					12.7	4	3.9
580		11X51cE40-2	Judee//MTS1023/16FAWWON-Irr-87	176	33.5		7	7	5	5	5	5		6	5.7						13.4	4	3.8
581		11X51cE61-4	Judee//MTS1023/16FAWWON-Irr-87	176	36.6		6	6	6	6	5	6		5	5.7						12.8	4	4.3
582		d 11X51cE74-4	Judee//MTS1023/16FAWWON-Irr-87	176	31.5		5	5	5	5	4	4		6	4.9						12.6	4	3.0
583		11X51cE83-3	Judee//MTS1023/16FAWWON-Irr-87	175	32.7		5	6	6	5	5	4		6	5.3	tr					13.0	5	4.4
584	h	11X53cE44-4	(Judee sib, MTS0819)/MV17-04/Judee	178	31.9	21.5	7	6	6	6	7	6		7	6.4	tr					12.5	5	4.3
585		11X53cE82-4	(Judee sib, MTS0819)/MV17-04/Judee	177	33.5		6	7	6	6	5	6		6	6.0						12.7	4	3.4
586		d 11X205cE21-4	MT1143/Bearpaw	178	33.9		6	6	7	6	6	7		6	6.3	tr					12.5	5	2.1
587	h	11X206cE1-1	Decade/(MTS0819, Judee sib)	182	33.1		7	7	5	5	5	6		7	6.0						13.8	2	4.3
588	h	11X206cE5-3	Decade/(MTS0819, Judee sib)	178	32.3	21.7	8	6	8	6	7	7		6	6.9	tr					12.9	5	4.6
589		11X206cE15-1	Decade/(MTS0819, Judee sib)	180	33.5		6	7	7	6	5	6		6	6.1						12.8	2	3.8
590		11X206cE21-1	Decade/(MTS0819, Judee sib)	179	33.5		6	6	7	7	5	6		6	6.1	1					12.7	5	4.8
591	h	11X206cE24-3	Decade/(MTS0819, Judee sib)	178	34.6	20.3	8	7	7	7	7	6		6	6.9	tr					13.7	5	4.0
592	h	11X206cE35-1	Decade/(MTS0819, Judee sib)	178	33.1	19.1	7	7	6	6	7	7		7	6.7	2					14.1	5	4.0
593		11X206cE41-2	Decade/(MTS0819, Judee sib)	180	30.7		5	6	5	5	5	6		6	5.4						13.5	2	3.6
594	h	11X206cE88-1	Decade/(MTS0819, Judee sib)	177	34.3	18.3	7	7	6	6	7	7		6	6.6	3					13.2	5	4.2
595		11X206cE97-2	Decade/(MTS0819, Judee sib)	177	33.5		7	6	7	5	5	5		5	5.7						13.3	3	3.8
596	h	11X206cE107-2	Decade/(MTS0819, Judee sib)	180	33.9		6	6	5	5	6	6		6	5.7						13.4	5	4.8
597		11X206cE118-3	Decade/(MTS0819, Judee sib)	178	33.5		7	6	6	6	5	5		6	5.9						13.5	3	4.0
598	h	11X216cE40-3	MTS0832/Spur	179	35.8	21.4	7	5	6	7	7	6		7	6.4						12.8	5	4.8
599	h	11X216cE90-2	MTS0832/Spur	178	35.8	20.2	6	6	7	7	7	7		7	6.7						12.9	5	4.8
600		11X1cE118-3	(Judee sib, MTS0819)/08X350-A6/Warr	179	35.4		6	6	6	5	4	5		6	5.4						12.6	2	4.6
601		Rampart	check	177	40.6		5	4	6	4	4	4		4	4.4	tr							
602	h	Warhorse	check	178	35.0	23.2	6	6	4	6	6	6		6	5.7								
603		11X1cE129-1	(Judee sib, MTS0819)/08X350-A6/Warr	179	33.9		6	5	7	5	6	6		6	5.9						12.7	2	4.8
604	h	11X1cE134-4	(Judee sib, MTS0819)/08X350-A6/Warr	180	32.7	21	7	7	6	6	5	6		7	6.3						13.7	2	3.8
605		11X1cE152-4	(Judee sib, MTS0819)/08X350-A6/Warr	180	32.3		7	7	5	5	6	6		6	6.0						13.1	2	4.3
606		11X1cE156-3	(Judee sib, MTS0819)/08X350-A6/Warr	181	30.3		6	6	6	6	6	6		6	6.0						13.3	2	3.3
607		11X1cE166-1	(Judee sib, MTS0819)/08X350-A6/Warr	180	33.1		6	6	6	5	6	7		7	6.1						12.8	2	4.1
608		11X1cE170-3	(Judee sib, MTS0819)/08X350-A6/Warr	179	32.3		6	7	4	4	6	6		6	5.6						12.8	2	4.1
609		11X1cE195-4	(Judee sib, MTS0819)/08X350-A6/Warr	179	34.6		6	6	6	5	6	7		6	6.0						12.5	2	3.5
610		11X1cE218-4	(Judee sib, MTS0819)/08X350-A6/Warr	180	36.2		6	5	6	6	6	6		7	6.0						12.4	2	4.2
611	h	11X6cE205-4	MTS1054/Warhorse/MTS1008	175	33.9	21.5	7	7	6	6	7	6		7	6.6						13.2	4	3.5
612		11X13cE131-3	(Colter sib, MT08177)/MTS0916//MTS08	179	32.7		6	6	6	6	5	5		7	5.9						12.5	5	4.5
613	h	11X13cE147-4	(Colter sib, MT08177)/MTS0916//MTS08	180	31.5	24.1	7	6	7	6	6	5		7	6.3						12.4	5	3.8
614	h	11X13cE169-1	(Colter sib, MT08177)/MTS0916//MTS08	182	29.9		5	6	6	7	5	6		6	5.9	3					13.3	5	3.3
615	h	11X13cE179-2	(Colter sib, MT08177)/MTS0916//MTS08	182	28.0		6	6	5	6	5	6		6	5.7						12.7	4	3.8
616		11X13cE186-1	(Colter sib, MT08177)/MTS0916//MTS08	182	30.3	23.5	7	7	6	7	5	5		7	6.3						12.9	5	3.6

Table 148. 2019 Sawfly Observation Nursery (SFO): All Locations

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height BZ	Stem solid-ness 5-25	Agronomic Scores (0-9)										Stripe Rust%		2018 HR data				
				BZ	date			BZ-SFO		BS-1000r		CD-1000r		FE-CLO		FE-Sr JEB	Avg.	BZ	FE-Sr >5%	22-Jul	24-Jul	2-Aug	Prot- ein	PPO SDS
								PLB	JEB	PLB	JEB	PLB	JEB	PLB	JEB									
617		11X13cE194-1	(Colter sib, MT08177)/MTS0916/(MTS08177)	180	30.3			19-Jul	1-Aug	25-Jul	29-Jul	24-Jul	30-Jul	2-Aug	5-Aug						13.2	5	3.8	
618	h	11X17cE156-3	MT10105/Warhorse/(MTS1011)	178	33.5	18		7	7	7	7	7	7		7					12.9	5	3.4		
619	h	11X17cE161-2	MT10105/Warhorse/(MTS1011)	177	34.3			6	6	6	6	7	6		6					13.0	5	3.8		
620		11X17cE171-2	MT10105/Warhorse/(MTS1011)	178	33.9	18.2		7	6	7	6	6	6		6					13.2	5	3.6		
621		11X17cE179-1	MT10105/Warhorse/(MTS1011)	176	33.1			6	7	6	5	5	6		7					13.1	5	4.2		
622		11X17cE183-2	MT10105/Warhorse/(MTS1011)	178	34.6			5	6	7	6	6	6		7					12.8	5	4.4		
623	h	11X17cE195-4	MT10105/Warhorse/(MTS1011)	176	34.3	18.6		6	6	6	7	7	7		6					13.0	5	3.6		
624	h	11X17cE199-3	MT10105/Warhorse/(MTS1011)	176	32.7	22.4		7	7	6	6	6	6		6					13.2	5	3.8		
625		11X17cE203-4	MT10105/Warhorse/(MTS1011)	180	34.3			6	5	6	6	6	6		7					13.1	5	3.7		
626	h	11X17cE222-2	MT10105/Warhorse/(MTS1011)	178	30.3			7	7	5	5	7	6		6					13.0	5	3.6		
627	h	11X17cE229-1	MT10105/Warhorse/(MTS1011)	178	34.6			5	6	5	5	6	6		7			tr		13.1	5	3.9		
628	h	11X17cE230-2	MT10105/Warhorse/(MTS1011)	178	30.7	19		7	6	6	6	7	6		7					13.6	5	3.8		
629		11X17cE241-4	MT10105/Warhorse/(MTS1011)	177	31.9	18.4		7	7	7	5	6	6		7					13.1	5	3.4		
630		11X17cE247-2	MT10105/Warhorse/(MTS1011)	177	33.5	16.7		7	7	6	6	7	7		8					13.0	5	3.6		
631		11X20cE79-2	Judee/3/(Paul/6*Choteau, 469-15)/(07g)	178	34.3			5	6	5	5	5	5		6					12.5	4	4.2		
632	h	11X20cE86-3	Judee/3/(Paul/6*Choteau, 469-15)/(07g)	179	33.1	23.4		6	7	6	5	6	6		8					12.9	4	3.4		
633		11X23cE126-3	Judee/3/Genou//((469-15, Paul/6*Chotea	176	31.1			6	6	6	6	5	5		6					12.7	4	4.0		
634		11X23cE147-2	Judee/3/Genou//((469-15, Paul/6*Chotea	177	33.1			6	7	6	5	5	6		6					12.9	5	4.2		
635		11X23cE207-4	Judee/3/Genou//((469-15, Paul/6*Chotea	171	32.7			6	7	6	5	6	5		7					12.5	4	4.2		
636		11X29cE207-2	Judee/5/(Jag/3/YIs/MT9882/MTS0222, 0	178	37.4			5	5	6	6	5	5		6					12.8	5	4.3		
637		11X37cE118-2	(Judee sib, MTS0819)/TC1981055/Geno	176	30.7			5	6	5	5	4	5		6					13.1	5	4.4		
638		11X37cE135-2	(Judee sib, MTS0819)/TC1981055/Geno	176	35.4			5	5	6	6	5	6		5				tr	5	13.1	5	4.4	
639	h	11X37cE193-4	(Judee sib, MTS0819)/TC1981055/Geno	176	30.3			5	7	6	6	6	7		6					12.4	5	4.6		
640	h	11X37cE199-2	(Judee sib, MTS0819)/TC1981055/Geno	177	32.7			7	6	5	5	7	6		6			tr		12.7	5	3.7		
641		11X37cE213-4	(Judee sib, MTS0819)/TC1981055/Geno	177	31.5			6	6	5	5	5	5		7				1		12.6	5	4.0	
642		11X45cE29-4	16FAWWON-Irr-67/MT10121/MTS1055	178	29.5			6	6	5	5	6	5		6					13.6	3	3.8		
643		11X45cE40-1	16FAWWON-Irr-67/MT10121/MTS1055	179	29.5	21		7	7	6	6	6	6		7					12.5	5	4.0		
644		11X45cE98-4	16FAWWON-Irr-67/MT10121/MTS1055	178	33.9			6	6	5	6	4	5		6				tr		12.7	2	4.5	
645	h	11X49cE143-1	Judee//16FAWWON-Irr-87/(MT0977, No	178	30.3			7	7	6	5	5	5		6					12.7	2	3.8		
646		11X51cE151-3	Judee/MTS1023/16FAWWON-Irr-87	178	29.1			5	6	6	6	4	5		6					14.3	5	3.6		
647	h	11X51cE221-2	Judee/MTS1023/16FAWWON-Irr-87	178	31.9			6	6	6	6	6	6		7					12.6	5	4.2		
648		d 11X53cE149-2	(Judee sib, MTS0819)/MV17-04/Judee	178	31.5			6	6	6	5	4	5		7					13.6	5	2.6		
649	h	11X53cE158-2	(Judee sib, MTS0819)/MV17-04/Judee	178	32.3	20.9		7	7	7	7	6	6		7					12.9	5	4.6		
650		11X206cE149-4	Decade/(MTS0819, Judee sib)	178	33.5			7	6	6	5	5	5		6					13.6	3	3.4		
651		Rampart	check	177	39.4			5	4	4	5	4	4		4									
652		Warhorse	check	177	34.3			6	6	6	6	6	6		6									
653		11X206cE160-3	Decade/(MTS0819, Judee sib)	179	33.9			7	7	5	5	6	6		6					13.7	3	4.4		
654		11X206cE164-3	Decade/(MTS0819, Judee sib)	178	32.3			7	6	7	5	5	5		6					13.3	3	3.8		
655		11X206cE184-2	Decade/(MTS0819, Judee sib)	178	32.7	24.1		6	6	6	6	6	7		7			tr		13.2	4	3.2		
656		11X206cE212-4	Decade/(MTS0819, Judee sib)	178	32.7			7	7	6	5	5	6		7					13.5	4	3.8		
657		11X206cE221-4	Decade/(MTS0819, Judee sib)	180	34.6			6	6	6	6	6	5		6					12.5	3	3.8		
658	h	11X206cE222-3	Decade/(MTS0819, Judee sib)	180	33.1	21.7		6	7	7	7	6	6		6					14.2	3	4.6		
659	h	11X206cE229-1	Decade/(MTS0819, Judee sib)	178	34.3	19.8		7	7	6	5	7	5		7					13.4	5	3.4		
660		d 11X210cE142-3	Judee/MTS1014	175	34.6			6	6	5	7	6	5		7					13.0	4	2.8		

Table 148. 2019 Sawfly Observation Nursery (SFO): All Locations

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height BZ	Stem solid-ness 5-25	Agronomic Scores (0-9)										Stripe Rust%		2018 HR data				
				BZ	date			BZ-SFO		BS-1000r		CD-1000r		FE-CLO		FE-Sr JEB	Avg.	BZ	FE-Sr >5%	24-Jul	2-Aug	Prot- ein	PPO	SDS
								PLB	JEB	PLB	JEB	PLB	JEB	PLB	JEB									
661		11X210cE149-4	Judee/MTS1014	176	34.3		5-25	19-Jul	1-Aug	25-Jul	29-Jul	24-Jul	30-Jul	2-Aug	5-Aug			22-Jul			12.9	4	3.2	
662		11X210cE189-3	Judee/MTS1014	176	34.3			6	7	6	6	5	5		6	6.0				12.9	4	3.8		
663	h	11X210cE190-2	Judee/MTS1014	175	34.6	22.5		7	6	7	7	7	7		7	6.9				12.9	4	3.4		
664		11X213cE118-1	MTS1021/Spur	176	32.3			5	7	5	6	6	6		5	5.7				12.5	4	4.4		
665		11X216cE130-3	MTS0832/Spur	179	33.1			6	6	5	5	7	7		5	5.6		3	5	13.6	5	3.4		
666		11X222cE147-1	MTS1029/MTS1011	177	33.9	22.2		6	7	6	6	7	6		6	6.3	tr			13.6	5	4.3		
667		11X222cE159-4	MTS1029/MTS1011	180	32.3	15.2		6	6	7	6	6	7		7	6.4				13.3	5	3.8		
668		11X222cE176-1	MTS1029/MTS1011	180	34.3			6	6	6	6	6	6		6	6.0				13.0	5	3.9		
669		11X222cE179-4	MTS1029/MTS1011	180	32.3			6	7	5	5	5	5		5	5.4				13.5	5	3.6		
670		11X222cE193-2	MTS1029/MTS1011	172	32.7	20.3		6	7	7	6	7	7		6	6.6				12.8	5	3.8		
671		11X222cE200-3	MTS1029/MTS1011	178	34.3			6	6	6	6	6	5		6	5.9		10	25	13.0	5	4.0		
672		11X229cE56-4	MTS1180/MTS1014	181	32.7			6	6	6	7	6	6		6	6.1				13.7	5	3.9		
673		11X232cE142-4	03X273cE8/MTS0826	184	31.5			6	5	6	5	5	5		6	5.4	tr		5	13.7	3	3.8		
674	h	11X232cE163-2	03X273cE8/MTS0826	179	34.6	17.4		7	7	7	7	6	6		7	6.7				13.6	3	3.8		
675		11X232cE206-1	03X273cE8/MTS0826	176	33.9			6	6	6	6	6	5		6	5.9				12.9	4	4.0		
676		11X232cE218-3	03X273cE8/MTS0826	180	33.9			7	7	5	5	4	5		6	5.6				13.7	3	4.2		
677		11X236cE12-1	03X139cE98/MT0866	182	35.8			6	6	5	4	5	6		5	5.3		20	40	13.5	5	3.4		
678		11X25E222-4	RRII/(469-15, Paul/6*Choteau)/3/MTS10	177	34.3			6	7	4	6	7	6		5	5.9		10	25	13.0	5	3.2		
679		11X25E290-1	RRII/(469-15, Paul/6*Choteau)/3/MTS10	177	35.4			6	6	6	6	7	6		5	6.0	15	5	20	13.1	5	4.2		
680		11X4cE31-3	Bearpaw/RRII/MTS1174	176	33.5			7	7	5	5	6	6		6	6.0				13.1	5	4.4		
681		11X4cE36-2	Bearpaw/RRII/MTS1174	179	34.6			5	6	5	5	7	6		5	5.6	1			-	5	5.2		
682		11X4cE46-1	Bearpaw/RRII/MTS1174	180	35.4			6	6	6	7	4	5		5	5.6				12.9	5	4.1		
683	w5	d 11X34E39-1	Bearpaw/3/RRII/(07gh374-9, MT0414/Pl	180	36.2			5	5	5	6	6	5		6	5.4	2	3	5	13.0	5	2.8		
684	d	11X34E42-4	Bearpaw/3/RRII/(07gh374-9, MT0414/Pl	177	34.3			7	6	7	5	5	5		6	5.9			10	12.9	5	2.6		
685		11X35E126-1	MTS1029/3/RRII/(07gh374-9, MT0414/P	178	34.6			6	5	5	6	5	6		7	5.7			5	12.6	5	3.7		
686	d	11X35E175-1	MTS1029/3/RRII/(07gh374-9, MT0414/P	178	35.0			5	6	5	5	6	5		6	5.4			5	12.5	5	3.1		
687		11X35E182-2	MTS1029/3/RRII/(07gh374-9, MT0414/P	178	33.9			6	6	5	6	6	6		6	5.9			5	12.6	5	3.2		
688		11X39E29-3	MTS1028/RRI/TCI981055	180	33.9			5	6	5	5	4	5		5	5.0				12.8	4	3.7		
689		11X39E82-4	MTS1028/RRI/TCI981055	179	34.3			6	6	6	6	5	5		6	5.7				12.7	4	3.4		
690		11X39E84-2	MTS1028/RRI/TCI981055	177	34.6			6	7	5	5	6	6		6	5.9		2		12.6	4	3.6		
691		10X117cE26-2	Judee/MTS0705(tall)/Accipiter	177	36.2			6	6	6	5	6	6		6	5.9				12.9	4	4.0		
692		10X117cE73-2	Judee/MTS0705(tall)/Accipiter	177	35.0			5	6	6	5	6	5		7	5.7				13.1	4	3.6		
693		10X117cE86-4	Judee/MTS0705(tall)/Accipiter	178	36.6			6	6	6	5	5	6		6	5.7	tr			13.2	4	4.3		
694		10X117cE98-3	Judee/MTS0705(tall)/Accipiter	177	36.2			5	5	7	6	6	6		6	5.9	15			12.7	4	3.9		
695		10X117cE102-1	Judee/MTS0705(tall)/Accipiter	177	35.8			6	6	6	5	6	7		6	6.0				12.7	4	3.6		
696		10X119E1-2	Warhorse*2/Accipiter	179	34.6			6	6	6	6	4	5		7	5.7				13.6	4	4.1		
697	h	10X119E3-3	Warhorse*2/Accipiter	177	34.3	19.7		7	7	7	7	6	7		6	6.7				12.7	4	3.4		
698	h	10X119E7-4	Warhorse*2/Accipiter	178	34.3			6	6	6	5	6	6		6	5.9		5		13.0	4	4.0		
699	h	10X119E13-3	Warhorse*2/Accipiter	178	34.3	21.4		7	6	6	5	6	7		7	6.3				13.1	4	4.5		
700		10X119E22-4	Warhorse*2/Accipiter	179	35.0			6	7	6	6	5	5		6	5.9				13.7	4	4.6		
701		Rampart	check	177	40.2			5	4	4	4	4	4		4	4.1								
702		Warhorse	check	178	36.2			6	6	6	6	6	6		6	6.0								
703	h	10X119E28-1	Warhorse*2/Accipiter	178	34.6	22.3		7	7	7	6	7	7		6	6.7				13.9	4	3.7		
704	h	10X119E35-2	Warhorse*2/Accipiter	178	33.5	23.0		7	6	6	5	7	7		6	6.3				13.0	4	4.6		

Table 148. 2019 Sawfly Observation Nursery (SFO): All Locations

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date	Plant height BZ	Stem solid- ness	Agronomic Scores (0-9)										Stripe Rust%		2018 HR data		
							BZ-SFO		BS-1000r		CD-1000r		FE-CLO		FE-Sr JEB	Avg.	BZ	FE-Sr >5%	Prot- ein	PPO SDS	
							PLB	JEB	PLB	JEB	PLB	JEB	PLB	JEB							22-Jul
705		10X119E36-4	Warhorse*2/Accipiter	172	31.5	5-25	19-Jul	1-Aug	25-Jul	29-Jul	24-Jul	30-Jul	2-Aug	5-Aug		22-Jul	24-Jul	2-Aug	14.2	4	4.3
706	h	10X119E39-4	Warhorse*2/Accipiter	175	30.7	19.3	6	6	7	6	7	7		6	6.1	tr	10	14.2	4	4.3	
707		10X119E48-4	Warhorse*2/Accipiter	175	30.3		6	6	7	6	7	6		6	6.3	2	5	14.5	4	3.8	
708		10X119E51-3	Warhorse*2/Accipiter	175	30.7		7	6	6	7	7	6		7	6.4		10	14.6	4	3.6	
709		10X119E61-4	Warhorse*2/Accipiter	172	31.1		6	6	7	6	6	6		6	6.4		15	14.4	4	3.5	
710	d	10X119E64-2	Warhorse*2/Accipiter	171	31.5		6	6	7	6	8	7		6	6.1		10	14.3	4	3.9	
711		10X119E66-4	Warhorse*2/Accipiter	171	29.9		7	7	7	5	7	7		7	6.6		15	14.3	4	3.0	
712	h	10X119E68-1	Warhorse*2/Accipiter	177	33.1		7	6	6	5	6	6		6	6.7	tr	10	14.1	4	4.0	
713		10X119E75-3	Warhorse*2/Accipiter	178	33.9		6	6	6	5	6	6		6	6.0	tr		14.0	4	3.8	
714	h	10X119E76-3	Warhorse*2/Accipiter	178	33.9	22.9	6	6	7	7	6	6		7	5.9			13.4	4	4.4	
715		10X119E90-3	Warhorse*2/Accipiter	175	31.5		7	7	7	6	7	7		6	6.4		10	13.5	4	4.0	
716		10X119E98-3	Warhorse*2/Accipiter	178	35.0		6	6	5	5	5	6		6	6.7			14.4	5	3.5	
717	h	10X119E102-2	Warhorse*2/Accipiter	175	31.9	20.0	6	6	7	6	7	6		6	5.6			13.9	4	4.0	
718	h	10X119E118-3	Warhorse*2/Accipiter	172	31.5	19.3	7	5	7	6	8	6		7	6.3	tr	5	14.6	5	3.5	
719		Rampart	check	177	39.8		5	4	4	4	4	4		4	6.6			14.4	5	3.7	
720		Warhorse	check	178	35.8		6	6	6	5	6	6		6	4.1						
721		Warhorse	check	179	35.4			6	6	6		6		5	5.9						
722		18CP010001	Syngenta solid-stemmed line	175	31.9			7	5	5		7		6	5.8						
723		18CP010094	Syngenta solid-stemmed line	180	29.1		5	4	4	5	5	5		6	6.3	1					
724		18CP010111	Syngenta solid-stemmed line	176	30.7		6	6	5	6	6	6		6	5.0	tr					
725		18CP010107	Syngenta solid-stemmed line	172	30.7		6	6	6	6	5	5		5	5.8	2	10	10			
726		18CP010504	Syngenta solid-stemmed line	175	31.5		5		6	6		6		5	5.5						
727		18CP010493	Syngenta solid-stemmed line	177	33.5		6	6	5	5	5	5		7	5.5						
728		18CP010402	Syngenta solid-stemmed line	176	32.7		6	6	5	5	5	5		6	5.8						
729		18CP010497	Syngenta solid-stemmed line	172	31.1		5	5	5	5	6	6		6	5.5	15	3	10			
730		18CP010499	Syngenta solid-stemmed line	175	30.3		6	6	5	5	6	6		6	5.5	tr					
731		18CP010506	Syngenta solid-stemmed line	171	29.9		5	6	6	6	7	7		5	5.8	tr	5				
732		Bobcat	check	178	32.3		6	6	6	6	6	6		6	6.0						
Average				177.2	33.9	19.5	5.8	5.9	5.7	5.5	5.4	5.7	5.7	5.8	5.7			12.8	3.8	3.7	

Table 149. 2019 Single Rep Observation 'A' Nursery (SROA): Lines harvested at the Post Farm

Row/ Plot	wPPO	2020 ID	Cross ID	Pedigree	Yield bu/a	Test weight bu/a	Heading date from	Plant height in	2018 HR data Prot- PPO SDS
1	untr		Yellowstone	check	144.2	62.4	1-Jan 178	35.8	ein
1	trt		Yellowstone	check	100.9	57.8			
4	untr		Mace	Wsm1 check	111.6	63.6	172	30.7	
4	trt		Mace	Wsm1 check	96.7	63.4			
11	untr		16X2-DH81	MTV1681/MT1265	144.8	61.2	179	35.8	12.1 1 3.8
11	trt		16X2-DH82	MTV1681/MT1266	91.9	59.9			
16	untr		CO12D922	Wsm2 check	147.5	63.8	170	32.3	
16	trt		CO12D922	Wsm2 check	133.4	64.6			
58	SM1		17WMA2014	Yellowstone*4//Cap19/Vida/3/MT08185	120.8	61.1	175	35.4	13.1 4 3.6
59	SM1	MT2001	17WMA2023	Yellowstone*4//Cap19/Vida/3/MT08185	127.4	61.5	176	33.9	12.9 5 3.5
67	SM1		17WMA2068	Yellowstone/MT08184/3/Yellowstone//Cap19/Vida	125.3	61.4	176	31.9	12.7 4 3.4
92		MT2002	12X88cE63	MT0871//MT1088/Decade	134.4	62.0	176	32.3	10.7 1 3.2
106		MT2003	12X89E43	MT1088*2/Decade	121.2	63.9	175	33.5	13.7 5 3.8
107		MT2004	12X89E79	MT1088*2/Decade	124.9	63.3	176	32.7	12.0 5 3.1
128			12X2E55	Accipiter/MTS0832//MTCS1205	116.9		175	33.5	13.7 5 4.2
132		MTCL2005	12X2E90	Accipiter/MTS0832//MTCS1205	112.7		179	33.9	11.9 4 4.2
158			12X11E15	Northern//MTCL1127/Overland	133.9	61.3	176	34.6	10.9 3 3.7
174			12X14E40	MTCL1260//MTCL1125/MT1091	118.4	62.0	172	35.4	9.9 4 3.0
177			12X14E55	MTCL1260//MTCL1125/MT1091	115.9		176	32.7	10.3 2 3.3
181			12X14E80	MTCL1260//MTCL1125/MT1091	117.9	62.3	177	34.6	10.7 2 2.8
182			12X14E81	MTCL1260//MTCL1125/MT1091	125.9	62.1	175	34.6	10.3 3 3.0
185			12X16cE46	Colter/(06X446C12, SY Clearstone sib)//MT1078	118.8	63.1	177	33.5	9.9 2 2.9
208			12X152cE11	MT1137//MTCL1067	118.9	63.2	177	34.6	11.5 1 3.0
214		MTCL2006	12X152cE43	MT1137//MTCL1067	119.8	63.5	179	33.9	11.1 1 3.2
251			Yellowstone	SY Clearstone 2CL at FE	131.4	62.3	179	37.0	
253			12X155cE81	MTCL1067/WB-Quake	117.3	62.1	177	35.0	11.1 5 3.4
266		MTCL2007	11X268E16-4	MTCL1125/MT1091	119.1	62.3	178	35.0	11.7 4 2.8
267		MTCL2008	11X268E25-3	MTCL1125/MT1091	132.2	63.4	176	34.6	12.1 4 3.0
269		MTCL2009	11X268E48-4	MTCL1125/MT1091	134.9	62.6	177	34.3	12.3 4 2.6
275		MTCL2010	11X270E2-4	MT0871/(06X445B1-2, SY Clearstone sib)	126.2	63.4	171	30.3	11.3 1 3.8
278		MTCL2011	11X270E17-1	MT0871/(06X445B1-2, SY Clearstone sib)	124.3	63.4	176	32.3	11.8 1 3.0
280		MTCL2012	11X270E21-3	MT0871/(06X445B1-2, SY Clearstone sib)	122.1	63.5	176	31.5	11.7 1 3.6
282		MTCL2013	11X270E26-1	MT0871/(06X445B1-2, SY Clearstone sib)	128.3	62.6	176	32.7	11.4 1 3.4

Table 149. 2019 Single Rep Observation 'A' Nursery (SROA): Lines harvested at the Post Farm

Row/ Plot	wPPO	2020 ID	Cross ID	Pedigree	Yield bu/a	Test weight bu/a	Heading date from	Plant height in	2018 HR data		
							1-Jan		ein	Prot-	PPO SDS
292	MTCL2014	11X270E101-4	MT0871/(06X445B1-2, SY Clearstone sib)		125.1	62.1	179	32.3	11.1	0	3.4
293	MTCL2015	11X270E102-2	MT0871/(06X445B1-2, SY Clearstone sib)		125.5	63.3	175	30.7	11.4	1	3.4
323		12X99cE105	MT1137/MT1078/MT1149		117.8	62.1	178	32.3	9.6	4	3.2
325	MT2016	12X99cE120	MT1137/MT1078/MT1149		124.8	62.6	175	32.7	10.7	4	3.7
331	MT2017	12X102E37	MT10113/MT1145/MT10102		120.3	63.3	171	31.1	9.7	4	2.7
345	MT2018	12X103E77	MT1149/MT10102/MT10116		123.0	62.8	180	33.5	11.2	3	3.4
357		12X104E45	MT10113/MT1137/MT10122		116.9		171	29.9	10.4	5	3.3
386	MT2019	12X105E126	MT10114/MT10128/MTW1251		120.4	61.7	177	32.7	10.1	3	2.8
392	MT2020	12X106E43	Northern/MT1143/06X424B6		123.8	63.6	175	31.5	11.2	3	2.6
411	MT2021	12X107E87	MT10113/(474-23, winter McNeal)/MT10121		128.8	62.6	176	35.4	10.1	4	3.8
419	MT2022	12X108E117	Overland/(457-12, winter McNeal)/MT10128		126.2	62.4	176	34.3	10.9	5	3.0
423	w2	MTW2023	WB3768*2/(10K1726w, Yellowstone white)		132.9	63.0	180	33.9	10.6	2	3.1
424	w2	12X109cE24	WB3768*2/(10K1726w, Yellowstone white)		113.1		180	34.6	11.4	2	3.9
445	MT2024	12X113E55	Northern/(10K1676w, Yellowstone white)/WB3768		135.1	61.9	179	34.6	10.9	1	2.6
459	MT2025	08X14cE22	YLL/Cap19Vida		120.2	63.5	175	31.5	11.3	3	3.4
461	MT2026	08X14cE50	YLL/Cap19Vida		122.8	64.0	175	31.5	9.8	3	2.7
464	MT2027	08X14cE74	YLL/Cap19Vida		121.1	63.4	175	33.1	9.3	3	3.0
465		08X14cE81	YLL/Cap19Vida		116.3		176	31.9	9.7	3	3.1
499	MT2028	12X120E36	MT10113/MT0871/MT1151		119.0	62.4	170	33.1	9.4	4	2.9
501		Yellowstone	check		138.8	63.1	179	38.6			
519		12X123E54	MT1240/MT1088/02X172E31-4		122.8	61.3	176	33.9	9.6	3	2.6
522	MT2029	12X123E72	MT1240/MT1088/02X172E31-4		118.8	62.2	175	32.3	12.1	4	2.9
525		12X123E125	MT1240/MT1088/02X172E31-4		115.1		175	32.7	11.0	4	2.8
544	w1	MTW2030	Northern/03X378cE8/MT0990		134.1	62.1	176	34.3	9.3	1	2.6
546	w1	MTW2031	Northern/03X378cE8/MT0990		124.8	62.0	176	33.1	10.0	1	2.7
557	MT2032	12X126E39	MT1285/03X378cE8/MT10102		127.6	62.5	177	33.5	10.3	4	2.7
560	MT2033	12X126E71	MT1285/03X378cE8/MT10102		129.8	63.3	178	35.4	11.2	4	2.8
567	MT2034	12X126E105	MT1285/03X378cE8/MT10102		129.5	62.9	178	34.6	9.7	4	2.6
680	w1	12X144E7	MT1235/KS09HW140/MT10122		114.4		177	33.1	9.6	1	2.6
681		12X144E16	MT1235/KS09HW140/MT10122		115.2		175	33.1	11.1	4	3.0
683	MT2035	12X144E24	MT1235/KS09HW140/MT10122		126.1	64.1	176	33.5	11.3	4	2.8
686	w1	MTW2036	MT1235/KS09HW140/MT10122		121.0	62.9	178	33.9	9.7	1	2.8
699	MT2037	12X150E22	Northern/MT1088/SY Wolf		122.4	62.9	176	35.4	10.0	0	3.2

Table 149. 2019 Single Rep Observation 'A' Nursery (SROA): Lines harvested at the Post Farm

Row/ Plot	wPPO	2020 ID	Cross ID	Pedigree	Yield bu/a	Test weight bu/a	Heading date from	Plant height in	2018 HR data		
							1-Jan		ein	Prot-	PPO SDS
718		MT2038	12X151E75	MT1088*2/SY Wolf	136.6	61.5	177	33.1	10.5	5	2.6
734		MT2039	12X176cE8	Colter/MT1105	131.6	63.0	177	33.1	12.2	0	4.0
749		MT2040	12X183E11	MT1088/MT1156	122.9	61.9	176	33.9	13.9	4	3.8
751			Yellowstone	check	120.5	60.9	178	38.6			
753			12X183E23	MT1088/MT1156	118.4	62.3	178	34.3	12.4	4	3.6
759			12X183E70	MT1088/MT1156	132.1	61.1	179	35.8	11.0	4	3.1
766		MT2041	12X183E118	MT1088/MT1156	121.5	62.0	179	33.9	12.2	4	3.5
771		MT2042	12X184E22	MT1090/MT1276	132.7	62.2	179	34.3	12.6	5	4.2
786			12X185E37	MT1105//MT1156	125.4	61.1	181	33.1	10.3	4	2.8
789			12X185E58	MT1105//MT1156	137.7	61.0	181	33.1	12.1	4	3.2
797			12X185E117	MT1105//MT1156	125.3	61.2	179	32.7	10.2	4	2.7
804		MT2043	12X185E146	MT1105//MT1156	124.6	61.6	179	33.1	10.4	4	3.0
809			12X186E44	MT1113/MT1235	118.0	61.4	175	30.7	11.6	4	3.1
834			12X204E96	MT1286/KS10HW10	112.4		176	33.1	9.8	4	3.0
838		MT2044	12X206E90	MT1285/OK08539	128.7	63.2	176	34.6	9.3	4	2.7
850		MT2045	12X209E49	MT0871/NI10712	125.9	61.9	176	33.5	9.2	4	3.1
861			12X210E43	MT1276//SD07W083-7	111.2		175	33.1	10.3	3	2.6
881		MT2046	12X214E127	MT1240/Redfield	120.6	62.7	175	33.9	9.4	3	2.6
893			11X61cE56-4	MT1078//08X349-A3/Yellowstone	127.0	60.0	181	32.3	9.6	3	2.6
916		MT2047	11X82cE64-3	Yellowstone//493-22, Reeder/6*Paul//3/MT0871	119.2	62.8	176	33.1	12.7	4	2.8
927		MT2048	11X88cE98-3	Northern//02X22cE38/MT10121	137.3	62.0	176	33.5	11.8	1	3.1
941		MT2049	11X112E53-2	Colter//03X273cEx/MT10105	120.0	61.8	176	33.9	9.3	4	3.0
945		MT2050	11X120cE62-3	MT10121//Yellowstone/SD08W015	129.4	62.7	175	34.3	9.5	3	2.6
949			11X123cE38-3	MT1141//Yellowstone/HV9W06-975	123.7	61.0	176	31.5	10.0	4	3.6
959			11X131cE34-1	Overland//MTW1098/KS08HW88	109.6		175	34.3	10.6	4	3.3
964			11X131cE88-4	Overland//MTW1098/KS08HW88	116.5		175	31.9	11.1	5	3.5
965		MT2051	11X131cE91-2	Overland//MTW1098/KS08HW88	119.8	62.9	175	33.5	10.0	5	2.9
978		MT2052	11X139cE47-2	Judith/OK06332//MT0990	125.1	61.9	171	30.3	10.4	4	3.7
1001			Yellowstone	check	133.4	62.5	179	38.2			
1016		MT2053	11X193cE16-1	HV9W04-1594R/Accipiter	131.7	64.2	175	32.3	9.9	3	2.9
1025		MT2054	10X048E70-2	MT10104//MTW0785/Yellowstone-Lr41	117.3	64.3	176	33.5	9.9	1	3.6
1030		MT2055	10X050cE34-2	MT10104//MTW0785/Yellowstone-Lr41	125.3	63.6	172	30.7	10.5	4	2.8
1039		MT2056	10X055E13-3	(Northern sib, MT0977)//MT0859/MT0938	140.6	64.5	180	35.8	9.4	1	3.0

Table 149. 2019 Single Rep Observation 'A' Nursery (SROA): Lines harvested at the Post Farm

Row/ Plot	wPPO	2020 ID	Cross ID	Pedigree	Yield bu/a	Test weight bu/a	Heading date from	Plant height in	2018 HR data		
							1-Jan		ein	Prot-	PPO SDS
1044		MT2057	10X057cE4-2	Robidoux/MT08185/MT0861	123.9	63.4	178	33.5	11.9	3	4.3
1061			10X067E22-2	MT10116/MT0861/MTW0785	116.1		176	32.7	9.9	1	3.0
1063		MT2058	10X067E88-3	MT10116/MT0861/MTW0785	117.9	63.4	175	31.5	12.5	5	3.3
1066		MT2059	09X257cE221-3	MT08185/YLL*2/PI640431/3/PROM/3*YLL/YLL*2/Pelsart	140.6	62.5	171	32.7	11.4	4	3.8
1068		MT2060	09X257cE232-2	MT08185/YLL*2/PI640431/3/PROM/3*YLL/YLL*2/Pelsart	129.6	62.4	171	32.3	11.3	4	3.6
1100			15X82cB80	MT1138*2/MT1262	134.3	60.0	177	34.6	10.8	4	3.7
1104			15X283B1	WA 8186/Loma	113.3		178	35.4	12.8	3	4.4
1111			15X283B57	WA 8186/Loma	117.7	60.1	179	34.6	10.9	3	3.8
1112			15X283B60	WA 8186/Loma	136.0	60.8	178	33.9	10.7	1	3.8
1155			15X255B1	MT1117/MT1504	113.3		176	35.8	11.0	3	3.4
Average All					123.8	62.4	176.3	33.5	10.9	3.1	3.2
Average MT20xx lines					125.9	62.8	176.0	33.2	10.9	3.0	3.2

Table 150. 2019 Single Rep Observation 'A' Nursery (SROA): All Location data

Row/ Plot	wPPO	ID	Pedigree	Heading date		Plant height		Agronomic Score							Stripe rust %		2018 HR data		
				BZ	FE	BZ	FE	PLB BZ	JEB BZ	PLB MC	JEB MC	PLB FE-CLO	JEB FE-CLO	FE-Sr JEB	Aver- age	BZ	FE-Sr >5%		
								23-Jul	1-Aug	26-Jul	29-Jul	2-Aug	6-Aug	6-Aug			24-Jul	6-Aug	ein
1	h	untr	Yellowstone	check	178	35.8		7	5	6	4			5	5.4	tr			
1	h	trt	Yellowstone																
2			Decade	check	174	34.3		6	5	5	5			4	5.0	tr	5	60	
3	wsmv		MT1265	Cmc4 check	178	37.0		7	4	6	4			5	5.2				
4	h	wsmv	Mace	Wsm1 check	172	30.7		5	6	6	4			4	5.0		20		
4	h	trt	Mace																
5	wsmv		16X2-DH63	MTV1681/MT1265	177	32.7		6	4	7	5			5	5.4			12.9	1 3.8
6	wsmv	d	16X2-DH65	MTV1681/MT1265	176	33.1		6	5	x	4			6	5.3	3	tr	40	16.1 5 3.0
7	wsmv		16X2-DH71	MTV1681/MT1265	180	36.2		7	4	x	3			5	4.8			12.4	1 4.0
8	wsmv		16X2-DH75	MTV1681/MT1265	177	35.8		6	4	6	4			6	5.2			13.6	2 3.9
9	wsmv		16X2-DH79	MTV1681/MT1265	178	35.8		6	4	6	6			5	5.4			12.9	1 3.8
10	wsmv		16X2-DH80	MTV1681/MT1265	179	36.2		7	5	7	6			6	6.2			12.3	1 3.2
11	h	wsmv	16X2-DH81	MTV1681/MT1265	179	35.8		6	6	6	5			5	5.6		10	12.1	1 3.8
11	h	trt	16X2-DH81																
12	wsmv		16X2-DH84	MTV1681/MT1265	178	32.3		6	5	x	4			5	5.0			12.2	2 3.4
13	wsmv		16X2-DH86	MTV1681/MT1265	177	34.3		7	4	x	3			7	5.3			12.4	1 3.6
14	wsmv		16X2-DH88	MTV1681/MT1265	180	35.4		6	4	6	5			6	5.4			12.8	1 3.6
15	wsmv		MTV1681	Wsm1 check	177	36.2		6	4	5	5			5	5.0				
16	h	wsmv	CO12D922	Wsm2 check	170	32.3		7	6	8	6			6	6.6				
16	h	trt	CO12D922																
17	wsmv	d	1681-OT12		175	33.1		7	3	7	6			6	5.8			2	3.1
18	wsmv		1681-OT46		172	34.6		8	4	x	3			6	5.3			2	3.9
19	wsmv		16X2-DH90	MTV1681/MT1265	178	34.3		6	5	5	4			5	5.0			12.5	1 3.8
20	wsmv		16X2-DH91	MTV1681/MT1265	177	35.0		5	5	5	4			6	5.0	tr		13.1	2 3.6
21	wsmv		16X2-DH93	MTV1681/MT1265	176	35.8		7	4	6	5			5	5.4		5	12.7	1 3.9
22	wsmv		16X2-DH94	MTV1681/MT1265	177	31.9		6	5	6	6			7	6.0			13.2	4 3.6
23	wsmv		16X2-DH96	MTV1681/MT1265	179	33.9		6	5	7	5			6	5.8			12.7	1 3.6
24	wsmv		16X2-DH98	MTV1681/MT1265	178	33.9		7	4	x	4			6	5.3			12.5	1 3.4
25	wsmv		16X2-DH100	MTV1681/MT1265	177	34.3		6	5	x	3			5	4.8			12.8	1 4.1
26	wsmv		16X2-DH103	MTV1681/MT1265	178	33.1		6	4	6	5			5	5.2			12.2	1 3.6
27	wsmv		16X2-DH105	MTV1681/MT1265	178	34.6		6	4	5	4			5	4.8			12.8	1 4.0
28	wsmv		16X2-DH106	MTV1681/MT1265	179	33.5		6	4	6	5			5	5.2		10	12.5	1 3.8
29	wsmv		16X2-DH107	MTV1681/MT1265	177	33.1		5	3	6	6			5	5.0			13.1	1 4.2
30	wsmv		16X2-DH110	MTV1681/MT1265	172	28.0		4	2	x	4			3	3.3		60	100	14.0 5 4.3
31		MT1793	Decade-Fhb1		170	31.5		7	5	x	3			4	4.8	tr	30	100	
32		MT1796	Decade-Fhb1		172	33.9		7	5	7	7			4	6.0	tr	20	100	
33	fhb	16X8-DH38	DecadeFhb1-DH13//MT1078/Langin		170	32.3		7	5	7	6			4	5.8	5	15	90	13.6 4 4.3
34	fhb d	16X8-DH49	DecadeFhb1-DH13//MT1078/Langin		171	31.9		5	4	6	7			4	5.2	40	25	90	15.2 5 3.0
35	fhb d	16X8-DH51	DecadeFhb1-DH13//MT1078/Langin		169	27.6		5	4	5	5			4	4.6	tr	5	60	15.6 5 3.0
36	fhb d	16X8-DH56	DecadeFhb1-DH13//MT1078/Langin		170	30.3		6	5	x	4			5	5.0		3	40	14.7 5 2.7
37	fhb	16X8-DH60	DecadeFhb1-DH13//MT1078/Langin		171	32.3		7	6	x	5			5	5.8		3	30	16.1 -
38	fhb	16X8-DH67	DecadeFhb1-DH13//MT1078/Langin		169	29.1		6	4	7	6			4	5.4	20	5	60	12.9 5 3.7
39	fhb	16X8-DH87	DecadeFhb1-DH13//MT1078/Langin		170	30.7		6	4	6	6			5	5.4	10	20	80	16.0 5 3.6
40	fhb d	16X9-DH80	09x257cD9-2/DecadeFhb1-DH7		170	32.7		7	4	5	5			4	5.0	10	10	70	12.6 5 2.8
41	fhb	16X9-DH95	09x257cD9-2/DecadeFhb1-DH7		175	31.5		5	5	5	6			4	5.0	5	60	14.1	5 3.8

Table 150. 2019 Single Rep Observation 'A' Nursery (SROA): All Location data

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height		Agronomic Score						Stripe rust %		2018 HR data						
				BZ	FE	BZ	FE	PLB BZ	JEB BZ	PLB MC	JEB MC	PLB FE-CLO	JEB FE-Sr JEB	Aver- age	BZ	FE-Sr >5%	2018 HR data					
																	Prot-	PPO SDS				
42	w5	d 16X9-DH103	09x257cD9-2/DecadeFhb1-DH7	172		29.9		6	5	x	2			3	4.0		24-Jul	6-Aug	ein	15.1	5	3.2
43	fhb	16X10-DH60	MT1332/DecadeFhb1-DH17	178		36.2		6	4	5	5				4	4.8	2	60		12.2	-	-
44	fhb	16X11-DH64	DecadeFhb1-DH11/Overland FHB-1	176		33.5		5	5	6	6				4	5.2	10	80		13.1	5	3.8
45	fhb	d 16X11-DH81	DecadeFhb1-DH11/Overland FHB-1	175		32.3		6	5	6	7				4	5.6	15	90		13.6	5	3.0
46	fhb	16X11-DH84	DecadeFhb1-DH11/Overland FHB-1	171		33.1		7	6	5	5				4	5.4	5	100		14.9	-	-
47	fhb	d 16X11-DH86	DecadeFhb1-DH11/Overland FHB-1	171		28.3		6	5	5	6				3	5.0		100		12.8	5	3.0
48	fhb	16X11-DH87	DecadeFhb1-DH11/Overland FHB-1	172		30.3		6	5	5	5				4	5.0		100		13.0	5	3.6
49	fhb	16X11-DH128	DecadeFhb1-DH11/Overland FHB-1	177		34.6		6	6	x					4	5.3	tr	100		15.0	5	3.2
50		15X4-DH1	MT1078//AAC Gateway/MT1265	179		35.8		6	6	x					4	5.3	tr	100		12.7	4	3.7
51		Yellowstone	check	178		36.2		7	5	x					5	5.7						
52		Decade	check	174		34.3		6	4	x					4	4.7	5	60				
53	d	15X4-DH3	MT1078//AAC Gateway/MT1265	180		34.6		5	6	x					5	5.3				13.6	4	3.0
54	d	15X4-DH4	MT1078//AAC Gateway/MT1265	179		32.3		5	5	x					4	4.7	5			15.2	5	1.8
55	SM1	17WMAB2007	Yellowstone*4/Cap19V/ida/3/MT08185	177		34.6		6	6	4	5				5	5.2				13.4	4	4.4
56	SM1	17WMAB2009	Yellowstone*4/Cap19V/ida/3/MT08185	176		35.8		6	5	5	6				4	5.2				13.5	4	3.7
57	SM1	17WMAB2013	Yellowstone*4/Cap19V/ida/3/MT08185	177		35.4		6	6	5	5				4	5.2				12.8	4	3.8
58	h	17WMAB2014	Yellowstone*4/Cap19V/ida/3/MT08185	175		35.4		6	6	7	6				4	5.8				13.1	4	3.6
59	h	17WMAB2023	Yellowstone*4/Cap19V/ida/3/MT08185	176		33.9		7	7	6	6				5	6.2				12.9	5	3.5
60	SM1	17WMAB2043	Yellowstone*4/Cap19V/ida/3/MT08185	178		37.8		6	6	x	4				5	5.3				13.3	4	3.5
61	SM1	17WMAB2045	Yellowstone*4/Cap19V/ida/3/MT08185	178		39.8		5	5	x	4				5	4.8				13.3	1	3.7
62	SM1	17WMAB2050	Yellowstone*4/Cap19V/ida/3/MT08185	176		37.0		6	6	6	6				6	6.0				13.5	4	3.6
63	SM1	17WMAB2056	Yellowstone/MT08184/3/Yellowstone//Ca	172		35.8		7	6	6	5				4	5.6	tr			13.3	4	3.8
64	SM1	17WMAB2057	Yellowstone/MT08184/3/Yellowstone//Ca	177		37.0		6	6	6	6				5	5.8				12.4	4	3.8
65	SM1	d 17WMAB2060	Yellowstone/MT08184/3/Yellowstone//Ca	176		33.1		6	5	5	5				4	5.0				12.9	4	3.0
66	SM1	17WMAB2065	Yellowstone/MT08184/3/Yellowstone//Ca	178		32.3		7	6	x	4				4	5.3				12.4	4	3.4
67	h	17WMAB2068	Yellowstone/MT08184/3/Yellowstone//Ca	176		31.9		7	7	x	4				5	5.8				12.7	4	3.4
68	SM1	17WMAB2072	Yellowstone/MT08184/3/Yellowstone//Ca	177		39.0		5	5	4	5				5	4.8				13.4	4	3.3
69	SM1	d 17WMAB2097	Yellowstone/MT08184/3/Yellowstone//Ca	176		39.4		6	6	6	5				5	5.6				13.6	2	3.0
70		12X86cE4	MT1105//MT1091/Accipiter	178		34.3		5	6	7	7				5	6.0				12.0	3	3.8
71		12X86cE7	MT1105//MT1091/Accipiter	177		34.6		7	7	6	6				5	6.2				13.0	4	3.8
72		12X86cE13	MT1105//MT1091/Accipiter	177		34.6		6	6	x	4				5	5.3				13.5	4	3.7
73		12X86cE22	MT1105//MT1091/Accipiter	177		34.6		6	5	x	4				6	5.3	20			11.8	4	3.6
74		12X86cE47	MT1105//MT1091/Accipiter	180		35.8		7	6	7	5				5	6.0	5	tr		10.9	4	3.6
75		12X86cE64	MT1105//MT1091/Accipiter	178		35.0		7	7	6	5				4	5.8				10.0	4	3.4
76		12X86cE77	MT1105//MT1091/Accipiter	178		35.4		6	6	6	6				5	5.8				11.2	4	3.7
77		12X86cE87	MT1105//MT1091/Accipiter	178		36.6		5	6	5	5				5	5.2	tr			10.1	4	3.7
78		12X86cE90	MT1105//MT1091/Accipiter	177		35.8		7	7	x	3				5	5.5				11.6	4	4.1
79		12X86cE95	MT1105//MT1091/Accipiter	176		34.6		6	5	5	6				5	5.4	10			14.5	4	3.4
80		12X86cE106	MT1105//MT1091/Accipiter	178		35.8		7	7	6	5				6	6.2				11.7	4	3.8
81		12X86cE109	MT1105//MT1091/Accipiter	177		35.4		6	6	6	6				5	5.8				11.1	4	3.8
82		12X86cE119	MT1105//MT1091/Accipiter	170		35.4		6	6	7	7				6	6.4				12.6	5	2.9
83		12X88cE1	MT0871//MT1088/Decade	177		33.5		7	6	5	6				5	5.8				13.9	2	4.4
84		12X88cE3	MT0871//MT1088/Decade	171		30.7		6	6	6	5				5	5.6		15		13.0	5	4.2
85		12X88cE7	MT0871//MT1088/Decade	176		33.9		6	5	6	5				5	5.4				11.1	2	3.6
86		12X88cE21	MT0871//MT1088/Decade	179		32.3		6	5	6	6				6	5.8	5	10		10.0	4	2.8

Table 150. 2019 Single Rep Observation 'A' Nursery (SROA): All Location data

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height		Agronomic Score						Stripe rust %		2018 HR data					
				BZ	FE	BZ	FE	PLB BZ	JEB BZ	PLB MC	JEB MC	PLB FE-CLO	JEB JEB	FE-Sr JEB	Aver- age	BZ	FE-Sr >5%	24-Jul	6-Aug	ein	
87		12X88cE29	MT0871//MT1088/Decade	172		31.1		5	5	4			5	4.8					9.4	4	3.0
88		12X88cE38	MT0871//MT1088/Decade	171		30.7		6	6	5			6	5.8					10.7	4	3.1
89		12X88cE43	MT0871//MT1088/Decade	177		33.5		5	6	6			6	5.6					10.9	4	3.6
90		12X88cE52	MT0871//MT1088/Decade	176		32.7		7	6	5			6	5.8					10.5	1	3.2
91		12X88cE58	MT0871//MT1088/Decade	177		34.6		5	6	6			5	5.6					10.6	3	3.5
92	h	12X88cE63	MT0871//MT1088/Decade	176		32.3		7	6	7			7	6.8					10.7	1	3.2
93		12X88cE70	MT0871//MT1088/Decade	177		33.1		7	7	6			6	6.2			5		12.9	4	3.0
94		12X88cE72	MT0871//MT1088/Decade	170		29.9		7	6	6			5	6.0			10		12.9	5	3.6
95		12X88cE77	MT0871//MT1088/Decade	175		33.1		6	7	5			7	6.2					10.9	3	3.5
96		12X88cE85	MT0871//MT1088/Decade	175		30.7		6	6	5			7	6.0					11.0	5	3.5
97		12X88cE105	MT0871//MT1088/Decade	177		32.3		5	6	5			6	5.6					11.0	5	4.0
98		12X88cE120	MT0871//MT1088/Decade	168		28.3		6	6	5			5	5.6					12.6	5	4.4
99		12X88cE123	MT0871//MT1088/Decade	177		34.6		6	7	6			7	6.6					11.6	4	4.1
100		12X88cE126	MT0871//MT1088/Decade	178		33.5		6	6	5			7	6.0					11.7	4	4.2
101		Yellowstone	check	178		38.6		7	5	5			5	5.4							
102		Decade	check	175		34.3		6	5	5			4	5.2		5	10	60			
103		12X89E15	MT1088*2/Decade	179		35.4		6	6	4			5	5.2			tr	25	10.6	4	3.2
104		12X89E18	MT1088*2/Decade	178		33.9		6	7	6			6	6.2				10	10.9	4	3.5
105		12X89E29	MT1088*2/Decade	178		32.7		6	7	6			5	6.0		tr	20	40	11.4	5	3.5
106	h	12X89E43	MT1088*2/Decade	175		33.5		6	7	7			5	6.4			5		13.7	5	3.8
107	h	12X89E79	MT1088*2/Decade	176		32.7		6	6	7			7	6.4					12.0	5	3.1
108		12X89E94	MT1088*2/Decade	177		32.7		6	7	x			6	5.8					12.4	5	3.4
109		12X89E96	MT1088*2/Decade	177		31.9		6	6	6			6	5.8					12.0	5	3.8
110		12X89E99	MT1088*2/Decade	179		31.5		6	6	5			6	5.8			10		11.1	5	3.2
111		12X89E101	MT1088*2/Decade	178		31.5		6	6	6			5	5.8					11.0	5	3.7
112		12X98E3	Northern//MT10114/MT0954	178		34.3		7	7	5			6	6.0					9.4	1	3.0
113		12X98E4	Northern//MT10114/MT0954	178		34.3		6	7	5			7	6.0					9.2	1	3.0
114		12X98E9	Northern//MT10114/MT0954	179		35.0		6	6	x			6	5.3			5		10.0	1	3.7
115		12X98E19	Northern//MT10114/MT0954	177		34.3		7	5	5			6	5.6					11.0	0	2.7
116		12X98E21	Northern//MT10114/MT0954	177		32.7		6	6	6			5	5.8					12.2	1	3.2
117		12X98E24	Northern//MT10114/MT0954	179		34.3		5	7	6			7	6.0					11.6	1	3.6
118		12X98E28	Northern//MT10114/MT0954	179		33.1		6	6	6			6	6.0					10.2	0	4.3
119		12X98E30	Northern//MT10114/MT0954	178		32.3		6	6	5			7	6.0					11.7	1	3.8
120		12X98E31	Northern//MT10114/MT0954	178		33.9		7	7	5			6	6.0					11.9	1	3.3
121		12X98E37	Northern//MT10114/MT0954	177		34.6		6	6	4			5	5.2					10.3	1	3.2
122		12X2E6	Accipiter/MTS0832//MTCS1205	180	182	31.9	33.5	5	6	6		5	6	5.7					12.9	4	3.8
123		12X2E13	Accipiter/MTS0832//MTCS1205	177	181	34.3	34.6	6	6	6		5	5	5.6					12.3	4	4.2
124		12X2E28	Accipiter/MTS0832//MTCS1205	179	181	35.0	34.3	6	6	6		5	6	5.6			1		13.4	4	3.8
125		12X2E44	Accipiter/MTS0832//MTCS1205	178	181	31.1	29.5	6	6	5		5	6	5.9			2		11.8	4	3.6
126		12X2E46	Accipiter/MTS0832//MTCS1205	170	182	32.3	30.7	5	7	5		5	5	5.7			tr		12.6	4	4.4
127		12X2E49	Accipiter/MTS0832//MTCS1205	178	179	34.6	35.0	6	6	5		5	6	6.0					13.1	4	3.8
128	h	12X2E55	Accipiter/MTS0832//MTCS1205	175	177	33.5	32.3	7	7	6		6	7	6.7					13.7	5	4.2
129		12X2E65	Accipiter/MTS0832//MTCS1205	178	182	33.9	31.5	5	6	6		5	5	5.6					12.0	4	3.2
130		12X2E69	Accipiter/MTS0832//MTCS1205	179	183	32.7	32.3	5	7	6		5	6	6.0			3	5	14.0	5	4.0
131		12X2E77	Accipiter/MTS0832//MTCS1205	178	182	34.3	34.3	5	6	5		6	6	5.6					12.7	4	4.2

Table 150. 2019 Single Rep Observation 'A' Nursery (SROA): All Location data

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height		Agronomic Score								Stripe rust %		2018 HR data		
				BZ	FE	BZ	FE	PLB BZ	JEB BZ	PLB MC	JEB MC	PLB FE-CLO	JEB FE-CLO	FE-Sr JEB	Aver- age	BZ	FE-Sr >5%	Prot- PPO	SDS	
				23-Jul	1-Aug	26-Jul	29-Jul	2-Aug	6-Aug	24-Jul	6-Aug	ein								
132	h	12X2E90	Accipiter/MTS0832//MTCS1205	179	182	33.9	33.9	6	7	6	6	7	6	7	6.4		11.9	4	4.2	
133		12X2sE3	Accipiter/MTS0832//MTCS1205	179	183	37.0	35.0	6	5	4	5	5	5	5	5.0		11.9	4	3.1	
134		12X2sE12	Accipiter/MTS0832//MTCS1205	180	182	34.6	34.3	5	7	5	6	6	6	6	5.9		12.2	4	3.8	
135		12X2sE17	Accipiter/MTS0832//MTCS1205	181	182	32.7	34.3	5	6	5	7	6	7	6	6.0		11.5	4	4.0	
136		12X2sE24	Accipiter/MTS0832//MTCS1205	179	181	34.6	34.6	5	6	5	5	5	6	6	5.4		11.6	4	3.6	
137		12X2sE41	Accipiter/MTS0832//MTCS1205	182	185	32.7	33.5	6	6	6	6	6	6	7	6.1		12.5	4	3.9	
138		12X2sE44	Accipiter/MTS0832//MTCS1205	182	186	33.9	33.5	6	6	5	5	7	5	7	5.9		13.0	4	4.0	
139		12X2sE77	Accipiter/MTS0832//MTCS1205	179	183	34.6	31.9	5	6	5	5	6	5	7	5.6	1	11.0	4	3.4	
140		12X7E7	MTCL1260//SY Clearstone sib, MTCL10	176	178	35.8	35.8	6	7	6	5	5	7	6	6.0	10	10.0	3	3.0	
141		12X7E9	MTCL1260//SY Clearstone sib, MTCL10	176	179	35.4	35.8	6	6	6	5	5	6	5	5.6	10	10.3	3	3.0	
142		12X7E19	MTCL1260//SY Clearstone sib, MTCL10	177	181	35.0	37.8	5	6	6	6	5	6	5	5.6	5	11.7	3	3.6	
143		12X7E25	MTCL1260//SY Clearstone sib, MTCL10	176	178	35.4	36.2	6	7	5	5	6		5	5.7	5	10.6	3	3.0	
144		12X7E31	MTCL1260//SY Clearstone sib, MTCL10	176	178	35.8	35.4	6	6	6	5	5	7	5	5.7	tr	5	10.9	3	3.6
145		12X7E36	MTCL1260//SY Clearstone sib, MTCL10	177	179	34.6	36.6	5	6	5	5	5	5	5	5.1	5	10.4	3	3.8	
146		12X7E46	MTCL1260//SY Clearstone sib, MTCL10	177	178	35.8	35.8	6	6	6	5	7	6	5	5.9	tr	10	10.4	3	3.0
147		12X7E88	MTCL1260//SY Clearstone sib, MTCL10	177	179	34.6	36.2	5	6	6	4	6	6	5	5.4	tr	5	10.1	3	3.0
148		12X8cE27	MTCL1067//MT0954/(MTCL1068, SY Cle	176	179	37.0	40.6	6	5	5	5	5	5	5	5.1	10	10.0	2	2.9	
149		12X8cE48	MTCL1067//MT0954/(MTCL1068, SY Cle	177	180	38.6	40.2	5	5	4	5	5	5	5	4.9	5	11.0	3	3.2	
150		12X8cE55	MTCL1067//MT0954/(MTCL1068, SY Cle	177	180	38.2	39.4	6	5	3	5	5	5	5	4.9		10.9	3	3.0	
151		Yellowstone	SY Clearstone 2CL at FE	178	182	36.2	37.4	7	5	6	6	5	5	5	5.6	tr				
152		Decade	Yellowstone at FE	175		33.9		6	4	6	6			4	5.2	5	70			
153		12X10E5	MT1276//MT1145/MTCL1127	171	177	32.7	31.5	5	4	5	5	6	4	4	4.7		11.6	4	3.7	
154		12X10E16	MT1276//MT1145/MTCL1127	177	183	34.3	35.4	6	7	5	5	6	7	6	6.0		10.5	3	3.4	
155		12X10E30	MT1276//MT1145/MTCL1127	172	176	30.7	30.3	6	5	6	5	5	4	4	5.0		10.4	4	3.0	
156		12X10E89	MT1276//MT1145/MTCL1127	177	176	33.9	32.7	7	6	6	6	7	6	5	6.1	5	10.3	4	3.0	
157		12X11E2	Northern//MTCL1127/Overland	178	181	33.9	35.0	7	6	5	5	6	6	6	5.9	5	10.0	3	3.0	
158	h	12X11E15	Northern//MTCL1127/Overland	176	181	34.6	33.1	8	6	7	7	7	6	6	6.7	5	10	10.9	3	3.7
159		12X11E49	Northern//MTCL1127/Overland	178	182	33.1	33.1	6	7	5	5	6	7	6	6.0	5	20	9.9	2	3.2
160		d 12X13E1	MTCL1067//MTCL1125/Northern	179	182	35.0	31.5	5	6	5	5	5	6	6	5.4	tr	5	10.6	2	2.4
161		d 12X13E9	MTCL1067//MTCL1125/Northern	177	179	33.5	34.6	6	6	6	6	6	7	6	6.1		10.4	3	2.4	
162		d 12X13E17	MTCL1067//MTCL1125/Northern	180	183	35.8	35.4	5	5	5	5	5	6	5	5.1		10.3	4	2.2	
163		12X13E26	MTCL1067//MTCL1125/Northern	181	184	31.1	32.7	6	6	5	5	5	5	7	5.6		10.5	3	3.8	
164		12X13E31	MTCL1067//MTCL1125/Northern	180	183	34.6	35.4	5	7	4	5	6	6	6	5.6		10.3	3	2.6	
165		12X13E33	MTCL1067//MTCL1125/Northern	179	182	36.2	35.8	6	6	7	6	7	7	5	6.3		10.0	4	2.9	
166		12X13E62	MTCL1067//MTCL1125/Northern	178	182	35.0	35.8	7	7	7	6	6	5	5	6.1		10.7	4	2.6	
167		d 12X13E115	MTCL1067//MTCL1125/Northern	177	182	35.8	35.8	5	6	5	5	6	6	5	5.4		10.2	4	2.4	
168		d 12X13E118	MTCL1067//MTCL1125/Northern	177	181	35.0	35.0	6	7	7	5	6	6	5	6.0		10.5	4	2.5	
169		12X14E2	MTCL1260//MTCL1125/MT1091	178	183	34.3	34.6	7	7	5	5	5	7	5	5.9		10.2	2	3.0	
170		12X14E11	MTCL1260//MTCL1125/MT1091	175	180	33.1	33.5	6	7	5	5	5	7	6	5.9		10.2	2	3.2	
171		12X14E15	MTCL1260//MTCL1125/MT1091	175	179	35.8	35.4	7	6	7	7	6	6	5	6.3		10.8	3	3.4	
172		12X14E16	MTCL1260//MTCL1125/MT1091	178	181	35.0	35.8	6	6	5	5	6	7	5	5.7		10.0	2	3.3	
173		12X14E25	MTCL1260//MTCL1125/MT1091	179	182	34.3	35.4	6	6	6	5	5	6	5	5.6		10.6	2	3.2	
174	h	12X14E40	MTCL1260//MTCL1125/MT1091	172	179	35.4	34.6	7	7	6	6	6	7	6	6.4		9.9	4	3.0	
175		12X14E44	MTCL1260//MTCL1125/MT1091	178	181	32.3	33.5	7	7	x	5	5	6	7	6.2	5	10.0	3	3.6	
176		12X14E51	MTCL1260//MTCL1125/MT1091	179	183	34.3	33.5	5	6	5	5	5	6	5	5.3		10.3	3	3.4	

Table 150. 2019 Single Rep Observation 'A' Nursery (SROA): All Location data

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height		Agronomic Score						Stripe rust %		2018 HR data						
				BZ	FE	BZ	FE	PLB BZ	JEB BZ	PLB MC	JEB MC	PLB FE-CLO	JEB FE-CLO	FE-Sr JEB	Aver- age	BZ	FE-Sr >5%	2018 HR data				
																		Prot-	PPO SDS			
177	h	12X14E55	MTCL1260//MTCL1125/MT1091	176	180	32.7	33.1	6	7	7	6	6	8	6	6.6		24-Jul	6-Aug	ein	10.3	2	3.3
178		12X14E62	MTCL1260//MTCL1125/MT1091	178	181	36.2	33.5	5	6		5	5	6	6	5.4	tr	1			9.0	3	3.4
179		12X14E67	MTCL1260//MTCL1125/MT1091	180	183	32.3	32.3	6	6		5	5	6	6	6.1		2			10.0	4	2.8
180		12X14E74	MTCL1260//MTCL1125/MT1091	177	182	32.7	33.9	6	7		6	5	7	6	6.1		tr	5		10.1	3	3.2
181	h	12X14E80	MTCL1260//MTCL1125/MT1091	177	182	34.6	35.4	7	7		5	6	7	6	6.3		1			10.7	2	2.8
182	h	12X14E81	MTCL1260//MTCL1125/MT1091	175	179	34.6	35.8	7	7		7	7	7	6	6.6					10.3	3	3.0
183		12X14E99	MTCL1260//MTCL1125/MT1091	178	181	36.2	35.8	6	6		5	5	7	5	5.6					10.2	3	3.3
184		12X14E108	MTCL1260//MTCL1125/MT1091	174	179	36.2	35.8	6	6		7	7	7	6	6.1		tr			10.3	2	3.1
185	h	12X16CE46	Colter/(06X446C12, SY Clearstone sib)/MT10114/(06X446B45-3, SY Clearstone	177	181	33.5	32.7	7	7		6	6	7	8	6.9					9.9	2	2.9
186		12X19CE79	MT10114/(06X446B45-3, SY Clearstone	177	181	34.6	35.4	5	6		x	4	5	5	5.0					9.9	3	3.0
187		12X27E7	MTCS1203//(SY Clearstone sib, MTCL11	178	181	33.5	34.6	5	7		x	5	6	5	5.5					10.0	4	3.2
188		12X27E17	MTCS1203//(SY Clearstone sib, MTCL11	178	181	33.1	33.9	5	6		5	5	6	6	5.4					11.8	3	3.6
189	w2	12X27E20	MTCS1203//(SY Clearstone sib, MTCL11	177	179	34.6	33.5	6	6		6	6	6	6	6.0					10.6	2	3.6
190		12X27E39	MTCS1203//(SY Clearstone sib, MTCL11	177	180	35.4	34.6	5	6		6	5	6	5	5.4					10.3	4	3.4
191		12X27E59	MTCS1203//(SY Clearstone sib, MTCL11	177	181	34.3	35.4	6	6		6	6	5	5	5.6					10.1	4	3.0
192		12X27E72	MTCS1203//(SY Clearstone sib, MTCL11	178	181	33.5	32.7	6	7		6	6	6	6	6.1					10.2	4	3.3
193	w4	12X27E75	MTCS1203//(SY Clearstone sib, MTCL11	176	178	34.3	33.5	6	7		x	4	7	6	6.0					10.6	4	3.8
194		12X27E88	MTCS1203//(SY Clearstone sib, MTCL11	178	181	35.4	34.6	6	6		6	6	6	6	6.0					10.5	4	2.8
195	w4	12X27E91	MTCS1203//(SY Clearstone sib, MTCL11	177	181	32.3	31.9	6	7		5	5	6	6	5.7					10.5	4	3.4
196		12X34E4	MTCS1203//MTCL1162/(MTCL1068, SY	179	181	33.5	34.6	7	6		6	5	5	7	6.0					10.2	4	4.0
197		12X34E19	MTCS1203//MTCL1162/(MTCL1068, SY	177	182	34.3	33.1	6	6		7	6	6	7	6.1					10.9	4	3.8
198		12X34E28	MTCS1203//MTCL1162/(MTCL1068, SY	179	183	35.8	35.8	6	6		4	5	7	6	5.7					10.6	4	3.4
199		12X34E51	MTCS1203//MTCL1162/(MTCL1068, SY	179	183	32.7	33.5	6	5		x	4	6	6	5.3					10.9	4	4.6
200		12X34E69	MTCS1203//MTCL1162/(MTCL1068, SY	176	179	35.4	36.2	6	6		5	5	6	6	5.7					12.0	5	3.8
201	Yellowstone	SY Clearstone 2CL at FE		178	181	36.6	36.6	7	5		6	6	5	5	5.6							
202	Decade	Yellowstone at FE		175		34.3		6	4		6	7		4	5.4	10	5	60				
203	12X34E92	MTCS1203//MTCL1162/(MTCL1068, SY		177	182	33.9	31.9	6	7		5	5	6	7	6.1					11.6	4	3.8
204	12X34E94	MTCS1203//MTCL1162/(MTCL1068, SY		179	182	34.3	35.8	6	6		x	4	5	6	5.3		tr			10.7	4	4.4
205	12X152CE2	MT1137/MTCL1067		179	182	35.8	33.5	5	6		x	4	5	6	5.2					11.1	4	3.5
206	12X152CE7	MT1137/MTCL1067		178	181	37.0	36.6	6	6		5	5	6	7	5.7		3			12.1	4	3.5
207	12X152CE9	MT1137/MTCL1067		177	181	37.8	35.4	6	5		7	5	5	6	5.6		1			10.3	0	3.0
208	h	12X152CE11	MT1137/MTCL1067	177	179	34.6	35.8	7	7		6	6	7	7	6.7		3			11.5	1	3.0
209		12X152CE15	MT1137/MTCL1067	178	181	35.8	35.4	7	6		7	5	7	6	6.1					11.2	1	3.6
210		12X152CE19	MT1137/MTCL1067	179	182	36.2	36.6	6	7		5	5	6	5	5.6		5			10.7	1	3.4
211	12X152CE24	MT1137/MTCL1067		179	182	36.2	36.6	6	6		5	5	7	5	5.6					10.6	1	3.4
212	12X152CE33	MT1137/MTCL1067		178	180	35.8	37.0	6	6		7	5	6	5	5.9		5			10.6	1	3.2
213	12X152CE38	MT1137/MTCL1067		180	182	31.5	31.9	7	6		6	5	7	6	6.0		10			10.7	1	3.3
214	h	12X152CE43	MT1137/MTCL1067	179	180	33.9	34.6	7	6		7	6	7	7	6.7	tr	5			11.1	1	3.2
215	12X152CE53	MT1137/MTCL1067		179	181	30.3	29.9	6	5		6	6	5	6	5.7					10.9	1	3.5
216	12X152CE65	MT1137/MTCL1067		178	180	35.0	37.0	5	6		x	5	6	5	5.3		5			11.6	1	3.6
217	12X152CE67	MT1137/MTCL1067		178	181	35.4	35.8	5	6		x	3	5	5	5.0		20			10.9	3	2.8
218	12X152CE69	MT1137/MTCL1067		177	181	34.6	34.6	6	7		6	5	7	6	6.1		15			11.4	1	3.5
219	12X152CE87	MT1137/MTCL1067		177	182	35.4	35.4	5	5		5	5	7	5	5.3	3	15			11.8	3	3.2
220	12X152CE89	MT1137/MTCL1067		177	182	36.6	37.8	6	6		7	5	7	5	5.9	2	5			12.3	1	3.2
221	12X152CE93	MT1137/MTCL1067		178	181	34.6	33.9	5	7		6	6	5	6	5.9		5			11.9	1	3.4

Table 150. 2019 Single Rep Observation 'A' Nursery (SROA): All Location data

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height		Agronomic Score								Stripe rust %		2018 HR data					
				BZ	FE	BZ	FE	PLB BZ	JEB BZ	PLB MC	JEB MC	PLB FE-CLO	JEB JEB	FE-Sr JEB	Aver- age	BZ	FE-Sr >5%	24-Jul	6-Aug	ein	12.2	0	3.4
222		12X152cE94	MT1137/MTCL1067	178	180	33.1	33.5	6	6	x	4	5	6	6	6	5.5				12.2	0	3.4	
223		12X152cE101	MT1137/MTCL1067	178	182	33.1	33.5	6	6	x	4	6	7	7	7	6.0	tr			11.8	0	3.0	
224	w1	12X154E5	SY Clearstone 2CL/MT1078	177	181	37.4	35.8	5	5	4	5	5	5	5	5	4.9				11.4	1	3.0	
225	w3	12X154E6	SY Clearstone 2CL/MT1078	178	182	34.3	34.6	6	6	6	6	6	7	7	6	6.1	tr			12.5	3	3.6	
226	w1	12X154E10	SY Clearstone 2CL/MT1078	176	182	34.6	34.6	6	6	7	7	6	5	5	5	6.0				12.3	1	3.2	
227	w3	12X154E12	SY Clearstone 2CL/MT1078	178	183	35.4	33.9	6	7	6	6	5	6	5	5	5.9				12.5	3	3.4	
228		12X154E25	SY Clearstone 2CL/MT1078	179	183	35.4	34.3	5	6	x	4	6	6	6	6	5.5	tr	5		11.5	3	2.7	
229	w3	12X154E28	SY Clearstone 2CL/MT1078	177	180	36.2	36.6	6	7	x	3	7	7	7	5	5.8		10		11.6	3	2.8	
230		12X154E29	SY Clearstone 2CL/MT1078	178	182	32.7	32.7	6	6	5	5	5	6	6	6	5.6				10.8	3	2.9	
231	w1	12X154E41	SY Clearstone 2CL/MT1078	177	180	36.2	36.6	6	6	7	6	6	7	6	6	6.3				10.4	1	3.2	
232		12X154E48	SY Clearstone 2CL/MT1078	178	182	35.8	37.4	5	6	5	5	5	5	5	5	5.1	tr	5		10.3	3	3.0	
233	w4	d 12X154E53	SY Clearstone 2CL/MT1078	177	180	37.0	39.4	5	5	6	5	6	5	5	5	5.3				10.9	4	3.3	
234	w3	12X154E55	SY Clearstone 2CL/MT1078	176	181	35.4	35.8	6	7	x	3	6	6	6	6	5.7	tr			11.0	3	2.8	
235		12X154E57	SY Clearstone 2CL/MT1078	179	182	36.6	37.0	5	6	x	4	6	6	6	5	5.3	2	5		10.1	4	3.0	
236	w2	12X154E71	SY Clearstone 2CL/MT1078	176	179	36.2	37.0	7	7	6	5	7	6	6	5	6.1				9.9	2	3.0	
237	w4	d 12X154E81	SY Clearstone 2CL/MT1078	177	180	34.3	35.8	5	6	6	6	6	7	6	6	6.0				10.5	4	3.2	
238	w5	d 12X154E83	SY Clearstone 2CL/MT1078	178	181	36.2	36.6	6	6	6	5	6	6	6	5	5.7		5		10.3	5	3.0	
239	w5	d 12X154E95	SY Clearstone 2CL/MT1078	176	179	34.6	36.2	6	7	7	7	6	7	6	6	6.6				10.9	5	3.2	
240	w5	d 12X154E99	SY Clearstone 2CL/MT1078	177	180	34.3	33.9	5	7	x	3	6	6	6	7	5.7				11.3	5	2.9	
241		12X155cE2	MTCL1067/WB-Quake	178	181	36.6	36.6	6	6	x	4	5	5	5	5	5.2				11.3	4	3.5	
242		12X155cE8	MTCL1067/WB-Quake	180	182	33.9	31.9	5	6	5	5	5	6	6	6	5.4	tr			11.2	4	3.7	
243		12X155cE17	MTCL1067/WB-Quake	179	182	33.5	33.5	5	6	7	6	5	6	5	5	5.7				11.8	4	3.4	
244		12X155cE28	MTCL1067/WB-Quake	179	182	36.2	35.0	6	5	6	6	5	5	5	5	5.4				11.5	5	3.8	
245		12X155cE32	MTCL1067/WB-Quake	179	183	33.1	34.3	5	6	6	5	5	6	6	5	5.4				11.2	4	3.4	
246		12X155cE41	MTCL1067/WB-Quake	177	181	32.7	32.7	5	6	5	4	5	7	6	6	5.4		5		12.0	4	4.0	
247		12X155cE45	MTCL1067/WB-Quake	180	182	35.0	35.8	6	6	5	5	5	6	5	5	5.4				11.7	4	3.3	
248		12X155cE59	MTCL1067/WB-Quake	180	184	35.4	34.3	6	6	5	5	6	5	6	5.6				10.8	4	3.2		
249		12X155cE71	MTCL1067/WB-Quake	179	182	34.6	34.6	5	6	6	6	6	6	6	5.9				11.1	4	3.5		
250		12X155cE80	MTCL1067/WB-Quake	179	182	33.1	33.5	3	5	4	4	4	6	6	5	4.4				10.5	5	3.1	
251	h	Yellowstone	SY Clearstone 2CL at FE	179	181	37.0	37.8	7	5	6	5	6	5	5	5	5.6	tr	5					
252		Decade	Yellowstone at FE	175		34.3		6	5	6	6			4	4	5.4	10	80					
253	h	12X155cE81	MTCL1067/WB-Quake	177	181	35.0	33.9	6	7	6	5	7	7	6	6	6.3				11.1	5	3.4	
254		12X155cE84	MTCL1067/WB-Quake	180	182	34.6	34.6	5	6	5	5	5	6	6	6	5.4				10.5	5	2.6	
255		12X155cE93	MTCL1067/WB-Quake	177	180	36.2	35.8	6	7	5	6	5	7	5	5	5.9		5		10.5	4	3.4	
256		12X155cE105	MTCL1067/WB-Quake	181	183	35.8	32.7	6	6	6	5	5	6	5	5	5.6		5		10.1	4	3.1	
257		11X262E9-4	MT1145/MTCL1127	175	178	32.3	30.7	7	6	6	6	7	7	5	6.3		5	20		11.6	4	3.6	
258		11X262E51-2	MT1145/MTCL1127	170	175	31.9	30.7	7	6	8	5	6	6	4	6.0			25		11.7	4	3.4	
259		11X263E61-3	MTCL1127/MT0866	172	177	31.1	30.7	7	7	7	7	7	7	4	6.6			60		12.5	4	3.9	
260		11X265E34-2	MTCL1127/06X368cE55	177	180	25.2	37.4	5	5	5	4	6	4	3	4.6		tr	20		10.7	4	3.6	
261		11X267E22-2	MTCL1125/Northern	177	179	32.3	33.1	7	6	6	6	7	5	5	6.0			1	15	10.1	4	2.6	
262		11X267E50-4	MTCL1125/Northern	180	182	33.5	34.3	6	6	5	5	5	5	6	5.4			5		10.2	4	2.9	
263		11X267E56-2	MTCL1125/Northern	180	182	35.0	33.9	6	7	6	6	6	5	5	5.9			5		11.8	5	3.2	
264	d	11X268E2-1	MTCL1125/MT1091	177	180	35.0	34.6	7	6	6	5	6	5	6	5.9				11.5	4	2.2		
265		11X268E11-2	MTCL1125/MT1091	178	177	33.9	35.4	7	6	5	5	7	7	6	6.1				12.1	4	2.6		
266	h	11X268E16-4	MTCL1125/MT1091	178	179	35.0	36.2	7	6	6	5	7	6	7	6.3				11.7	4	2.8		

Table 150. 2019 Single Rep Observation 'A' Nursery (SROA): All Location data

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height		Agronomic Score						Stripe rust %		2018 HR data						
				BZ	FE	BZ	FE	PLB BZ	JEB BZ	PLB MC	JEB MC	PLB FE-CLO	JEB FE-Sr JEB	Aver- age	BZ	FE-Sr >5%	Prot- PPO	SDS				
267	h	11X268E25-3	MTCL1125/MT1091	176	180	34.6	35.4	8	6	7	6	6	7	6	6.6		24-Jul	6-Aug	ein	12.1	4	3.0
268		11X268E31-3	MTCL1125/MT1091	177	180	35.4	34.6	6	7	5	5	6	6	6	5.9					12.1	4	2.8
269	h	11X268E48-4	MTCL1125/MT1091	177	180	34.3	33.5	7	7	7	6	7	6	7	6.7					12.3	4	2.6
270		11X268E53-3	MTCL1125/MT1091	177	180	33.5	34.6	6	6	6	6	6	7	6	6.1					12.1	4	3.2
271		11X269E29-4	MTCL1125/MT10128	183	185	33.1	31.9	6	6	6	5	5	5	5	5.4	3	15			11.5	4	2.8
272	d	11X269E44-4	MTCL1125/MT10128	182	183	33.9	34.6	6	6	6	6	7	6	6	6.1		5			10.4	4	2.5
273	d	11X269E66-2	MTCL1125/MT10128	182	184	33.9	33.1	6	7	5	5	6	6	5	5.7	2	20			11.1	4	2.4
274		11X269E86-3	MTCL1125/MT10128	182	184	32.3	32.3	7	6	6	7	6	6	5	6.1	1	15			10.4	4	3.0
275	h	11X270E2-4	MT0871/(06X445B1-2, SY Clearstone sib)	171	177	30.3	30.3	7	7	7	6	8	6	6	6.7					11.3	1	3.8
276		11X270E6-2	MT0871/(06X445B1-2, SY Clearstone sib)	176	178	32.7	32.3	7	7	x	4	7	7	7	6.5					11.7	1	3.5
277		11X270E16-2	MT0871/(06X445B1-2, SY Clearstone sib)	178	179	33.1	31.1	6	6	5	5	5	7	6	5.7					12.2	1	3.4
278	h	11X270E17-1	MT0871/(06X445B1-2, SY Clearstone sib)	176	178	32.3	32.3	7	6	7	6	7	8	7	6.9					11.8	1	3.0
279		11X270E20-3	MT0871/(06X445B1-2, SY Clearstone sib)	175	178	32.3	29.1	8	6	7	5	6	6	6	6.3	tr				11.6	1	3.6
280	h	11X270E21-3	MT0871/(06X445B1-2, SY Clearstone sib)	176	177	31.5	29.5	7	7	6	7	6	7	7	6.7					11.7	1	3.6
281		11X270E24-3	MT0871/(06X445B1-2, SY Clearstone sib)	179	182	30.3	29.9	6	6	5	6	6	6	7	6.0					11.7	0	3.0
282	h	11X270E26-1	MT0871/(06X445B1-2, SY Clearstone sib)	176	180	32.7	30.7	7	7	7	6	6	7	6	6.6					11.4	1	3.4
283		11X270E27-4	MT0871/(06X445B1-2, SY Clearstone sib)	177	181	31.9	29.5	6	6	5	6	5	6	7	5.9	tr				11.6	1	2.6
284		11X270E32-3	MT0871/(06X445B1-2, SY Clearstone sib)	177	180	30.3	29.5	6	6	6	5	5	6	7	5.9					11.2	1	3.2
285		11X270E47-1	MT0871/(06X445B1-2, SY Clearstone sib)	179	181	32.3	30.7	6	6	7	5	6	7	8	6.4					11.1	1	3.2
286		11X270E64-1	MT0871/(06X445B1-2, SY Clearstone sib)	179	182	32.3	32.7	7	6	6	6	7	7	6	6.4					11.7	0	3.4
287		11X270E67-3	MT0871/(06X445B1-2, SY Clearstone sib)	175	178	32.3	31.9	6	7	6	6	6	7	7	6.4					11.9	0	2.8
288		11X270E79-1	MT0871/(06X445B1-2, SY Clearstone sib)	176	179	29.9	32.3	6	6	5	5	5	6	6	5.6					11.2	1	3.1
289		11X270E83-1	MT0871/(06X445B1-2, SY Clearstone sib)	177	181	30.7	31.5	7	7	5	6	6	6	8	6.4					11.6	1	3.2
290		11X270E92-1	MT0871/(06X445B1-2, SY Clearstone sib)	177	179	30.3	30.3	6	6	5	5	6	6	7	5.9					10.7	1	3.4
291		11X270E96-3	MT0871/(06X445B1-2, SY Clearstone sib)	178	181	33.9	32.3	6	6	6	5	6	7	6	6.0					11.1	1	3.8
292	h	11X270E101-4	MT0871/(06X445B1-2, SY Clearstone sib)	179	182	32.3	32.7	7	7	6	6	7	6	7	6.6					11.1	0	3.4
293	h	11X270E102-2	MT0871/(06X445B1-2, SY Clearstone sib)	175	176	30.7	29.9	7	7	7	5	7	6	7	6.6					11.4	1	3.4
294		12X7D20-3	MTCL1260/(SY Clearstone sib, MTCL10	176	176	35.4	34.3	7	7	4	5	6	7	5	5.9					11.1	3	3.7
295		12X7D37-1	MTCL1260/(SY Clearstone sib, MTCL10	176	177	36.2	35.4	6	6	5	5	6	6	5	5.6					11.5	3	3.2
296		12X7D64-3	MTCL1260/(SY Clearstone sib, MTCL10	176	177	34.6	34.3	6	5	6	6	7	6	6	6.0	tr	5			10.8	3	3.4
297		12X7D79-3	MTCL1260/(SY Clearstone sib, MTCL10	176	177	34.6	33.9	6	6	6	5	5	7	5	5.7	1				11.0	3	3.3
298		12X7D98-2	MTCL1260/(SY Clearstone sib, MTCL10	176	177	35.0	32.7	6	6	6	5	6	7	5	5.9					10.7	3	2.8
299		12X7D100-1	MTCL1260/(SY Clearstone sib, MTCL10	175	177	35.8	33.9	6	6	6	5	5	6	5	5.6					10.6	3	3.2
300		12X98E42	Northern//MT10114/MT0954	177		33.9		6	6	6	5			6	5.8					11.0	0	4.7
301	Yellowstone	check	check	178		38.6		7	5	5	5			5	5.4	tr						
302	Yellowstone	check	check	178		36.2		7	5	6	6			4	5.6	15	80					
303	12X98E48	Northern//MT10114/MT0954	Northern//MT10114/MT0954	178		33.9		6	5	6	6			4	5.4	tr	20			11.7	1	3.6
304	12X98E54	Northern//MT10114/MT0954	Northern//MT10114/MT0954	178		33.5		6	6	5	6			6	5.8	5				11.0	1	3.4
305	12X98E59	Northern//MT10114/MT0954	Northern//MT10114/MT0954	178		35.4		5	5	5	5			5	5.0					12.2	1	4.2
306	12X98E64	Northern//MT10114/MT0954	Northern//MT10114/MT0954	178		33.1		6	6	6	5			6	5.8					11.6	2	3.8
307	12X98E69	Northern//MT10114/MT0954	Northern//MT10114/MT0954	178		33.9		6	6	6	5			6	5.8					10.9	2	3.2
308	12X98E80	Northern//MT10114/MT0954	Northern//MT10114/MT0954	179		35.0		6	7	5	5			5	5.6					10.2	1	3.2
309	12X98E86	Northern//MT10114/MT0954	Northern//MT10114/MT0954	177		35.4		6	6	7	6			6	6.2					11.4	2	2.9
310	12X98E101	Northern//MT10114/MT0954	Northern//MT10114/MT0954	177		35.0		6	6	6	6			5	5.8					9.3	1	2.8
311	12X98E106	Northern//MT10114/MT0954	Northern//MT10114/MT0954	179		33.1		6	6	5	5			6	5.6	2				9.3	1	3.2

Table 150. 2019 Single Rep Observation 'A' Nursery (SROA): All Location data

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height		Agronomic Score						Stripe rust %		2018 HR data				
				BZ	FE	BZ	FE	PLB BZ	JEB BZ	PLB MC	JEB MC	PLB FE-CLO	JEB JEB	FE-Sr JEB	Aver- age	BZ	FE-Sr >5%	2018 HR data		
																		Prot-	PPO SDS	
312		12X98E113	Northern//MT10114/MT0954	177		34.6		7	7	5	5			7	6.2			10.6	1	2.9
313		12X98E121	Northern//MT10114/MT0954	178		33.1		6	6	5	4			6	5.4			9.5	1	3.6
314		12X98E123	Northern//MT10114/MT0954	177		33.9		6	7	5	6			6	6.0			10.1	1	3.2
315		12X98E126	Northern//MT10114/MT0954	178		33.5		6	7	6	5			6	6.0			9.5	1	3.0
316		12X98E139	Northern//MT10114/MT0954	178		35.0		6	6	7	6			6	6.2	tr		10.2	1	3.4
317		12X99cE11	MT1137/MT1078/MT1149	177		30.7		6	6	6	5			7	6.0			9.8	1	2.8
318		12X99cE22	MT1137/MT1078/MT1149	178		34.3		7	7	4	5			7	6.0			9.4	3	3.3
319		12X99cE27	MT1137/MT1078/MT1149	177		33.9		7	7	5	5			5	5.8	10	50	9.2	3	3.1
320		12X99cE28	MT1137/MT1078/MT1149	177		33.9		6	6	6	5			5	5.6			9.5	3	3.6
321		12X99cE34	MT1137/MT1078/MT1149	178		34.6		6	6	7	6			6	6.2	3	10	9.6	3	2.8
322		12X99cE36	MT1137/MT1078/MT1149	178		34.3		7	6	6	6			7	6.4		20	9.7	3	3.2
323	h	12X99cE105	MT1137/MT1078/MT1149	178		32.3		7	7	6	6			6	6.4			9.6	4	3.2
324		12X99cE112	MT1137/MT1078/MT1149	177		31.9		6	6	6	5			7	6.0		10	9.7	4	3.3
325	h	12X99cE120	MT1137/MT1078/MT1149	175		32.7		7	7	7	5			6	6.4			10.7	4	3.7
326		12X99cE122	MT1137/MT1078/MT1149	176		33.5		3	4	6	5			5	4.6			10.1	3	3.4
327		12X99cE126	MT1137/MT1078/MT1149	180		33.5		5	5	6	6			5	5.4	2	5	10.0	4	3.0
328		12X99cE128	MT1137/MT1078/MT1149	177		33.9		6	6	7	6			5	6.0		15	10.6	3	3.0
329		12X99cE131	MT1137/MT1078/MT1149	178		33.9		4	6	6	5			5	5.2			9.9	4	3.2
330	d	12X102E2	MT10113//MT1145/MT10102	174		33.1		8	6	7	7			6	6.8			9.7	4	2.4
331	h	12X102E37	MT10113//MT1145/MT10102	171		31.1		8	7	7	6			7	7.0			9.7	4	2.7
332	d	12X102E59	MT10113//MT1145/MT10102	176		32.3		5	6	6	5			6	5.6			9.5	4	2.3
333		12X102E66	MT10113//MT1145/MT10102	177		35.8		6	5	6	6			5	5.6			9.5	4	2.6
334	d	12X102E92	MT10113//MT1145/MT10102	171		31.1		8	6	6	5			7	6.4			10.2	4	2.5
335		12X102E98	MT10113//MT1145/MT10102	172		33.1		7	7	6	6			5	6.2			11.0	4	2.6
336		12X102E109	MT10113//MT1145/MT10102	171		30.3		5	6	6	5			6	5.6			10.4	4	3.3
337		12X103E21	MT1149//MT10102/MT10116	178		32.3		6	6	6	5			6	5.8		5	9.3	3	3.0
338		12X103E24	MT1149//MT10102/MT10116	176		34.3		6	6	5	5			5	5.4			9.5	4	3.2
339	d	12X103E38	MT1149//MT10102/MT10116	177		32.3		7	7	6	5			6	6.2	tr		9.8	1	2.5
340		12X103E39	MT1149//MT10102/MT10116	177		32.3		6	6	6	6			7	6.2			10.2	4	3.8
341		12X103E42	MT1149//MT10102/MT10116	178		33.9		6	6	7	6			6	6.2			10.2	4	3.6
342		12X103E50	MT1149//MT10102/MT10116	178		33.9		6	6	x	5			6	5.8			9.5	4	3.0
343		12X103E61	MT1149//MT10102/MT10116	178		35.0		6	7	x	4			7	6.0			10.9	4	3.9
344		12X103E65	MT1149//MT10102/MT10116	177		33.9		7	6	6	6			6	6.2	3	5	9.7	0	3.1
345	h	12X103E77	MT1149//MT10102/MT10116	180		33.5		7	7	7	6			5	6.4	tr		11.2	3	3.4
346		12X103E78	MT1149//MT10102/MT10116	179		33.5		6	6	6	5			7	6.0			11.4	3	3.8
347	d	12X103E83	MT1149//MT10102/MT10116	177		33.5		7	6	7	6			6	6.4	tr	10	9.3	1	2.4
348		12X103E124	MT1149//MT10102/MT10116	179		35.0		6	6	5	5			5	5.4	tr	5	9.9	4	3.3
349		12X103E128	MT1149//MT10102/MT10116	176		37.0		6	6	5	5			5	5.4			10.2	4	3.2
350		12X104E1	MT10113//MT1137/MT10122	175		31.1		6	6	6	5			5	5.6	tr	10	10.2	0	2.8
351	Yellowstone	check	check	178		38.6		7	5	6	5			5	5.6	tr	5			
352	Decade	check	check	175		35.0		6	4	6	6			4	5.2	3	20			
353	12X104E4		MT10113//MT1137/MT10122	174		31.9		6	6	6	6			5	5.8		tr	10.1	2	3.1
354	12X104E27		MT10113//MT1137/MT10122	172		31.1		7	6	7	5			5	6.0	5	20	12.0	2	3.3
355	12X104E30		MT10113//MT1137/MT10122	172		31.1		6	6	5	6			6	5.8		5	10.2	5	3.2
356	12X104E37		MT10113//MT1137/MT10122	172		29.5		6	6	7	6			5	6.0			10.0	5	3.2

Table 150. 2019 Single Rep Observation 'A' Nursery (SROA): All Location data

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height		Agronomic Score						Stripe rust %		2018 HR data						
				BZ	FE	BZ	FE	PLB BZ	JEB BZ	PLB MC	JEB MC	PLB FE-CLO	JEB JEB	FE-Sr JEB	Aver- age	BZ	FE-Sr >5%	2018 HR data				
																		Prot-	PPO SDS			
357	h	12X104E45	MT10113/MT1137/MT10122	171		29.9		7	6	7	7						24-Jul	6-Aug	ein	10.4	5	3.3
358		12X104E51	MT10113/MT1137/MT10122	172		31.9		7	6	6	6									10.9	5	3.4
359	w2	12X104E55	MT10113/MT1137/MT10122	171		33.1		7	5	7	6						5	30		11.3	2	3.3
360		12X104E57	MT10113/MT1137/MT10122	172		31.5		7	7	6	5						10	40		9.8	5	3.5
361		12X104E100	MT10113/MT1137/MT10122	172		27.2		5	5	x	4						20	70		9.4	4	3.2
362		12X104E103	MT10113/MT1137/MT10122	172		29.9		6	7	6	6					tr	10	50		11.4	4	3.0
363		12X104E108	MT10113/MT1137/MT10122	175		29.9		6	6	6	6					tr	50	90		10.1	0	2.8
364	w1	12X104E113	MT10113/MT1137/MT10122	176		33.9		6	5	7	5					3	70	100		10.3	1	3.2
365		12X105E1	MT10114/MT10128/MTW1251	177		33.1		6	6	7	6					tr	20	70		9.5	4	3.0
366		12X105E7	MT10114/MT10128/MTW1251	177		33.9		6	7	x	5					tr	35	60		10.1	4	3.2
367		12X105E10	MT10114/MT10128/MTW1251	178		32.3		7	6	x	4						5	10		9.7	4	3.2
368		12X105E14	MT10114/MT10128/MTW1251	178		32.7		7	7	7	7						1	15		9.9	4	2.7
369		12X105E17	MT10114/MT10128/MTW1251	178		31.1		6	6	6	6						tr	10		10.2	1	3.4
370		12X105E21	MT10114/MT10128/MTW1251	179		34.3		6	7	7	7					tr	10	35		9.8	4	3.1
371		12X105E23	MT10114/MT10128/MTW1251	178		29.5		6	6	6	6						5	15		10.1	1	3.1
372		12X105E24	MT10114/MT10128/MTW1251	179		32.7		7	7	x	4						1	10		9.8	3	3.0
373		12X105E28	MT10114/MT10128/MTW1251	180		33.5		6	5	x	4					tr	tr	25		10.7	2	2.7
374		12X105E29	MT10114/MT10128/MTW1251	178		32.7		7	6	7	5						tr	10		9.7	4	3.1
375		12X105E31	MT10114/MT10128/MTW1251	177		31.9		7	6	7	6						15	15		10.3	4	3.1
376		12X105E80	MT10114/MT10128/MTW1251	177		33.5		6	7	6	5					tr		5		10.6	5	3.6
377		12X105E95	MT10114/MT10128/MTW1251	179		35.0		7	6	7	6						tr	15		9.6	1	3.0
378		12X105E97	MT10114/MT10128/MTW1251	180		30.7		6	6	6	5						1	25		9.5	4	2.7
379		12X105E101	MT10114/MT10128/MTW1251	179		33.5		8	6	x	5						3	15		9.5	1	2.6
380		12X105E104	MT10114/MT10128/MTW1251	180		33.5		5	5	7	7						70	100		10.5	1	3.5
381		12X105E106	MT10114/MT10128/MTW1251	179		31.1		6	6	6	6						10	30		10.5	1	2.9
382		12X105E113	MT10114/MT10128/MTW1251	179		33.1		7	5	6	6					5	40	90		9.9	3	3.0
383		12X105E114	MT10114/MT10128/MTW1251	180		32.7		4	5	6	5						50	90		10.9	3	2.9
384		12X105E116	MT10114/MT10128/MTW1251	177		31.9		7	6	x	5						tr	15		9.7	3	2.9
385		12X105E119	MT10114/MT10128/MTW1251	177		31.5		7	7	x	4						tr	20		9.6	3	3.0
386	h	12X105E126	MT10114/MT10128/MTW1251	177		32.7		7	6	7	6					2	10	10.1		10.1	3	2.8
387	w	12X105E130	MT10114/MT10128/MTW1251	176		31.5		8	7	7	6							20		9.5	3	3.0
388		12X106E3	Northern/MT1143/06X424B6	178		32.7		6	6	6	7					tr	10	40		11.0	2	2.6
389		12X106E13	Northern/MT1143/06X424B6	176		31.9		7	6	7	6					5	25	80		10.1	1	2.9
390		12X106E36	Northern/MT1143/06X424B6	177		33.5		7	4	x	4					10	15	70		12.1	1	4.4
391		12X106E42	Northern/MT1143/06X424B6	178		33.1		6	5	x	4					tr	20			10.0	2	2.7
392	h	12X106E43	Northern/MT1143/06X424B6	175		31.5		7	6	7	6							5		11.2	3	2.6
393		12X106E53	Northern/MT1143/06X424B6	178		33.1		5	6	6	5									10.7	3	2.7
394		12X106E54	Northern/MT1143/06X424B6	176		34.6		6	6	6	6									11.2	3	3.0
395		12X106E57	Northern/MT1143/06X424B6	178		34.6		6	5	5	6					20	5	5		10.5	1	2.8
396		12X106E65	Northern/MT1143/06X424B6	177		33.5		7	5	x	3					15	5	25		9.7	1	3.0
397		12X106E67	Northern/MT1143/06X424B6	177		30.7		7	5	x	3					tr	15	15		10.2	4	2.6
398		12X106E73	Northern/MT1143/06X424B6	178		33.1		6	6	6	6					tr	10	10		10.2	2	2.8
399		12X106E89	Northern/MT1143/06X424B6	178		33.5		6	6	5	5					tr	5	5		-	1	2.7
400	d	12X106E96	Northern/MT1143/06X424B6	178		32.7		6	7	5	4									-	3	2.4
401		Yellowstone	check	178		38.6		7	5	7	6					tr						

Table 150. 2019 Single Rep Observation 'A' Nursery (SROA): All Location data

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height		Agronomic Score							Stripe rust %		2018 HR data					
				BZ	FE	BZ	FE	PLB BZ	JEB BZ	PLB MC	JEB MC	PLB FE-CLO	JEB JEB	FE-Sr JEB	Aver- age	BZ	FE-Sr >5%	24-Jul	6-Aug	ein		
402		Decade	check	175		34.6		6	4	x	4			4	4.5	10						
403		12X106E99	Northern//MT1143J06X424B6	177		33.1		6	5	x	4			5	5.0	tr		5	15	9.4	2	2.9
404		12X106E109	Northern//MT1143J06X424B6	176		33.1		7	5	5	6			4	5.4	1		5	25	9.9	2	3.0
405		12X106E119	Northern//MT1143J06X424B6	177		35.8		6	4	6	5			5	5.2	15		5	30	9.6	2	2.6
406		12X106E124	Northern//MT1143J06X424B6	176		29.9		6	5	6	5			6	5.6	tr			5	9.9	4	2.6
407		d 12X106E126	Northern//MT1143J06X424B6	177		34.3		6	6	6	7			6	6.2			5	10	9.2	2	2.4
408		12X106E133	Northern//MT1143J06X424B6	176		34.3		7	5	x	2			4	4.5	tr		15	50	9.2	1	3.4
409		12X107E31	MT101113/(474-23, winter McNeal)/MT10	172		33.5		6	4	x	4			4	4.5	10		20	80	10.4	1	3.7
410		12X107E44	MT101113/(474-23, winter McNeal)/MT10	171		30.3		5	4	5	5			4	4.6	20		10	60	11.1	4	3.4
411	h	12X107E87	MT101113/(474-23, winter McNeal)/MT10	176		35.4		7	6	7	7			5	6.4			10		10.1	4	3.8
412		12X107E95	MT101113/(474-23, winter McNeal)/MT10	176		29.1		5	5	5	5			6	5.2	15		5		10.1	5	3.0
413		12X108E12	Overland/(457-12, winter McNeal)/MT10	172		34.6		6	5	7	7			5	6.0	5		3	10	11.1	4	2.6
414		12X108E13	Overland/(457-12, winter McNeal)/MT10	175		32.3		7	5	x	5			6	5.8	3		tr	15	10.6	4	2.6
415		12X108E26	Overland/(457-12, winter McNeal)/MT10	177		34.3		6	5	x	5			5	5.3	tr				10.6	4	2.8
416		12X108E28	Overland/(457-12, winter McNeal)/MT10	175		33.9		7	6	7	7			5	6.4					10.8	5	2.6
417		12X108E66	Overland/(457-12, winter McNeal)/MT10	177		32.7		5	6	6	6			6	5.8					10.1	4	3.0
418		12X108E97	Overland/(457-12, winter McNeal)/MT10	177		33.1		6	7	6	5			6	6.0			3		11.3	4	3.6
419	h	12X108E117	Overland/(457-12, winter McNeal)/MT10	176		34.3		8	6	7	7			7	7.0			tr	10	10.9	5	3.0
420		12X108E127	Overland/(457-12, winter McNeal)/MT10	174		30.7		5	5	6	5			5	5.2	tr		5	20	12.5	4	3.5
421	w2	12X109cE12	WB3768*2/(10K1726w, Yellowstone white)	181		35.8		6	5	5	5			5	5.2	2		tr	5	10.6	2	3.2
422	w2	12X109cE13	WB3768*2/(10K1726w, Yellowstone white)	183		33.9		5	6	4	4			6	5.0					10.5	2	3.0
423	h	12X109cE22	WB3768*2/(10K1726w, Yellowstone white)	180		33.9		7	7	6	5			7	6.4			tr		10.6	2	3.1
424	h	12X109cE24	WB3768*2/(10K1726w, Yellowstone white)	180		34.6		7	6	7	6			6	6.4	tr		tr		11.4	2	3.9
425	w1	12X109cE34	WB3768*2/(10K1726w, Yellowstone white)	180		33.1		6	6	6	5			6	5.8					10.0	1	3.0
426	w2	12X109cE48	WB3768*2/(10K1726w, Yellowstone white)	180		36.6		6	5	7	6			5	5.8	tr			5	10.0	2	2.6
427		12X109cE49	WB3768*2/(10K1726w, Yellowstone white)	176		35.8		6	6	7	6			4	5.8					10.5	1	3.0
428	w2	12X109cE50	WB3768*2/(10K1726w, Yellowstone white)	181		33.1		5	6	5	5			3	4.8					10.6	2	3.3
429	w1	12X109cE59	WB3768*2/(10K1726w, Yellowstone white)	182		35.8		6	5	6	6			4	5.4					9.2	1	2.7
430	w2	12X109cE62	WB3768*2/(10K1726w, Yellowstone white)	179		35.8		7	6	6	6			4	5.8					9.2	2	3.2
431	w2	12X109cE91	WB3768*2/(10K1726w, Yellowstone white)	180		36.2		6	5	5	5			4	5.0	tr				9.5	2	2.7
432	w1	12X110cE10	MT1088//WB3768/(10K1726w, Yellowsto	180		34.3		6	5	5	5			4	5.0	2				11.2	1	4.0
433		12X110cE30	MT1088//WB3768/(10K1726w, Yellowsto	179		35.0		7	4	6	5			5	5.4	5				11.9	1	3.6
434		12X110cE59	MT1088//WB3768/(10K1726w, Yellowsto	177		35.8		4	4	7	5			5	5.0	25		10	20	10.8	4	4.0
435		12X110cE68	MT1088//WB3768/(10K1726w, Yellowsto	179		33.9		6	5	6	5			4	5.2	5		5	10	9.7	1	3.1
436		12X110cE70	MT1088//WB3768/(10K1726w, Yellowsto	177		34.6		5	5	7	6			6	5.8	2		tr	5	10.1	3	4.0
437		12X110cE73	MT1088//WB3768/(10K1726w, Yellowsto	178		34.6		6	6	6	5			4	5.4			tr		10.2	1	3.4
438		12X110cE87	MT1088//WB3768/(10K1726w, Yellowsto	177		35.0		7	6	7	6			5	6.2			3	5	9.5	1	3.1
439		12X110cE91	MT1088//WB3768/(10K1726w, Yellowsto	180		33.1		5	6	6	5			6	5.6			5	5	9.3	1	3.0
440		12X110cE101	MT1088//WB3768/(10K1726w, Yellowsto	176		35.4		6	6	4	4			6	5.2			5	15	9.2	4	3.6
441		12X110cE107	MT1088//WB3768/(10K1726w, Yellowsto	177		34.6		5	5	7	6			5	5.6	2		3	30	9.2	4	3.2
442	w1	12X113E20	Northern/(10K1676w, Yellowstone white)	182		32.7		6	7	6	5			6	6.0					10.2	1	3.0
443		12X113E40	Northern/(10K1676w, Yellowstone white)	179		31.5		6	6	6	5			5	5.6					11.8	1	3.3
444	w1	d 12X113E45	Northern/(10K1676w, Yellowstone white)	181		33.9		5	6	x	2			6	4.8	tr				10.7	1	2.3
445	h	12X113E55	Northern/(10K1676w, Yellowstone white)	179		34.6		7	7	6	6			7	6.6					10.9	1	2.6
446		12X113E58	Northern/(10K1676w, Yellowstone white)	177		34.6		5	7	6	5			6	5.8					11.4	1	2.8

Table 150. 2019 Single Rep Observation 'A' Nursery (SROA): All Location data

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height		Agronomic Score						Stripe rust %		2018 HR data					
				BZ	FE	BZ	FE	PLB BZ	JEB BZ	PLB MC	JEB MC	PLB FE-CLO	JEB FE-CLO	FE-Sr JEB	Aver- age	BZ	FE-Sr >5%	2018 HR data			
																		Prot-	PPO SDS		
447	w3	12X113E70	Northern/(10K1676w, Yellowstone white)	182		33.9		6	5	6	5			5.6	tr	24-Jul	6-Aug	ein	10.7	3	2.7
448		12X113E79	Northern/(10K1676w, Yellowstone white)	178		35.4		5	5	7	7			5.8		10	25		9.6	1	2.6
449		12X114E7	MT1149/(10K1676w, Yellowstone white)	177		36.2		5	6	7	7			6.2	5				10.8	3	3.4
450		12X114E18	MT1149/(10K1676w, Yellowstone white)	177		35.4		5	6	7	6			5.8	10				12.1	3	3.4
451		Yellowstone	check	178		38.2		7	5	6	5			5.6	tr		5				
452		Decade	check	175		33.5		5	4	6	5			4.8	15	40					
453		12X114E28	MT1149/(10K1676w, Yellowstone white)	177		36.6		6	5	6	6			5.8					12.4	3	4.4
454		12X114E35	MT1149/(10K1676w, Yellowstone white)	178		36.2		6	6	6	5			5.6					11.1	3	4.6
455		12X114E62	MT1149/(10K1676w, Yellowstone white)	179		36.6		6	6	5	5			5.6					9.6	3	3.6
456		12X114E79	MT1149/(10K1676w, Yellowstone white)	176		39.0		4	5	6	6			5.2					9.7	3	3.4
457		12X114E104	MT1149/(10K1676w, Yellowstone white)	179		36.2		6	6	5	5			5.4					10.3	3	3.6
458		08X14cE19	YLL//Cap19Vida	176		31.9		7	6	6	5			5.8					11.4	3	3.1
459	h	08X14cE22	YLL//Cap19Vida	175		31.5		7	6	7	6			6.4		15	10		11.3	3	3.4
460		08X14cE36	YLL//Cap19Vida	175		31.5		7	6	6	6			6.2		20			10.0	3	2.6
461	h	08X14cE50	YLL//Cap19Vida	175		31.5		8	6	7	7			6.6		25	5		9.8	3	2.7
462		08X14cE59	YLL//Cap19Vida	175		31.5		8	6	6	5			6.0		30			9.7	3	3.4
463		08X14cE62	YLL//Cap19Vida	175		31.9		7	6	6	5			6.0		20	10		9.4	3	2.7
464	h	08X14cE74	YLL//Cap19Vida	175		33.1		8	7	7	6			6.6		5			9.3	3	3.0
465	h	08X14cE81	YLL//Cap19Vida	176		31.9		7	6	7	6			6.4					9.7	3	3.1
466		08X14cE93	YLL//Cap19Vida	177		35.8		5	6	5	6			5.4					10.7	3	3.3
467		08X14cE103	YLL//Cap19Vida	176		33.5		7	5	6	5			5.8					9.7	4	2.7
468		08X14cE110	YLL//Cap19Vida	176		33.1		7	6	6	5			6.0					10.4	3	3.1
469		08X14cE113	YLL//Cap19Vida	176		30.3		7	6	5	5			5.6					10.6	4	2.7
470		08X14cE115	YLL//Cap19Vida	177		36.6		5	6	4	5			5.0					10.5	3	2.8
471		12X117E2	Decade//MT0990/(10K1734w, Yellowstone)	171		32.3		4	4	6	6			4.8	20	20	70		12.5	4	3.4
472		12X117E10	Decade//MT0990/(10K1734w, Yellowstone)	172		34.6		4	3	6	5			4.2	20	50	100		10.7	4	2.6
473		12X117E14	Decade//MT0990/(10K1734w, Yellowstone)	174		32.7		4	4	6	6			4.8	15	15	80		9.7	1	2.7
474		12X117E18	Decade//MT0990/(10K1734w, Yellowstone)	175		32.7		4	3	7	7			5.2	25	10	70		9.6	3	2.6
475		12X117E28	Decade//MT0990/(10K1734w, Yellowstone)	170		29.5		4	4	5	6			4.6	5	10	80		11.3	0	2.8
476		12X117E31	Decade//MT0990/(10K1734w, Yellowstone)	171		32.3		4	5	6	6			5.0	tr	15	70		10.0	0	2.8
477		12X117E37	Decade//MT0990/(10K1734w, Yellowstone)	177		33.5		6	4	6	6			5.2	tr	5	60		11.2	0	2.8
478		12X117E52	Decade//MT0990/(10K1734w, Yellowstone)	181		34.6		5	6	6	5			5.2	tr	3	70		9.7	0	2.6
479		12X117E55	Decade//MT0990/(10K1734w, Yellowstone)	175		32.7		4	4	7	7			5.0	5	5	80		10.7	4	2.8
480		12X117E60	Decade//MT0990/(10K1734w, Yellowstone)	176		33.1		4	6	6	6			5.2	tr	10	75		9.2	0	2.6
481	d	12X117E62	Decade//MT0990/(10K1734w, Yellowstone)	175		34.3		4	4	5	6			4.6	10	30	100		10.4	3	2.5
482	d	12X117E66	Decade//MT0990/(10K1734w, Yellowstone)	175		32.7		4	5	7	7			5.4	3	10	90		9.2	3	2.4
483	d	12X117E74	Decade//MT0990/(10K1734w, Yellowstone)	176		36.6		5	5	6	5			5.0	10	3	30		9.9	3	2.5
484	d	12X117E110	Decade//MT0990/(10K1734w, Yellowstone)	175		33.9		4	4	5	5			4.4	25	5	60		10.4	1	2.4
485	d	12X117E121	Decade//MT0990/(10K1734w, Yellowstone)	175		33.5		4	4	7	7			5.0	20	40	100		9.9	4	2.2
486	d	12X118E9	MT1276//MTW1146/MT1134	180		35.0		5	5	5	6			5.4		1			11.2	4	2.4
487		12X118E28	MT1276//MTW1146/MT1134	171		34.3		7	6	6	6			6.2					10.7	4	3.1
488	d	12X118E49	MT1276//MTW1146/MT1134	174		35.8		6	6	5	5			5.4					9.4	4	2.4
489	d	12X118E58	MT1276//MTW1146/MT1134	172		35.4		7	6	6	5			6.0					11.2	4	2.4
490	d	12X118E60	MT1276//MTW1146/MT1134	171		32.7		5	6	5	6			5.6					10.9	4	2.4
491	d	12X118E103	MT1276//MTW1146/MT1134	175		35.4		4	5	6	5			5.0	15	15	75		9.4	4	2.4

Table 150. 2019 Single Rep Observation 'A' Nursery (SROA): All Location data

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height		Agronomic Score						Stripe rust %		2018 HR data							
				BZ	FE	BZ	FE	PLB BZ	JEB BZ	PLB MC	JEB MC	PLB FE-CLO	JEB FE-CLO	FE-Sr JEB	Aver- age	Stripe rust %		2018 HR data					
																23-Jul	1-Aug	26-Jul	29-Jul	2-Aug	6-Aug	BZ	FE-Sr
492	d	12X118E113	MT1276//MTW1146/MT1134	175		35.4		4	5	x	5					4	4.5	10	20	90	9.3	4	2.3
493	d	12X118E119	MT1276//MTW1146/MT1134	171		35.4		7	6	7	5					5	6.0				9.7	4	2.5
494		12X118E126	MT1276//MTW1146/MT1134	172		34.6		7	5	7	5					6	6.0	1	5	5	10.5	4	2.6
495		12X119E4	Colter*2/MT1147	177		34.6		5	7	5	6					6	5.8				9.5	4	2.8
496	d	12X119E32	Colter*2/MT1147	178		35.8		7	6	6	7					7	6.6				9.6	4	2.4
497		12X119E60	Colter*2/MT1147	177		33.9		6	7	6	6					5	6.0				10.3	4	2.8
498		12X120E28	MT10113//MT0871/MT1151	175		32.3		6	6	6	7					5	6.0	10	10	10	9.6	4	2.8
499	h	12X120E36	MT10113//MT0871/MT1151	170		33.1		7	7	7	6					6	6.6		5	5	9.4	4	2.9
500		12X120E47	MT10113//MT0871/MT1151	176		35.0		5	6	6	7					5	5.8	5	15	15	9.5	1	2.6
501	h	Yellowstone	check	179		38.6		7	5	6	5					5	5.6		tr	10			
502		Decade	check	175		35.0		6	5	6	6					4	5.4	5	15	80			
503		12X120E53	MT10113//MT0871/MT1151	177		31.9		5	6	5	5					5	5.2		5	5	9.5	1	2.8
504	d	12X120E54	MT10113//MT0871/MT1151	175		34.6		7	7	7	6					6	6.6		5	5	9.2	1	2.5
505		12X120E58	MT10113//MT0871/MT1151	176		33.1		6	6	x	4					6	5.5		5	5	9.7	1	2.6
506		12X120E76	MT10113//MT0871/MT1151	171		33.5		6	5	6	5					7	5.8	5	25	25	9.9	4	3.2
507		12X120E80	MT10113//MT0871/MT1151	171		33.1		6	5	7	5					6	5.8	10	40	40	9.9	4	2.8
508		12X120E86	MT10113//MT0871/MT1151	176		33.1		6	5	7	5					7	6.0	15	50	50	9.4	1	2.7
509		12X120E115	MT10113//MT0871/MT1151	176		33.1		5	6	7	6					5	5.8	5	15	15	9.3	4	2.6
510		12X122E58	WB3768//Overland/MTW1154	176		33.1		6	6	7	5					5	5.8	10	50	50	10.5	0	2.6
511	d	12X122E63	WB3768//Overland/MTW1154	177		33.5		5	6	x	3					5	4.8	tr	5	15	10.1	2	2.3
512	d	12X122E94	WB3768//Overland/MTW1154	178		33.9		5	6	5	5					5	5.2		25	25	10.0	3	2.0
513	d	12X122E95	WB3768//Overland/MTW1154	178		34.6		5	5	6	5					5	5.2	3	15	15	10.2	3	2.4
514		12X122E96	WB3768//Overland/MTW1154	177		37.4		5	5	6	6					4	5.2	2	10	10	10.1	3	3.0
515		12X122E101	WB3768//Overland/MTW1154	176		34.3		5	4	5	5					5	4.8	5	10	10	10.9	2	2.8
516		12X123E4	MT1240//MT1088/02X172E31-4	175		33.5		7	6	x	4					5	5.5	tr	tr	5	9.7	4	2.6
517		12X123E20	MT1240//MT1088/02X172E31-4	175		33.5		7	5	x	4					6	5.5	tr			9.3	3	2.6
518		12X123E42	MT1240//MT1088/02X172E31-4	177		34.3		6	6	7	5					5	5.8		2		9.3	0	2.6
519	h	12X123E54	MT1240//MT1088/02X172E31-4	176		33.9		7	7	7	6					6	6.6				9.6	3	2.6
520		12X123E61	MT1240//MT1088/02X172E31-4	177		33.9		6	6	6	5					5	5.6				11.5	2	2.8
521		12X123E67	MT1240//MT1088/02X172E31-4	176		33.5		6	6	7	5					5	5.8				10.7	1	2.8
522	h	12X123E72	MT1240//MT1088/02X172E31-4	175		32.3		7	6	x	6					6	6.3	tr	tr		12.1	4	2.9
523		12X123E105	MT1240//MT1088/02X172E31-4	176		32.3		7	7	x	4					6	6.0			5	10.8	4	3.1
524		12X123E111	MT1240//MT1088/02X172E31-4	176		35.4		6	6	7	4					5	5.6				11.3	2	3.2
525	h	12X123E125	MT1240//MT1088/02X172E31-4	175		32.7		7	6	6	7					6	6.4	tr	tr	10	11.0	4	2.8
526		12X125E1	Northern//03X378cE8/MT0990	179		36.2		6	6	6	5					5	5.6	2	10	10	10.2	1	2.6
527	d	12X125E5	Northern//03X378cE8/MT0990	177		33.1		6	7	7	6					7	6.6	t	15	15	9.4	1	2.2
528		12X125E6	Northern//03X378cE8/MT0990	177		34.3		7	7	x	4					5	5.8		3		9.4	3	2.7
529	d	12X125E9	Northern//03X378cE8/MT0990	178		36.6		5	6	5	5					6	5.4				9.3	1	2.4
530		12X125E17	Northern//03X378cE8/MT0990	179		36.6		6	6	6	6					6	6.0				9.6	0	3.4
531		12X125E27	Northern//03X378cE8/MT0990	178		33.9		6	6	6	6					5	5.8	tr	tr	10	10.4	1	2.7
532	w1	12X125E32	Northern//03X378cE8/MT0990	178		34.6		7	6	6	5					7	6.2				9.5	1	2.4
533		12X125E35	Northern//03X378cE8/MT0990	179		36.6		5	6	7	6					5	5.8		5	5	9.8	1	3.4
534		12X125E40	Northern//03X378cE8/MT0990	177		33.5		7	6	x	4					5	5.5	2	10	10	9.7	1	2.6
535		12X125E46	Northern//03X378cE8/MT0990	179		34.3		6	7	7	5					6	6.2		5	5	9.5	3	2.6
536		12X125E64	Northern//03X378cE8/MT0990	179		35.8		6	6	6	5					5	5.6				10.8	3	2.9

Table 150. 2019 Single Rep Observation 'A' Nursery (SROA): All Location data

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height		Agronomic Score						Stripe rust %		2018 HR data						
				BZ	FE	BZ	FE	PLB BZ	JEB BZ	PLB MC	JEB MC	PLB FE-CLO	JEB JEB	FE-Sr JEB	Aver- age	BZ	FE-Sr >5%	24-Jul	6-Aug	ein		
537		12X125E71	Northern//03X378cE8/MT0990	179		36.6		6	6	6	7		5	6.0						11.5	4	3.2
538		12X125E77	Northern//03X378cE8/MT0990	179		35.8		6	7	7	6		5	6.2						11.2	4	3.2
539		12X125E80	Northern//03X378cE8/MT0990	177		36.2		6	6	7	7		6	6.4		10				11.0	4	3.2
540		12X125E93	Northern//03X378cE8/MT0990	180		34.3		6	6	x	5		6	5.8						11.4	4	3.2
541	w1	12X125E99	Northern//03X378cE8/MT0990	179		35.4		6	6	x	4		5	5.3	3	10				10.6	1	3.7
542		12X125E104	Northern//03X378cE8/MT0990	179		34.6		7	7	6	5		5	6.0						10.6	1	3.0
543		12X125E108	Northern//03X378cE8/MT0990	178		34.3		6	7	6	6		5	6.0	1	15				11.9	1	2.9
544	h	12X125E125	Northern//03X378cE8/MT0990	176		34.3		7	6	7	7		6	6.6						9.3	1	2.6
545	w1	d 12X125E133	Northern//03X378cE8/MT0990	177		34.6		7	6	7	6		6	6.4						9.6	1	2.5
546	h	12X125E138	Northern//03X378cE8/MT0990	176		33.1		7	7	7	5		6	6.4						10.0	1	2.7
547	d	12X125E140	Northern//03X378cE8/MT0990	176		33.1		6	6	x	5		7	6.0	3	5				9.4	1	2.4
548		12X125E145	Northern//03X378cE8/MT0990	178		36.2		6	6	6	5		6	5.8		5				9.9	4	2.6
549	d	12X125E147	Northern//03X378cE8/MT0990	176		33.9		6	6	7	6		7	6.4						9.8	1	2.5
550		12X125E151	Northern//03X378cE8/MT0990	178		35.0		6	5	6	6		6	5.8	5	15				10.5	1	2.7
551		Yellowstone	check	178		38.2		6	5	6	5		5	5.4	tr	3	10					
552		Decade	check	175		34.6		6	4	x	4		4	4.5	5	70						
553		12X126E6	MT1285//03X378cE8/MT10102	176		34.3		7	6	x	5		6	6.0						9.9	4	2.7
554	d	12X126E9	MT1285//03X378cE8/MT10102	177		34.6		6	6	7	6		5	6.0						10.2	4	2.5
555	d	12X126E13	MT1285//03X378cE8/MT10102	177		33.9		7	7	6	5		6	6.2						9.8	4	2.4
556		12X126E33	MT1285//03X378cE8/MT10102	178		33.9		7	7	6	5		6	6.2						11.0	4	2.7
557	h	12X126E39	MT1285//03X378cE8/MT10102	177		33.5		8	7	7	6		6	6.8						10.3	4	2.7
558		12X126E52	MT1285//03X378cE8/MT10102	178		34.3		6	6	7	5		6	6.0						9.9	4	2.6
559		12X126E65	MT1285//03X378cE8/MT10102	178		37.4		5	5	7	6		4	5.4	tr	20	80			10.6	4	2.7
560	h	12X126E71	MT1285//03X378cE8/MT10102	178		35.4		7	6	8	7		7	7.0						11.2	4	2.8
561	w4	d 12X126E77	MT1285//03X378cE8/MT10102	177		34.3		7	6	7	6		6	6.4						9.9	4	2.6
562		12X126E80	MT1285//03X378cE8/MT10102	177		34.3		6	6	7	7		6	6.4						9.3	4	2.6
563		12X126E85	MT1285//03X378cE8/MT10102	179		36.2		5	7	5	5		5	5.4						9.9	4	2.6
564		12X126E88	MT1285//03X378cE8/MT10102	178		34.3		6	6	x	3		7	5.5						10.4	4	2.8
565		12X126E90	MT1285//03X378cE8/MT10102	177		34.6		7	6	x	2		6	5.3						10.3	4	2.6
566		12X126E98	MT1285//03X378cE8/MT10102	179		32.7		6	7	6	5		7	6.2						10.5	4	3.1
567	h	12X126E105	MT1285//03X378cE8/MT10102	178		34.6		8	6	7	7		7	7.0	2					9.7	4	2.6
568		12X126E107	MT1285//03X378cE8/MT10102	178		34.6		6	6	7	6		6	6.2						9.9	4	2.6
569		12X128E2	MT1149//MT10122//06X368cE55	177		35.0		6	6	6	5		5	5.6		5				10.4	4	3.6
570		12X128E4	MT1149//MT10122//06X368cE55	176		35.4		6	7	x	3		6	5.5		5				9.8	4	3.1
571	w4	d 12X128E18	MT1149//MT10122//06X368cE55	179		25.2		4	4	x	4		4	4.0	10	40				9.6	4	2.3
572		12X128E24	MT1149//MT10122//06X368cE55	176		31.9		6	6	5	6		4	5.4	10	15				10.9	4	3.2
573	w4	d 12X128E25	MT1149//MT10122//06X368cE55	178		24.4		3	3	3	4		4	3.4	40	5				10.4	4	3.3
574		12X128E27	MT1149//MT10122//06X368cE55	177		35.0		5	7	7	6		6	6.2	tr	1				10.5	4	3.6
575		12X128E37	MT1149//MT10122//06X368cE55	176		35.4		6	6	7	7		6	6.4		3	10			10.4	4	3.4
576		12X128E48	MT1149//MT10122//06X368cE55	176		35.8		5	5	x	3		4	4.3		5	60			9.8	3	2.6
577		12X128E61	MT1149//MT10122//06X368cE55	178		36.2		6	6	x	5		5	5.5		2	25			10.2	4	3.4
578		12X128E63	MT1149//MT10122//06X368cE55	178		33.9		6	7	5	5		5	5.6						10.2	4	3.3
579	w4	d 12X128E72	MT1149//MT10122//06X368cE55	180		24.8		4	5	3	4		4	4.0						10.6	4	2.9
580		12X128E84	MT1149//MT10122//06X368cE55	179		33.1		6	7	6	6		4	5.8						10.4	4	3.4
581	w4	d 12X128E88	MT1149//MT10122//06X368cE55	179		27.6		4	5	4	5		4	4.4		tr	10			9.7	4	3.0

Table 150. 2019 Single Rep Observation 'A' Nursery (SROA): All Location data

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height		Agronomic Score						Stripe rust %		2018 HR data							
				BZ	FE	BZ	FE	PLB BZ	JEB BZ	PLB MC	JEB MC	PLB FE-CLO	JEB FE-CLO	FE-Sr JEB	Aver- age	BZ	FE-Sr >5%	24-Jul	6-Aug	ein			
627	w2	12X132E75	MT0871//HV9W04-1594R/MT0866	175		31.9		6	5	6	6			5.8			10	1	25	11.7	2	3.0	
628	w2	d 12X132E76	MT0871//HV9W04-1594R/MT0866	177		31.1		5	4	6	5			5.0			5	5	30	11.1	2	2.0	
629	w2	d 12X132E81	MT0871//HV9W04-1594R/MT0866	177		31.5		4	4	6	6			4.8			5			10.9	2	2.1	
630	w2	12X132E90	MT0871//HV9W04-1594R/MT0866	177		33.5		7	6	5	6			5.8						11.0	2	4.0	
631		12X132E96	MT0871//HV9W04-1594R/MT0866	176		31.9		7	6	6	6			6.2						10.0	4	3.0	
632		12X132E101	MT0871//HV9W04-1594R/MT0866	172		29.9		6	5	5	5			5.2						11.6	2	3.5	
633	w2	12X132E110	MT0871//HV9W04-1594R/MT0866	172		28.3		6	6	6	6			6.0						9.8	2	2.9	
634	w2	d 12X132E116	MT0871//HV9W04-1594R/MT0866	177		31.1		5	6	5	5			5.2		3	50			9.4	2	2.0	
635	w2	12X132E119	MT0871//HV9W04-1594R/MT0866	175				6	7	6	6			6.2		1				10.0	2	3.2	
636	w2	d 12X132E127	MT0871//HV9W04-1594R/MT0866	177		30.3		5	6	5	5			5.2		3	50			10.3	2	2.2	
637	w2	d 12X132E133	MT0871//HV9W04-1594R/MT0866	178		30.3		5	5	6	5			5.2		tr				10.6	2	2.0	
638		12X135E3	MT10113//MTW1146/KS09HW62	178		33.1		6	6	5	5			5.6						9.3	4	3.0	
639		d 12X135E12	MT10113//MTW1146/KS09HW62	175		32.3		5	6	6	6			6.0						10.1	4	2.4	
640	w4	d 12X135E30	MT10113//MTW1146/KS09HW62	176		32.3		6	6	6	6			6.0						10.7	4	2.8	
641		12X135E32	MT10113//MTW1146/KS09HW62	177		33.9		6	6	6	6			6.0						10.2	3	2.6	
642		12X135E33	MT10113//MTW1146/KS09HW62	174		33.1		5	7	6	5			6.0						10.4	3	2.8	
643		d 12X135E45	MT10113//MTW1146/KS09HW62	176		31.1		5	6	6	5			5.4		5	30			9.9	5	2.4	
644	w5	d 12X135E54	MT10113//MTW1146/KS09HW62	179		32.7		5	6	6	6			5.8		tr	10			10.2	5	2.3	
645		d 12X135E103	MT10113//MTW1146/KS09HW62	172		31.9		6	5	6	7			6.0						9.4	5	2.2	
646		12X135E112	MT10113//MTW1146/KS09HW62	177		32.3		6	6	6	6			6.2						9.9	4	2.6	
647		d 12X139cE5	Northern*2/SD08198	182		32.7		5	6	5	5			5.2						9.8	2	2.0	
648		d 12X139cE16	Northern*2/SD08198	183		31.9		6	7	6	6			6.2						9.5	2	2.2	
649		d 12X139cE20	Northern*2/SD08198	179		34.6		5	5	5	5			5.0		10	30			9.2	2	2.3	
650		12X139cE33	Northern*2/SD08198	176		31.9		6	5	5	5			5.4		3	15			10.8	1	2.6	
651		Yellowstone	check	178		38.2		7	5	6	5			5.6				5					
652		Decade	check	175		35.4		6	5	6	7			5.6		2							
653		d 12X139cE37	Northern*2/SD08198	176		32.7		6	6	5	6			5.8		tr				10.2	2	2.3	
654		d 12X139cE45	Northern*2/SD08198	180		31.5		5	7	5	5			5.6						9.8	1	2.2	
655		12X139cE58	Northern*2/SD08198	179		34.3		6	7	5	5			5.6						9.6	1	2.6	
656		d 12X139cE75	Northern*2/SD08198	180		31.9		5	6	5	6			5.6						10.0	1	2.2	
657		d 12X139cE76	Northern*2/SD08198	180		33.1		5	6	5	6			5.6						9.9	1	2.2	
658		d 12X139cE78	Northern*2/SD08198	180		31.9		5	6	6	6			6.0		tr				10.8	1	2.3	
659		12X139cE92	Northern*2/SD08198	179		35.4		4	5	6	5			5.0		3	30			10.2	2	2.7	
660		d 12X139cE113	Northern*2/SD08198	180		32.3		5	6	x	5			5.5						10.0	1	2.4	
661		12X139cE116	Northern*2/SD08198	180		31.9		6	6	x	5			6.0						9.9	4	2.8	
662		d 12X139cE124	Northern*2/SD08198	179		33.1		5	6	5	5			5.4				5		9.8	1	2.4	
663		12X139cE135	Northern*2/SD08198	179		32.3		6	7	6	5			6.2		tr				10.1	4	2.9	
664		d 12X140E3	MT10113//SD08198/MT1078	176		31.5		6	6	6	6			5.6						10.0	4	2.5	
665		d 12X140E22	MT10113//SD08198/MT1078	176		32.7		6	6	7	7			6.2		tr				9.4	4	2.4	
666		12X140E29	MT10113//SD08198/MT1078	171		32.7		7	5	7	6			6.0		tr				9.8	4	2.7	
667		12X140E40	MT10113//SD08198/MT1078	175		31.5		6	6	6	6			5.6		2	5			9.7	4	2.6	
668		12X140E43	MT10113//SD08198/MT1078	175		32.7		6	6	7	6			6.0		tr				10.0	4	2.6	
669		12X140E56	MT10113//SD08198/MT1078	172		31.5		6	6	7	7			6.2		10	50			10.1	4	2.6	
670		12X140E59	MT10113//SD08198/MT1078	172		33.9		6	4	6	6			5.4		10	25			10.1	4	2.9	
671		d 12X140E64	MT10113//SD08198/MT1078	172		31.5		6	6	5	5			5.2		tr				10.0	4	2.4	

Table 150. 2019 Single Rep Observation 'A' Nursery (SROA): All Location data

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height		Agronomic Score						Stripe rust %		2018 HR data				
				BZ	FE	BZ	FE	PLB BZ	JEB BZ	PLB MC	JEB MC	PLB FE-CLO	JEB FE-CLO	FE-Sr JEB	Aver- age	Stripe rust %		2018 HR data		
																23-Jul	1-Aug	26-Jul	29-Jul	2-Aug
672	d	12X140E77	MT10113//SD08198/MT1078	172		33.9		5	5	7	6		4	5.4	tr	5	60	9.5	4	2.4
673		12X140E86	MT10113//SD08198/MT1078	174		31.1		5	5	x	4		4	4.5	10	tr	70	10.1	4	3.1
674		12X140E91	MT10113//SD08198/MT1078	172		33.1		6	6	6	6		5	5.8		3	50	10.7	4	2.6
675		12X140E97	MT10113//SD08198/MT1078	174		32.3		6	5	6	6		6	5.8			10	10.0	4	3.2
676		12X140E101	MT10113//SD08198/MT1078	171		29.1		6	5	5	5		5	5.2	tr	3	20	9.8	5	3.2
677		12X140E117	MT10113//SD08198/MT1078	175		34.3		6	6	8	7		5	6.4		2	40	10.2	4	3.1
678		12X140E118	MT10113//SD08198/MT1078	175		32.7		6	5	7	6		6	6.0		2	15	9.5	4	2.7
679		12X140E121	MT10113//SD08198/MT1078	176		30.3		6	5	x	5		5	5.3		5	25	10.1	4	2.8
680	h	12X144E7	MT1235//KS09HW140/MT10122	177		33.1		8	6	7	8		7	7.2				9.6	1	2.6
681	h	12X144E16	MT1235//KS09HW140/MT10122	175		33.1		7	5	6	6		8	6.4				11.1	4	3.0
682	w1	12X144E20	MT1235//KS09HW140/MT10122	179		33.5		6	5	6	7		7	6.2				11.3	1	3.0
683	h	12X144E24	MT1235//KS09HW140/MT10122	176		33.5		7	6	6	6		7	6.4				11.3	4	2.8
684	d	12X144E28	MT1235//KS09HW140/MT10122	176		33.9		7	7	7	5		6	6.4				11.1	4	2.4
685	w1	d 12X144E29	MT1235//KS09HW140/MT10122	178		33.5		7	8	x	5		7	6.8				9.7	1	2.0
686	h	12X144E47	MT1235//KS09HW140/MT10122	178		33.9		8	6	6	6		7	6.6				9.7	1	2.8
687	w1	d 12X144E49	MT1235//KS09HW140/MT10122	178		33.1		7	7	7	7		8	7.2				9.8	1	2.2
688	w2	12X144E50	MT1235//KS09HW140/MT10122	176		34.3		6	7	6	6		7	6.4				11.1	2	2.6
689	w1	d 12X144E72	MT1235//KS09HW140/MT10122	178		33.1		6	7	7	7		6	6.6	tr			9.6	1	2.0
690	w1	d 12X144E74	MT1235//KS09HW140/MT10122	178		34.3		6	6	x	6		6	6.0				9.8	1	2.2
691		12X144E77	MT1235//KS09HW140/MT10122	179		35.4		5	7	x	5		7	6.0			5	10.2	2	2.8
692	w4	d 12X144E91	MT1235//KS09HW140/MT10122	179		36.2		6	6	6	6		6	6.0		1	10	10.0	4	3.0
693	w2	d 12X144E98	MT1235//KS09HW140/MT10122	178		33.5		7	4	6	7		6	6.0		tr		9.7	2	2.2
694	w2	d 12X144E118	MT1235//KS09HW140/MT10122	179		32.3		6	6	6	6		7	6.2		tr		10.5	2	2.4
695	w4	d 12X145E23	MT1285//KS09HW140/MTW1146	177		33.9		6	6	6	5		5	5.6				11.1	4	2.8
696	w4	d 12X145E28	MT1285//KS09HW140/MTW1146	177		34.6		6	7	5	5		5	5.6				10.0	4	2.4
697		12X145E86	MT1285//KS09HW140/MTW1146	179		32.3		5	6	x	5		6	5.5				9.5	4	3.2
698		12X150E2	Northern//MT1088/SY Wolf	179		33.5		5	6	5	5		6	5.4				10.2	4	2.8
699	h	12X150E22	Northern//MT1088/SY Wolf	176		35.4		7	6	7	7		6	6.6			5	10.0	0	3.2
700		12X150E38	Northern//MT1088/SY Wolf	178		30.7		6	6	5	5		5	5.4			15	9.2	4	2.9
701	Yellowstone	check	check	178		37.4		6	5	6	5		4	5.2			10			
702	Decade	check	check	175		33.9		6	4	4	4		4	4.4	5	10	60			
703	d 12X150E46	Northern//MT1088/SY Wolf	Northern//MT1088/SY Wolf	177		36.2		5	5	5	5		5	5.0				9.9	3	2.4
704	d 12X150E57	Northern//MT1088/SY Wolf	Northern//MT1088/SY Wolf	177		33.1		6	6	5	5		7	5.8		tr	5	9.5	4	2.4
705	12X150E60	Northern//MT1088/SY Wolf	Northern//MT1088/SY Wolf	178		36.6		5	5	6	5		6	5.4				9.3	1	2.6
706	12X150E81	Northern//MT1088/SY Wolf	Northern//MT1088/SY Wolf	178		37.0		6	5	7	5		5	5.6				10.4	4	3.0
707	12X150E96	Northern//MT1088/SY Wolf	Northern//MT1088/SY Wolf	178		33.5		5	6	6	6		6	5.8				11.0	4	2.8
708	12X150E101	Northern//MT1088/SY Wolf	Northern//MT1088/SY Wolf	179		32.7		5	6	x	3		6	5.0				10.8	3	3.4
709	d 12X150E106	Northern//MT1088/SY Wolf	Northern//MT1088/SY Wolf	177		36.2		6	6	5	5		5	5.4				10.9	1	2.5
710	12X151E36	MT1088*2/SY Wolf	MT1088*2/SY Wolf	180		31.9		5	5	6	6		5	5.4		tr		10.0	4	2.8
711	12X151E44	MT1088*2/SY Wolf	MT1088*2/SY Wolf	180		34.6		5	5	6	5		5	5.2		5	25	11.4	4	2.9
712	12X151E47	MT1088*2/SY Wolf	MT1088*2/SY Wolf	179		33.1		6	6	6	6		6	6.0		tr	5	9.7	3	2.9
713	12X151E50	MT1088*2/SY Wolf	MT1088*2/SY Wolf	182		34.6		5	5	5	5		6	5.2				9.8	4	2.8
714	12X151E57	MT1088*2/SY Wolf	MT1088*2/SY Wolf	179		33.9		5	5	x	3		7	5.0				10.3	4	2.6
715	12X151E58	MT1088*2/SY Wolf	MT1088*2/SY Wolf	177		33.9		6	6	x	4		6	5.5				11.5	4	3.2
716	12X151E60	MT1088*2/SY Wolf	MT1088*2/SY Wolf	177		32.7		5	6	7	5		5	5.6				10.2	4	2.6

Table 150. 2019 Single Rep Observation 'A' Nursery (SROA): All Location data

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height		Agronomic Score						Stripe rust %		2018 HR data				
				BZ	FE	BZ	FE	PLB BZ	JEB BZ	PLB MC	JEB MC	PLB FE-CLO	JEB FE-CLO	FE-Sr JEB	Aver- age	BZ	FE-Sr >5%	2018 HR data		
																		Prot-	PPO	SDS
717	12X151E64		MT1088*2/SY Wolf	178		31.5		23-Jul 5	1-Aug 5	26-Jul 6	29-Jul 6	2-Aug	6-Aug 6	5.6		24-Jul 6-Aug	ein	10.3	5	2.6
718	h 12X151E75		MT1088*2/SY Wolf	177		33.1		6	7	7	7		7	6.8				10.5	5	2.6
719	12X151E85		MT1088*2/SY Wolf	178		31.5		5	6	4	5		5	5.0		5	15	10.4	4	2.7
720	12X151E90		MT1088*2/SY Wolf	176		34.3		6	6	x	4		6	5.5				11.2	4	2.8
721	12X151E96		MT1088*2/SY Wolf	182		33.5		5	6	x	3		6	5.0				10.2	4	3.0
722	12X151E99		MT1088*2/SY Wolf	183		33.5		5	5	6	5		5	5.2				10.3	4	2.8
723	d 12X151E104		MT1088*2/SY Wolf	177		33.1		5	6	7	6		7	6.2				10.4	4	2.4
724	d 12X151E113		MT1088*2/SY Wolf	182		29.9		5	5	5	5		6	5.2				9.8	4	2.5
725	d 12X151E114		MT1088*2/SY Wolf	182		33.5		5	5	6	5		6	5.4				9.9	4	2.4
726	12X151E124		MT1088*2/SY Wolf	182		32.7		5	5	x	3		5	4.5				9.3	4	2.6
727	w1 d 12X169E24		WB3768/MTW1251	180		32.3		7	6	x	4		7	6.0		5		9.9	1	2.4
728	w1 12X169E26		WB3768/MTW1251	180		34.6		6	7	6	5		5	5.8		tr	5	9.7	1	2.6
729	w1 12X169E49		WB3768/MTW1251	180		30.7		7	6	6	6		6	6.2		tr		10.1	1	2.8
730	w1 12X169E54		WB3768/MTW1251	180		33.1		6	6	6	5		5	5.6		1		10.0	1	2.8
731	w1 12X169E80		WB3768/MTW1251	180		34.3		6	7	6	6		6	6.2				9.3	1	2.6
732	w1 12X169E84		WB3768/MTW1251	180		33.5		6	6	x	4		6	5.5				9.7	1	2.8
733	w2 d 12X169E95		WB3768/MTW1251	179		31.5		5	6	x	4		7	5.5		5		9.2	2	2.4
734	h 12X176cE8		Colter/MT1105	177		33.1		7	7	7	7		7	7.0		tr	5	12.2	0	4.0
735	12X176cE15		Colter/MT1105	178		33.9		5	6	6	5		6	5.6				12.7	4	4.1
736	12X176cE20		Colter/MT1105	178		36.2		5	6	6	5		5	5.4				11.7	4	3.4
737	12X176cE39		Colter/MT1105	178		34.3		5	7	7	6		6	6.2		10		10.8	4	3.1
738	12X176cE42		Colter/MT1105	178		33.1		6	6	x	4		7	5.8		tr		12.5	1	4.0
739	12X176cE45		Colter/MT1105	177		35.4		5	6	x	4		5	5.0				12.4	4	3.0
740	12X176cE49		Colter/MT1105	178		34.6		5	6	6	6		5	5.6		3	10	12.0	4	3.8
741	12X176cE54		Colter/MT1105	178		33.1		6	7	5	5		6	5.8		tr		13.0	4	3.6
742	12X176cE61		Colter/MT1105	178		31.9		6	6	6	6		6	6.0				12.6	1	3.7
743	12X176cE76		Colter/MT1105	178		32.3		6	6	7	6		6	6.2				13.5	1	3.5
744	12X176cE97		Colter/MT1105	177		34.3		6	6	x	3		5	5.0				11.7	4	3.4
745	12X176cE114		Colter/MT1105	177		33.1		5	6	x	4		6	5.3		tr	5	10.5	4	3.0
746	12X176cE117		Colter/MT1105	178		36.6		5	5	4	5		5	4.8		tr	5	10.3	3	3.2
747	12X176cE133		Colter/MT1105	178		34.3		6	6	6	6		5	5.8		tr		11.5	4	3.6
748	12X183E1		MT1088/MT1156	178		34.3		7	7	6	6		6	6.4		3	10	12.9	4	3.6
749	h 12X183E11		MT1088/MT1156	176		33.9		7	7	7	7		6	6.8				13.9	4	3.8
750	12X183E21		MT1088/MT1156	177		34.6		7	6	x	3		5	5.3				13.3	4	4.4
751	h Yellowstone		check	178		38.6		6	5	6	5		5	5.4		tr				
752	Decade		check	175		35.4		6	5	6	5		4	5.2		3	40			
753	h 12X183E23		MT1088/MT1156	178		34.3		7	6	6	6		7	6.4				12.4	4	3.6
754	12X183E28		MT1088/MT1156	176		35.8		8	6	6	6		6	6.4				12.7	4	3.4
755	12X183E36		MT1088/MT1156	180		36.6		7	6	7	7		6	6.6		5		11.6	4	3.2
756	12X183E47		MT1088/MT1156	179		33.5		7	7	5	5		5	5.8				11.4	4	3.1
757	w4 d 12X183E54		MT1088/MT1156	179		34.3		7	7	7	6		6	6.6		tr	5	12.0	4	3.8
758	12X183E60		MT1088/MT1156	178		39.8		5	4	5	5		5	4.8				10.9	4	3.2
759	h 12X183E70		MT1088/MT1156	179		35.8		8	7	8	7		6	7.2				11.0	4	3.1
760	12X183E74		MT1088/MT1156	179		33.9		6	6	6	5		7	6.0		tr		12.2	4	3.1
761	12X183E80		MT1088/MT1156	178		33.1		7	7	6	6		6	6.4		2	15	11.1	4	3.4

Table 150. 2019 Single Rep Observation 'A' Nursery (SROA): All Location data

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height		Agronomic Score						Stripe rust %		2018 HR data			
				BZ	FE	BZ	FE	PLB BZ	JEB BZ	PLB MC	JEB MC	PLB FE-CLO	JEB JEB	FE-Sr JEB	Aver- age	BZ	FE-Sr >5%	2018 HR data	
																		Prot-	PPO SDS
762		12X183E92	MT1088/MT1156	178		36.2		8	6	7	6				5	6.4		ein	
763		12X183E95	MT1088/MT1156	178		34.3		6	6	6	5			tr	5	5.6	12.3	4	4.0
764		12X183E99	MT1088/MT1156	179		33.5		6	7	5	6				7	6.2	13.4	4	4.6
765	w4	d 12X183E104	MT1088/MT1156	178		34.6		8	6	6	7				6	6.6	11.8	4	3.2
766	h	12X183E118	MT1088/MT1156	179		33.9		7	6	7	6				6	6.4	13.1	4	4.0
767	w5	d 12X183E120	MT1088/MT1156	178		32.7		7	7	6	6				7	6.6	12.2	4	3.5
768		12X183E131	MT1088/MT1156	180		35.4		7	6	5	5				6	5.8	12.3	5	3.8
769		12X184E10	MT1090/MT1276	177		35.0		6	6	6	5				7	6.0	11.9	4	3.4
770		12X184E18	MT1090/MT1276	180		35.8		4	5	6	5				5	5.0	12.1	4	3.5
771	h	12X184E22	MT1090/MT1276	179		34.3		7	6	7	7				5	6.4	12.9	4	3.7
772		12X184E28	MT1090/MT1276	178		34.3		7	7	6	5				6	6.2	12.6	5	4.2
773		12X184E40	MT1090/MT1276	179		37.4		4	5	5	5				5	4.8	12.7	4	3.4
774		12X184E45	MT1090/MT1276	177		35.4		6	6	7	6				6	6.2	12.0	4	3.6
775		12X184E56	MT1090/MT1276	177		35.8		6	6	6	6				5	5.8	12.1	4	3.8
776		12X184E68	MT1090/MT1276	177		35.4		5	6	6	6				6	5.8	11.3	4	3.0
777		12X184E75	MT1090/MT1276	177		35.4		6	7	6	5				5	5.8	11.3	4	3.2
778		12X184E87	MT1090/MT1276	177		35.4		6	6	5	6				7	6.0	11.7	4	3.2
779		12X184E97	MT1090/MT1276	176		36.2		5	6	6	6				5	5.6	12.5	4	3.2
780		12X184E100	MT1090/MT1276	177		35.4		6	7	x	4				5	5.5	12.0	4	2.8
781		12X185E2	MT1105//MT1156	180		31.9		7	6	7	5			tr	7	6.4	11.3	4	2.9
782		12X185E5	MT1105//MT1156	180		33.1		8	7	6	5				6	6.4	12.0	4	3.3
783		12X185E7	MT1105//MT1156	180		32.7		7	6	7	7				5	6.4	12.1	4	3.2
784		12X185E23	MT1105//MT1156	180		33.9		6	6	6	6				6	6.0	12.4	4	3.3
785		12X185E30	MT1105//MT1156	180		34.6		6	7	5	6				6	6.0	12.6	4	3.6
786	h	12X185E37	MT1105//MT1156	181		33.1		7	6	7	6			tr	7	6.6	10.4	4	2.8
787	w4	d 12X185E48	MT1105//MT1156	181		32.7		6	6	5	5				6	5.6	10.3	4	2.8
788		12X185E55	MT1105//MT1156	182		33.1		7	5	7	6				6	6.2	10.0	4	2.8
789	h	12X185E58	MT1105//MT1156	181		33.1		8	6	6	5				8	6.6	11.9	4	3.1
790		12X185E59	MT1105//MT1156	181		31.5		7	6	6	6			tr	6	6.2	12.1	4	3.2
791		12X185E75	MT1105//MT1156	181		35.4		6	7	7	6				5	6.2	12.1	4	2.9
792		12X185E83	MT1105//MT1156	180		33.5		6	6	6	5				5	6.2	10.3	4	2.8
793		12X185E92	MT1105//MT1156	179		34.6		6	6	5	6			tr	7	6.0	11.2	4	3.4
794		12X185E95	MT1105//MT1156	180		36.2		5	5	6	5			tr	5	5.6	11.1	4	2.8
795		12X185E100	MT1105//MT1156	180		32.3		6	6	7	7			10	50	5.0	11.7	4	3.3
796		12X185E107	MT1105//MT1156	177		35.8		6	6	6	6			1	5	6.4	10.7	4	3.3
797	h	12X185E117	MT1105//MT1156	179		32.7		8	6	7	6			tr	10	5.8	10.4	4	2.7
798		12X185E122	MT1105//MT1156	179		33.1		6	7	6	5			tr	5	6.8	10.2	4	2.7
799	w4	d 12X185E130	MT1105//MT1156	178		33.1		6	6	6	6				7	6.2	10.2	4	3.0
800		12X185E141	MT1105//MT1156	178		31.9		6	6	6	5				8	6.4	9.8	4	2.5
801	Yellowstone	check	check	178		37.8		6	5	6	5				6	5.8	9.8	4	3.0
802	Decade	check	check	175		36.2		6	4	6	5				5	5.4			
803		12X185E143	MT1105//MT1156	178		33.9		6	7	6	5			25	5	5.2	10	4	3.2
804	h	12X185E146	MT1105//MT1156	179		33.1		8	6	7	6			2	7	6.2	tr	10	
805		12X185E155	MT1105//MT1156	179		32.3		7	6	6	5				6	6.6	10.4	4	3.0
806		12X186E2	MT1113/MT1235	175		35.0		6	5	6	6			1	7	6.2	9.8	4	3.2

Table 150. 2019 Single Rep Observation 'A' Nursery (SROA): All Location data

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height		Agronomic Score						Stripe rust %		2018 HR data		
				BZ	FE	BZ	FE	PLB BZ	JEB BZ	PLB MC	JEB MC	PLB FE-CLO	JEB FE-CLO	FE-Sr JEB	Aver- age	Stripe rust %		2018 HR data
																FE-Sr >5%	BZ	
807	h	d	12X186E12	MT1113/MT1235	175		35.0	23-Jul	1-Aug	26-Jul	29-Jul	2-Aug	6-Aug	7.0		24-Jul	6-Aug	ein
808		12X186E30	MT1113/MT1235	176		33.9	6	6	7	7	6	7	6.0		tr	5	9.6 4 2.2	
809		12X186E44	MT1113/MT1235	175		30.7	7	7	7	6	5	6	7	6.8			5	11.1 4 2.6
810		12X186E48	MT1113/MT1235	176		34.3	6	6	6	5			6	5.8	1	10	11.6 4 3.1	
811	w	d	12X186E82	MT1113/MT1235	178		33.1	7	7	6	5		7	6.4				9.5 4 2.4
812		12X186E85	MT1113/MT1235	176		36.2	6	6	6	6	6	6	6.0			10	10.6 4 2.6	
813		12X186E90	MT1113/MT1235	177		31.1	6	5	6	7	7	5	5.8		5	20	9.8 4 2.6	
814		12X186E100	MT1113/MT1235	176		36.6	7	4	6	5	5	5	5.4		2	15	10.5 4 3.0	
815	w	12X197E11	MT1149/04X115cE30	177		34.6	7	6	6	6	6	5	6.0		5	20	10.2 1 3.3	
816		d	12X197E13	MT1149/04X115cE30	177		33.1	3	4	7	6		6	5.2				9.5 4 2.6
817		d	12X197E24	MT1149/04X115cE30	176		34.3	5	5	6	5	5	6	5.4				9.2 1 2.4
818		d	12X197E32	MT1149/04X115cE30	179		28.0	5	5	5	4	4	5	4.8		10		9.3 3 2.4
819	w3	12X197E33	MT1149/04X115cE30	176		32.7	6	6	6	6	5	5	5.6					10.1 1 3.4
820		12X197E45	MT1149/04X115cE30	177		37.0	5	5	7	6	6	5	5.6		10	40	9.6 3 3.2	
821		12X198E9	MT1235//04X115cE67	179		39.4	5	5	5	5	5	5	5	5.0		5	15	10.5 1 2.7
822		d	12X198E32	MT1235//04X115cE67	176		35.8	7	6	6	6	6	6	6.2		3	10	9.5 1 2.2
823	d	12X200E5	Northern/Gallus	181		33.5	5	6	6	6	5	5	6	5.6				9.6 2 2.2
824		d	12X200E75	Northern/Gallus	182		35.0	6	6	6	5	5	7	6.0				9.2 2 2.2
825		d	12X200E87	Northern/Gallus	181		33.5	5	5	7	6	6	6	5.8				9.6 2 2.2
826		d	12X200E104	Northern/Gallus	182		34.3	5	6	6	6	6	6	5.8				9.4 2 2.3
827	d	12X200E109	Northern/Gallus	184		30.7	6	5	6	5	5	7	5.8					9.6 2 2.9
828		12X201E16	MT1088/CH-111.14098	177		33.9	6	6	x	4	4	7	5.8					9.2 4 2.9
829		d	12X201E37	MT1088/CH-111.14098	180		33.9	5	6	x	5	5	6	5.5				10.1 4 2.5
830		12X201E39	MT1088/CH-111.14098	176		32.3	5	7	5	5	6	6	6	5.8				9.9 4 2.8
831	h	12X201E77	MT1088/CH-111.14098	177		29.5	5	6	6	5	5	6	6	5.6				9.9 4 2.8
832		12X204E58	MT1286/KS10HW10	176		32.3	6	6	6	6	6	6	6	6.0				9.8 4 3.2
833		12X204E66	MT1286/KS10HW10	178		33.1	5	6	6	6	5	5	7	5.8				11.0 4 3.4
834		12X204E96	MT1286/KS10HW10	176		33.1	7	7	7	6	6	6	6	6.6		2		9.8 4 3.0
835	h	12X204E102	MT1286/KS10HW10	176		35.4	5	6	6	5	5	6	6	5.6		5	15	10.6 4 3.2
836		d	12X206E40	MT1285/OK08539	170		29.5	6	6	7	6	6	7	6.4				9.8 4 2.3
837		d	12X206E83	MT1285/OK08539	171		29.5	6	5	7	5	5	6	5.8				9.4 4 2.3
838		12X206E90	MT1285/OK08539	176		34.6	5	7	6	6	7	6	8	6.6				9.3 4 2.7
839	h	d	12X206E126	MT1285/OK08539	170		31.5	5	5	7	6	6	7	6.0				9.2 4 2.2
840		12X208E5	MT1090/NE09498	176		34.6	5	6	7	7	5	5	6	5.8				9.3 5 2.9
841		12X208E33	MT1090/NE09498	176		33.5	6	7	x	x	5	5	7	6.3				9.9 4 2.8
842		12X208E60	MT1090/NE09498	175		33.9	6	7	6	6	5	5	6	6.0				9.3 4 2.9
843	h	12X208E98	MT1090/NE09498	176		37.0	5	5	7	7	5	5	6	5.6				10.7 4 2.8
844		12X208E105	MT1090/NE09498	175		35.4	6	6	7	7	6	6	5	6.0				10.5 4 2.6
845		d	12X209E21	MT0871/NI10712	177		32.3	5	6	6	6	6	6	5.8			5	9.9 4 2.3
846		12X209E29	MT0871/NI10712	176		33.9	6	6	x	x	4	4	5	5.3			5	10.4 4 2.6
847	h	12X209E34	MT0871/NI10712	171		34.3	5	6	x	5	5	6	5.5					10.0 4 3.0
848		12X209E43	MT0871/NI10712	176		33.1	5	6	6	6	5	5	6	5.6				10.0 4 2.7
849		12X209E46	MT0871/NI10712	177		33.5	5	6	6	6	6	6	7	6.0				9.9 4 2.9
850		12X209E49	MT0871/NI10712	176		33.5	6	7	6	7	6	7	6	6.4				9.2 4 3.1
851		Yellowstone	check	178		38.2	6	5	6	6	5	5	5.4					

Table 150. 2019 Single Rep Observation 'A' Nursery (SROA): All Location data

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height		Agronomic Score						Stripe rust %		2018 HR data						
				BZ	FE	BZ	FE	PLB BZ	JEB BZ	PLB MC	JEB MC	PLB FE-CLO	JEB FE-CLO	FE-Sr JEB	Aver- age	BZ	FE-Sr >5%	24-Jul	6-Aug	ein		
852		Decade	check	175		34.6		6	5	x	5				5.3	5	5	15	40			
853		12X209E83	MT0871/N10712	176		32.3		6	6	6	6				6.0	6				9.4	4	2.6
854		d 12X209E91	MT0871/N10712	176		30.3		6	6	6	5				5.8	6				10.4	3	1.9
855		d 12X210E21	MT1276//SD07W083-7	177		32.3		4	5	6	5				5.2	6				9.4	3	2.4
856		d 12X210E26	MT1276//SD07W083-7	175		32.7		6	6	6	6				5.8	5		tr	10	9.8	3	2.3
857		d 12X210E32	MT1276//SD07W083-7	175		33.5		5	7	6	7				6.2	6				10.4	3	2.0
858		d 12X210E33	MT1276//SD07W083-7	175		34.6		5	6	x	4				5.3	6				10.3	3	2.2
859		12X210E37	MT1276//SD07W083-7	176		36.2		7	5	x	5				5.5	5				10.7	3	2.6
860		12X210E39	MT1276//SD07W083-7	178		34.6		5	7	6	6				5.8	5				10.6	3	2.6
861	h	12X210E43	MT1276//SD07W083-7	175		33.1		6	6	7	7				6.4	6				10.3	3	2.6
862		d 12X210E44	MT1276//SD07W083-7	177		33.5		7	6	6	5				6.0	6				10.1	3	2.2
863		12X210E61	MT1276//SD07W083-7	177		33.5		6	7	6	5				5.8	5				10.5	4	2.6
864		12X210E86	MT1276//SD07W083-7	178		34.3		5	6	x	4				5.0	5				9.7	3	2.8
865		12X210E89	MT1276//SD07W083-7	176		33.1		6	6	6	5				6.0	7		tr		9.6	3	2.6
866		d 12X210E91	MT1276//SD07W083-7	176		33.9		6	7	5	6				6.0	6				9.2	3	2.4
867		12X210E102	MT1276//SD07W083-7	177		34.3		5	6	5	5				5.2	5				9.5	3	2.9
868		d 12X210E107	MT1276//SD07W083-7	176		33.9		6	7	5	5				6.0	7				9.6	3	2.0
869		12X214E27	MT1240/Redfield	172		33.5		6	6	6	6				5.8	5				9.9	3	2.8
870		12X214E41	MT1240/Redfield	175		33.1		7	6	x	4				5.5	5				9.7	3	3.0
871		d 12X214E58	MT1240/Redfield	175		33.1		8	6	6	5				6.2	6				9.8	3	2.5
872		d 12X214E68	MT1240/Redfield	171				7	6	8	7				6.8	6				9.8	3	2.5
873		12X214E76	MT1240/Redfield	172		32.7		6	5	7	6				5.8	5				11.2	3	3.0
874		d 12X214E80	MT1240/Redfield	171		31.5		6	6	7	6				6.2	6		tr	20	9.3	3	2.5
875		12X214E86	MT1240/Redfield	174		34.3		6	6	6	5				5.6	5				9.6	3	2.8
876		12X214E98	MT1240/Redfield	174		33.9		7	5	x	3				5.0	5		tr	5	9.6	3	3.2
877		12X214E105	MT1240/Redfield	171		30.7		8	6	x	5				6.0	5				9.6	3	2.8
878		12X214E110	MT1240/Redfield	172		31.5		6	6	6	5				5.8	6		tr		9.8	3	2.6
879		12X214E117	MT1240/Redfield	174		32.7		6	5	5	6				5.6	6				10.4	3	2.7
880		12X214E119	MT1240/Redfield	174		33.1		7	6	6	6				6.2	6		10		10.4	3	2.8
881	h	12X214E127	MT1240/Redfield	175		33.9		7	7	7	6				6.4	5		10		9.4	3	2.6
882	w2	d 11X42cE5-2	Bearpaw//16FAWWON-Irr-61/MT0871	180		33.1		6	6	x	4				5.5	6		tr		10.2	2	2.2
883	w2	d 11X42cE13-2	Bearpaw//16FAWWON-Irr-61/MT0871	179		32.3		6	7	x	4				5.8	6		tr		9.9	2	2.2
884	w1	d 11X42cE17-2	Bearpaw//16FAWWON-Irr-61/MT0871	181		32.7		6	6	5	5				5.6	6				9.6	1	1.8
885		d 11X59cE22-1	08X349-A3/Yellowstone//MT1143	179		33.9		6	6	6	6				6.0	6				10.3	1	2.1
886		d 11X59cE34-1	08X349-A3/Yellowstone//MT1143	179		33.9		7	6	5	5				5.6	5		tr		9.7	1	1.8
887		d 11X59cE36-2	08X349-A3/Yellowstone//MT1143	179		33.1		6	7	6	6				6.0	5				9.8	1	2.2
888		11X59cE79-3	08X349-A3/Yellowstone//MT1143	178		32.3		5	6	x	3				5.0	6				10.6	3	2.8
889		11X59cE81-2	08X349-A3/Yellowstone//MT1143	179		33.1		6	6	x	5				6.0	7		3		11.8	1	2.8
890		d 11X59cE85-2	08X349-A3/Yellowstone//MT1143	178		33.1		5	6	6	6				5.8	6				10.8	1	2.4
891		11X61cE17-1	MT1078//08X349-A3/Yellowstone	182		31.5		5	5	6	6				5.8	7				10.1	3	2.6
892		d 11X61cE47-2	MT1078//08X349-A3/Yellowstone	182		31.5		5	6	6	6				5.8	6				9.9	2	2.4
893	h	11X61cE56-4	MT1078//08X349-A3/Yellowstone	181		32.3		6	7	7	7				6.8	7				9.6	3	2.6
894		11X61cE63-2	MT1078//08X349-A3/Yellowstone	180		31.1		5	6	x	4				5.5	7		tr		10.3	1	2.9
895		d 11X67cE24-4	MTS0832//08X349-A5/MT0954	179		33.9		6	7	x	4				5.8	6				9.3	1	2.5
896		11X67cE93-4	MTS0832//08X349-A5/MT0954	180		34.6		6	6	6	6				6.0	6				9.3	0	2.7

Table 150. 2019 Single Rep Observation 'A' Nursery (SROA): All Location data

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height		Agronomic Score						Stripe rust %		2018 HR data						
				BZ	FE	BZ	FE	PLB BZ	JEB BZ	PLB MC	JEB MC	PLB FE-CLO	JEB FE-CLO	FE-Sr JEB	Aver- age	BZ	FE-Sr >5%	2018 HR data				
																		Prot-	PPO SDS			
897	11X68cE8-1		06X21B93/08X349-A5//MT0866	182		30.7		5	5	5	5		2-Aug	6-Aug	7	5.4		ein	10.9	1	3.0	
898	11X68cE89-4		06X21B93/08X349-A5//MT0866	183		30.3		5	5	5	5				7	5.4			11.3	1	3.2	
899	11X68cE100-3		06X21B93/08X349-A5//MT0866	180		33.5		5	6	6	6				7	6.0			9.8	3	2.6	
900	d 11X71cE4-3		08X350-A2/MT0890//Northern	177		32.3		6	6	x	3				7	5.5			10.7	2	2.2	
901	Yellowstone		check	179		38.2		6	5	x	4				5	5.0		10				
902	Decade		check	175		34.3		6	5	6	5				4	5.2		30	70			
903	d 11X71cE12-4		08X350-A2/MT0890//Northern	177		33.5		6	6	6	6				7	6.2			9.7	3	2.1	
904	d 11X71cE18-1		08X350-A2/MT0890//Northern	178		35.0		6	5	6	5				7	5.8			10.3	1	2.4	
905	d 11X71cE41-3		08X350-A2/MT0890//Northern	178		31.9		6	6	7	6				6	6.2			9.9	2	2.2	
906	d 11X71cE50-1		08X350-A2/MT0890//Northern	176		30.7		7	6	x	4				6	5.8			9.8	2	2.4	
907	d 11X71cE69-2		08X350-A2/MT0890//Northern	177		33.1		6	7	x	4				7	6.0		5	11.1	2	2.2	
908	d 11X71cE81-4		08X350-A2/MT0890//Northern	177		30.3		7	6	6	6				7	6.4		5	10.2	2	2.5	
909	11X76cE28-3		08X350-A6/2*MT10121	179		33.9		5	5	6	5				7	5.6			11.2	1	3.0	
910	11X76cE57-2		08X350-A6/2*MT10121	180		33.9		5	6	6	6				6	5.8			11.1	1	2.6	
911	11X76cE89-1		08X350-A6/2*MT10121	180		33.9		5	6	7	6				6	6.0		tr	11.6	0	2.8	
912	11X76cE104-2		08X350-A6/2*MT10121	180		35.0		6	6	x	3				6	5.3			9.3	4	2.8	
913	d 11X78cE45-1		MT08136/MT0954//WB3768	181		34.3		6	6	x	4				7	5.8			9.5	0	2.4	
914	11X78cE90-2		MT08136/MT0954//WB3768	179		35.0		6	7	8	6				6	6.6			10.7	1	3.0	
915	11X82cE23-3		Yellowstone//493-22, Reeder/6*Paul//3/N	177		33.1		7	6	6	5				6	6.0			12.2	4	2.6	
916	h 11X82cE64-3		Yellowstone//493-22, Reeder/6*Paul//3/N	176		33.1		7	7	6	6				6	6.4			12.7	4	2.8	
917	11X82cE100-3		Yellowstone//493-22, Reeder/6*Paul//3/N	180		37.0		5	5	6	5				5	5.2			11.3	1	2.6	
918	11X84cE37-1		MT10122//Yellowstone/02X5cE94	175		33.9		5	6	x	4				6	5.3			11.1	3	2.8	
919	d 11X84cE50-2		MT10122//Yellowstone/02X5cE94	171		30.7		6	7	x	4				6	5.8			10.8	4	2.4	
920	11X88cE27-2		Northern//02X22cE38/MT10121	177		34.3		7	6	5	5				6	5.8			11.6	2	3.0	
921	11X88cE31-1		Northern//02X22cE38/MT10121	177		32.7		6	6	5	5				6	5.6			11.0	1	3.3	
922	11X88cE36-4		Northern//02X22cE38/MT10121	179		33.9		6	6	6	6				7	6.2			11.1	1	2.6	
923	11X88cE56-2		Northern//02X22cE38/MT10121	176		35.4		6	6	7	5				6	6.0			11.1	1	2.6	
924	11X88cE66-2		Northern//02X22cE38/MT10121	179		35.0		6	6	x	4				6	5.5			10.1	1	2.8	
925	11X88cE73-3		Northern//02X22cE38/MT10121	176		32.7		7	6	6	5				6	6.0			10.6	2	2.6	
926	11X88cE76-4		Northern//02X22cE38/MT10121	179		34.3		6	7	6	5				7	6.2			11.8	2	2.8	
927	h 11X88cE98-3		Northern//02X22cE38/MT10121	176		33.5		7	6	7	6				7	6.6			11.8	1	3.1	
928	11X91cE19-3		Decade//02X159E41//WB3768	180		30.7		6	6	6	6				7	6.2			12.2	1	3.8	
929	11X91cE26-2		Decade//02X159E41//WB3768	182		29.5		5	5	5	5				6	5.2		5	10	12.2	3	3.6
930	11X95cE23-1		Accipiter//MT0871/02X159E41	179		33.5		6	7	6	5				6	6.0			10.1	1	2.6	
931	11X95cE40-1		Accipiter//MT0871/02X159E41	179		35.0		7	6	6	5				7	6.2		tr	9.7	1	3.0	
932	11X95cE48-1		Accipiter//MT0871/02X159E41	179		33.1		5	7	5	5				6	5.6			9.4	3	2.7	
933	d 11X95cE76-2		Accipiter//MT0871/02X159E41	183		32.7		5	5	5	5				7	5.4			9.7	1	2.4	
934	11X95cE88-2		Accipiter//MT0871/02X159E41	179		33.5		6	6	5	5				8	6.0			9.5	4	2.8	
935	11X104E8-1		04X557C28-1//MTS1008//Accipiter	175		34.3		6	7	6	6				6	6.2			9.2	3	2.8	
936	11X104E28-3		04X557C28-1//MTS1008//Accipiter	177		34.6		5	6	5	5				6	5.4		5	9.2	4	2.6	
937	11X104E41-2		04X557C28-1//MTS1008//Accipiter	178		32.7		5	6	6	6				6	5.8		2	9.3	4	2.8	
938	11X91cE20-2		Decade//02X159E41//WB3768	179		31.5		6	6	5	5				5	5.4			9.3	4	3.4	
939	d 11X109E56-4		05X438-aB30-2//MT0890//MT1143	176		31.9		5	6	6	6				6	5.8			9.7	4	2.3	
940	11X95cE30-1		Accipiter//MT0871/02X159E41	179		33.9		5	6	5	5				7	5.6			9.4	1	3.1	
941	h 11X112E53-2		Colter//03X273cEx//MT10105	176		33.9		6	7	7	7				6	6.6			9.3	4	3.0	

Table 150. 2019 Single Rep Observation 'A' Nursery (SROA): All Location data

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height		Agronomic Score								Stripe rust %		2018 HR data						
				BZ	FE	BZ	FE	PLB BZ	JEB BZ	PLB MC	JEB MC	PLB FE-CLO	JEB JEB	FE-Sr JEB	Aver- age	BZ	FE-Sr >5%	24-Jul	6-Aug	ein	Prot-	PPO	SDS	
942		11X117cE41-3	Yellowstone/KS011020-6/MT0866	176		33.1		6	7	6	5													
943	d	11X119E39-3	Yellowstone/KS020649-1/MT1135	172		33.1		6	6	6	6													
944	d	11X119E41-1	Yellowstone/KS020649-1/MT1135	175		35.8		6	6	6	7													
945	h	11X120cE62-3	MT10121//Yellowstone/SD08W015	175		34.3		8	7	7	7													
946		11X123cE20-4	MT1141//Yellowstone/HV9W06-975	178		33.1		6	6	5	5													
947		11X123cE26-4	MT1141//Yellowstone/HV9W06-975	176		34.6		7	7	7	6							tr						
948		11X123cE31-3	MT1141//Yellowstone/HV9W06-975	175		34.3		6	6	6	5													
949	h	11X123cE38-3	MT1141//Yellowstone/HV9W06-975	176		31.5		7	7	6	6													
950		11X123cE58-2	MT1141//Yellowstone/HV9W06-975	176		31.1		6	5	4	5													
951		Yellowstone	check	179		39.0		6	5	6	5													
952		Decade	check	175		35.0		6	5	5	5													
953		11X123cE100-3	MT1141//Yellowstone/HV9W06-975	176		32.3		6	6	5	5													
954		11X123cE103-1	MT1141//Yellowstone/HV9W06-975	175		31.5		7	5	6	6													
955		11X127cE70-1	Yellowstone/Sultan//Overland	179		36.2		5	6	5	6													
956	d	11X129cE91-4	Yellowstone/16FAWWONSA-23/MT0990	182		32.7		5	6	5	5													
957		11X131cE9-3	Overland//MTW1098/KS08HW88	174		32.7		7	7	6	5													
958		11X131cE12-4	Overland//MTW1098/KS08HW88	172		33.1		7	6	6	5													
959	h	11X131cE34-1	Overland//MTW1098/KS08HW88	175		34.3		8	7	6	6													
960		11X131cE50-2	Overland//MTW1098/KS08HW88	174		32.7		6	6	6	6													
961	d	11X131cE54-4	Overland//MTW1098/KS08HW88	175		32.7		6	7	6	5													
962		11X131cE60-3	Overland//MTW1098/KS08HW88	175		31.9		7	6	5	5													
963		11X131cE77-3	Overland//MTW1098/KS08HW88	175		32.3		7	6	7	6													
964	h	11X131cE88-4	Overland//MTW1098/KS08HW88	175		31.9		7	6	7	7													
965	h	11X131cE91-2	Overland//MTW1098/KS08HW88	175		33.5		8	6	6	6													
966	d	11X133cE6-2	KS010953-K1/2*MT0871	175		28.7		4	5	5	5													
967		11X133cE65-2	KS010953-K1/2*MT0871	176		28.3		4	6	5	6													
968	d	11X135cE2-2	06X424B20//Yellowstone/Garrison	180		31.9		5	6	5	5													
969		11X135cE15-1	06X424B20//Yellowstone/Garrison	180		30.7		6	7	6	6													
970		11X135cE26-3	06X424B20//Yellowstone/Garrison	177		30.7		6	6	5	5													
971		11X135cE31-1	06X424B20//Yellowstone/Garrison	179		31.9		7	6	6	5													
972	d	11X135cE62-3	06X424B20//Yellowstone/Garrison	179		30.3		6	7	6	5													
973	d	11X135cE81-1	06X424B20//Yellowstone/Garrison	180		31.1		6	6	5	5													
974	d	11X135cE102-1	06X424B20//Yellowstone/Garrison	176		30.3		6	6	5	6													
975	d	11X139cE15-4	Judith/OK06332//MT0990	175		31.1		5	7	6	6													
976		11X139cE19-3	Judith/OK06332//MT0990	171		31.9		6	7	6	5													
977		11X139cE42-3	Judith/OK06332//MT0990	175		31.9		6	6	6	7													
978	h	11X139cE47-2	Judith/OK06332//MT0990	171		30.3		7	7	7	7													
979		11X139cE58-4	Judith/OK06332//MT0990	172		32.7		6	6	5	6													
980		11X139cE61-4	Judith/OK06332//MT0990	172		31.9		6	6	7	6													
981	d	11X139cE78-3	Judith/OK06332//MT0990	175		31.1		5	6	6	5													
982		11X139cE88-1	Judith/OK06332//MT0990	175		31.9		6	7	6	5													
983	d	11X139cE104-1	Judith/OK06332//MT0990	174		31.1		6	7	6	6													
984	d	11X139cE106-3	Judith/OK06332//MT0990	172		31.1		6	6	6	5													
985	w1	11X141cE59-3	MT1092//OK06345/WB3768	175		33.9		6	5	6	5													
986	w2	11X141cE96-2	MT1092//OK06345/WB3768	175		32.3		5	6	5	6													

Table 150. 2019 Single Rep Observation 'A' Nursery (SROA): All Location data

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height		Agronomic Score								Stripe rust %		2018 HR data	
				BZ	FE	BZ	FE	PLB BZ	JEB BZ	PLB MC	JEB MC	PLB FE-CLO	JEB FE-CLO	Aver- age	BZ	FE-Sr >5%	Prot- PPO	SDS	SDS
				23-Jul	1-Aug	26-Jul	29-Jul	2-Aug	6-Aug						24-Jul	6-Aug	ein		
987	11X143E8-3		Colter/McGuire/SD08175	176		32.7		4	6	6	6			5.8			11.8	2	3.3
988	11X143E99-2		Colter/McGuire/SD08175	176		33.5		4	6	6	6			5.6			12.0	2	3.4
989	11X145E44-1		MT0871/16FAWWON-lrr-84/(MT08177,	178		35.4		6	6	5	5			5.4			11.1	2	3.2
990	d 11X145E69-4		MT0871/16FAWWON-lrr-84/(MT08177,	179		34.6		6	6	5	5			5.4			10.4	2	2.5
991	11X148cE7-1		MT10121*2/MV11-04	179		33.1		5	7	5	5			5.8			9.3	3	2.8
992	d 11X151cE70-3		(Colter sib, MT08177)/16FAWWON-SA-8	180		32.3		6	7	5	5			6.0			11.0	2	2.4
993	11X151cE86-3		(Colter sib, MT08177)/16FAWWON-SA-8	179		35.4		6	6	6	5			5.8			11.5	2	3.1
994	11X153E18-1		MT1091/Accipiter	178		32.7		6	6	6	6			6.2			10.8	0	3.2
995	11X153E50-1		MT1091/Accipiter	177		32.7		7	6	7	6			6.4			9.4	1	3.0
996	11X157cE1-4		MT1145/MT0866	176		34.3		5	6	6	5			5.4			10.1	3	2.6
997	11X157cE17-2		MT1145/MT0866	176		33.9		6	6	6	5			5.6			11.0	3	3.0
998	11X157cE57-2		MT1145/MT0866	176		33.1		5	7	5	5			5.6			12.0	4	3.2
999	11X157cE67-4		MT1145/MT0866	176		34.3		6	7	6	6			6.2			12.8	4	3.7
1000	11X157cE70-2		MT1145/MT0866	177		33.9		5	6	7	6			6.0			12.0	4	3.2
1001	h Yellowstone		check	179		38.2		6	5					5.3					
1002	Decade		check	175		34.6		6	4					4.7	3	10	60		
1003	11X160cE27-3		MT1137/MT1078	177		33.1		5	6					5.3			10.9	3	4.0
1004	11X160cE42-1		MT1137/MT1078	176		33.9		6	6					5.7			11.7	4	3.1
1005	11X162cE48-4		MT10102/MT10116	178		33.5		6	7					6.0			10.2	3	2.6
1006	11X165E17-3		MT1143/06X424B6	179		33.5		5	6					5.3			9.3	1	2.8
1007	d 11X166cE33-3		(474-23, winter McNeal)/MT10121	176		35.4		7	6					6.0			10.4	4	2.4
1008	11X166cE60-2		(474-23, winter McNeal)/MT10121	176		35.0		6	6					5.7			10.4	4	2.6
1009	11X172cE8-2		(10K1676w, Yellowstone white)/MT10114	181		35.8		6	5					5.3			9.6	0	2.8
1010	11X172cE44-1		(10K1676w, Yellowstone white)/MT10114	180		35.0		7	6					6.0			10.0	1	3.2
1011	11X172cE52-3		(10K1676w, Yellowstone white)/MT10114	178		35.4		6	7					6.0			11.9	1	3.1
1012	11X172cE115-4		(10K1676w, Yellowstone white)/MT10114	180		33.9		6	6					6.0			10.1	1	3.2
1013	11X179cE47-1		MT0871/MT1151	179		33.1		6	6					6.3			10.5	1	3.5
1014	11X182cE10-1		MT1088/02X172E31-4	176		33.5		6	6					5.7	tr	3	15	9.8	3
1015	11X182cE35-3		MT1088/02X172E31-4	177		35.4		5	5					5.0		5	9.6	1	3.2
1016	h 11X193cE16-1		HV9W04-1594R/Accipiter	175		32.3		8	6					6.7		15	9.9	3	2.9
1017	11X193cE24-1		HV9W04-1594R/Accipiter	175		33.1		7	5					6.3	5	10	9.9	3	3.4
1018	d 11X201E5-3		MT0871/(SD06156-1, Redfield sib)	179		33.5		5	6					6.0			9.4	4	2.4
1019	11X201E11-4		MT0871/(SD06156-1, Redfield sib)	178		32.3		5	5					5.3		10	10.1	3	3.5
1020	11X201E18-1		MT0871/(SD06156-1, Redfield sib)	180		35.4		6	6					5.7			9.8	1	3.1
1021	11X201E28-1		MT0871/(SD06156-1, Redfield sib)	176		29.9		7	6					6.3			10.5	4	3.7
1022	11X201E98-2		MT0871/(SD06156-1, Redfield sib)	179		31.1		6	6					6.0			9.4	1	3.0
1023	10X048E54-1		MT10104/MTW0785/Yellowstone-Lr41	178		32.7		7	7					6.3			9.6	1	3.5
1024	10X048E61-1		MT10104/MTW0785/Yellowstone-Lr41	179		34.6		5	6					5.3			9.5	3	3.0
1025	h 10X048E70-2		MT10104/MTW0785/Yellowstone-Lr41	176		33.5		7	7					6.7			9.9	1	3.6
1026	10X048E76-3		MT10104/MTW0785/Yellowstone-Lr41	177		34.3		5	5					5.0			9.2	2	2.6
1027	10X048E78-3		MT10104/MTW0785/Yellowstone-Lr41	180		30.7		5	5					5.3			9.8	4	2.7
1028	10X048E82-2		MT10104/MTW0785/Yellowstone-Lr41	179		32.3		6	7					6.7			9.6	1	2.6
1029	10X048E95-1		MT10104/MTW0785/Yellowstone-Lr41	179		34.3		6	6					5.7			9.6	4	2.7
1030	h 10X050cE34-2		MT10104/MTW0785/Yellowstone-Lr41	172		30.7		7	7					6.7			10.5	4	2.8
1031	10X050cE80-4		MT10104/MTW0785/Yellowstone-Lr41	171		30.7		7	6					6.3			10.4	4	2.7

Table 150. 2019 Single Rep Observation 'A' Nursery (SROA): All Location data

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height		Agronomic Score						Stripe rust %		2018 HR data					
				BZ	FE	BZ	FE	PLB BZ	JEB BZ	PLB MC	JEB MC	PLB FE-CLO	JEB FE-CLO	FE-Sr JEB	Aver- age	BZ	FE-Sr >5%	2018 HR data			
																		23-Jul	1-Aug	26-Jul	29-Jul
1032		10X051E34-4	MT10122//Yellowstone-Lr41/MT0859	177		35.8		5	5					5	5.0			9.4	0	3.4	
1033		10X051E69-4	MT10122//Yellowstone-Lr41/MT0859	176		35.4		5	5					5	5.0			10.2	1	3.5	
1034		10X052E20-4	MTW1098//MT0495/MT0859	176		32.3		6	6					6	6.0			9.5	4	2.9	
1035		10X052E30-3	MTW1098//MT0495/MT0859	175		32.3		6	6					5	5.7	tr		9.4	1	2.6	
1036		10X052E74-2	MTW1098//MT0495/MT0859	176		32.3		6	7					6	6.3			9.5	1	2.8	
1037		10X053cE51-2	MT0866*2/MT0859	176		32.3		6	6					7	6.3	2		10.5	3	3.9	
1038	d	10X055E10-3	(Northern sib, MT0977)//MT0859/MT0938	178		35.0		5	5					6	5.3			10.5	2	2.2	
1039	h	10X055E13-3	(Northern sib, MT0977)//MT0859/MT0938	180		35.8		8	6					6	6.7			9.4	1	3.0	
1040		10X056E37-3	MT1084//MT0967/MT0859	178		33.9		6	6					7	6.3			9.2	4	2.6	
1041		10X056E88-2	MT1084//MT0967/MT0859	177		31.5		6	7					6	6.3			10.8	4	3.0	
1042		10X056E103-4	MT1084//MT0967/MT0859	177		32.7		5	6					6	5.7			9.9	4	2.9	
1043		10X056E119-3	MT1084//MT0967/MT0859	178		30.7		6	6					6	6.0			10.4	4	3.0	
1044	h	10X057cE4-2	Robidoux//MT08185/MT0861	178		33.5		6	7					7	6.7			11.9	3	4.3	
1045		10X057cE48-2	Robidoux//MT08185/MT0861	178		33.9		5	6					7	6.0			12.3	3	3.8	
1046		10X057cE74-1	Robidoux//MT08185/MT0861	178		33.1		5	6					6	5.7			11.8	3	4.2	
1047		10X058cE5-2	Northern//MT0861/CDC Falcon	182		33.5		6	6					7	6.3			9.8	1	3.0	
1048		10X058cE23-3	Northern//MT0861/CDC Falcon	182		34.3		6	5					6	5.7			10.0	1	3.1	
1049		10X058cE60-3	Northern//MT0861/CDC Falcon	179		34.3		6	6					5	5.7			9.7	3	3.8	
1050		10X058cE73-1	Northern//MT0861/CDC Falcon	181		33.1		6	5					6	5.7			9.2	1	2.9	
1051		Yellowstone	check	178		37.8		6	5					5	5.3	5					
1052		Decade	check	174		34.3		6	4					4	4.7	10					
1053		10X058cE79-4	Northern//MT0861/CDC Falcon	177		33.9		7	6					5	6.0			9.2	3	3.5	
1054		10X061cE10-4	MT10122//MT0861/MT06103	176		30.3		5	7					6	6.0	5		10.3	4	3.4	
1055		10X063cE37-3	MT0951//MT0861/MT0754	176		32.3		6	6					5	5.7			9.7	4	3.2	
1056		10X063cE48-4	MT0951//MT0861/MT0754	177		33.9		6	6					6	6.0			10.7	4	4.0	
1057		10X063cE68-1	MT0951//MT0861/MT0754	176		33.5		6	6					6	6.0			11.2	4	3.4	
1058		10X063cE70-3	MT0951//MT0861/MT0754	175		32.7		6	6					6	6.0			10.3	4	3.5	
1059		10X065E59-4	MT10104//MT0861/MT0890	177		34.6		5	7					6	6.0			13.0	4	3.4	
1060		10X065E61-3	MT10104//MT0861/MT0890	175		32.3		6	6					6	6.0			12.6	4	3.7	
1061	h	10X067E22-2	MT10116//MT0861/MTW0785	176		32.7		6	7					7	6.7			9.9	1	3.0	
1062		10X067E68-1	MT10116//MT0861/MTW0785	178		33.1		6	5					5	5.3			10.1	1	3.4	
1063	h	10X067E88-3	MT10116//MT0861/MTW0785	175		31.5		7	6					7	6.7			12.5	5	3.3	
1064		10X067E90-4	MT10116//MT0861/MTW0785	176		31.5		6	7					6	6.3	tr		12.3	2	3.8	
1065		09X257cE208-3	MT08185//YLL*2/PI640431/3/PROM/3*Y	172		29.1		5	6					5	5.3			11.6	4	3.9	
1066	h	09X257cE221-3	MT08185//YLL*2/PI640431/3/PROM/3*Y	171		32.7		7	7					6	6.7			11.4	4	3.8	
1067		09X257cE230-2	MT08185//YLL*2/PI640431/3/PROM/3*Y	174		32.3		6	6					5	5.7			12.2	1	4.4	
1068	h	09X257cE232-2	MT08185//YLL*2/PI640431/3/PROM/3*Y	171		32.3		8	6					6	6.7			11.3	4	3.6	
1069		09X260cE216-4	MT08185//YLL*2/PI640431/3/YLL*3/NE0	176		38.2		5	5					5	5.0			11.3	0	3.5	
1070		09X260cE217-4	MT08185//YLL*2/PI640431/3/YLL*3/NE0	177		36.2		5	5					5	5.0			11.1	1	3.6	
1071		09X260cE221-3	MT08185//YLL*2/PI640431/3/YLL*3/NE0	176		39.4		6	5					5	5.3			11.8	1	3.7	
1072		09X260cE225-2	MT08185//YLL*2/PI640431/3/YLL*3/NE0	177		38.2		6	6					5	5.7			11.0	1	3.8	
1073		09X260cE232-4	MT08185//YLL*2/PI640431/3/YLL*3/NE0	176		37.4		5	5					5	5.0			11.1	0	3.8	
1074		09X264cE210-2	MT08184/3/MT08185//YLL*2/PI640431	176		34.6		5	6					6	5.7			10.9	1	3.3	
1075		13X221cD2	MTS1211/CIMMYT30798	175		34.3		4	5					6	5.0	10	5	10	12.3	4	3.4
1076		13X221cD6	MTS1211/CIMMYT30798	176		33.5		5	5					5	5.0	5	2	5	12.8	4	3.3

Table 150. 2019 Single Rep Observation 'A' Nursery (SROA): All Location data

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height		Agronomic Score						Stripe rust %		2018 HR data						
				BZ	FE	BZ	FE	PLB BZ	JEB BZ	PLB MC	JEB MC	PLB FE-CLO	JEB FE-CLO	FE-Sr JEB	Aver- age	Stripe rust %		Prot- PPO SDS				
																24-Jul	6-Aug		24-Jul	6-Aug		
1077	13X221cD23		MTS1211/CIMMYT30798	168		29.9		5	3							10	5	15	12.3	4	3.4	
1078	d 13X221cD45		MTS1211/CIMMYT30798	175		33.9		6	4							tr	3	5		12.6	4	2.4
1079	13X221cD58		MTS1211/CIMMYT30798	175		33.9		5	4										12.5	4	3.8	
1080	13X221cD60		MTS1211/CIMMYT30798	177		36.2		5	5										12.6	4	3.5	
1081	13X221cD63		MTS1211/CIMMYT30798	175		36.2		6	5								tr		11.8	4	3.2	
1082	13X221cD69		MTS1211/CIMMYT30798	174		32.3		4	4							10			12.7	5	2.9	
1083	13X221cD106		MTS1211/CIMMYT30798	172		35.0		6	5							5			12.0	5	3.4	
1084	13X221cD122		MTS1211/CIMMYT30798	175		35.8		4	4							15			13.1	5	3.2	
1085	13X221cD156		MTS1211/CIMMYT30798	177		30.3		6	4							tr			12.3	4	4.2	
1086	13X221cD160		MTS1211/CIMMYT30798	170		30.7		6	5								tr		12.9	4	2.8	
1087	13X221cD183		MTS1211/CIMMYT30798	169		31.9		6	6							tr	3	30	12.0	5	3.1	
1088	d 13X221cD195		MTS1211/CIMMYT30798	170		33.9		5	5								5	20	11.0	4	2.5	
1089	13X221cD207		MTS1211/CIMMYT30798	170		32.3		5	6								5	40	12.0	5	3.4	
1090	13X221cD213		MTS1211/CIMMYT30798	171		33.5		6	6								tr	50	11.8	4	3.5	
1091	13X221cD214		MTS1211/CIMMYT30798	169		31.9		6	5							10	3	15	13.0	4	3.3	
1092	w5 d 13X221cD220		MTS1211/CIMMYT30798	172		32.3		5	6								2	10	11.9	5	3.1	
1093	13X221cD235		MTS1211/CIMMYT30798	169		32.3		4	5							tr			12.1	4	3.7	
1094	13X221cD248		MTS1211/CIMMYT30798	172		33.9		6	6							tr	5		11.7	5	3.3	
1095	15X82cB18		MT1138*2/MT1262	178		32.7		6	6								20		11.9	5	4.3	
1096	15X82cB24		MT1138*2/MT1262	178		37.0		6	5										11.2	4	3.9	
1097	15X82cB48		MT1138*2/MT1262	175		35.0		7	6										12.1	5	4.1	
1098	15X82cB51		MT1138*2/MT1262	177		35.4		6	6										11.5	4	3.8	
1099	15X82cB63		MT1138*2/MT1262	177		36.6		5	5										11.4	4	3.6	
1100	h 15X82cB80		MT1138*2/MT1262	177		34.6		7	6										10.8	4	3.7	
1101	Yellowstone		check	178		37.8		6	5													
1102	Decade		check	174		35.0		6	4							10	10	70				
1103	15X82cB85		MT1138*2/MT1262	178		37.0		5	5										11.7	4	4.3	
1104	h 15X283B1		WA 8186/Loma	178		35.4		5	6										12.8	3	4.4	
1105	15X283B5		WA 8186/Loma	178		33.9		6	6										10.4	1	4.0	
1106	15X283B15		WA 8186/Loma	177		33.5		5	6										11.9	3	4.0	
1107	15X283B18		WA 8186/Loma	180		34.3		5	6										11.7	4	3.7	
1108	15X283B30		WA 8186/Loma	184		34.6		6	6										10.9	5	2.7	
1109	15X283B36		WA 8186/Loma	180		37.0		5	5										10.5	3	3.4	
1110	15X283B55		WA 8186/Loma	177		33.5		6	6										10.7	3	4.2	
1111	h 15X283B57		WA 8186/Loma	179		34.6		6	7										10.9	3	3.8	
1112	h 15X283B60		WA 8186/Loma	178		33.9		6	6										10.7	1	3.8	
1113	15X283B65		WA 8186/Loma	177		32.3		6	5										11.2	1	3.8	
1114	w3 15X304B28		Judee-null PPO-A1-J125-27/Snowmass	168		34.6		5	4							25	tr	10	12.7	3	3.9	
1115	15X304B99		Judee-null PPO-A1-J125-27/Snowmass	169		35.0		7	6										11.8	4	3.8	
1116	d 15X285B12		MT1331/TC1022086	171		35.0		5	6										11.0	4	2.5	
1117	15X285B45		MT1331/TC1022086	170		32.3		6	6										10.9	4	2.8	
1118	15X285B59		MT1331/TC1022086	172		33.9		5	5									5	11.0	4	3.3	
1119	15X285B107		MT1331/TC1022086	171		33.5		7	6									5	11.1	4	3.0	
1120	w4 d 15X293B45		MT1469/TC1-02-47	172		30.3		5	5										10.9	4	3.1	
1121	w4 d 15X293B47		MT1469/TC1-02-47	176		29.1		5	5										11.8	4	4.0	

Table 150. 2019 Single Rep Observation 'A' Nursery (SROA): All Location data

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height		Agronomic Score						Stripe rust %		2018 HR data					
				BZ	FE	BZ	FE	PLB BZ	JEB BZ	PLB MC	JEB MC	PLB FE-CLO	JEB FE-Sr	Aver- age	BZ	FE-Sr >5%	2018 HR data				
																	23-Jul	1-Aug	26-Jul	29-Jul	2-Aug
1122	15X293B60		MT1469/TCI-02-47	174		30.7		6	6					6	6.0			ein	11.4	4	3.3
1123	15X303aB41		MT1541/St.Erythr 1282-08	175		33.9		5	5					5	5.0	20			11.1	4	3.8
1124	15X303aB55		MT1541/St.Erythr 1282-08	175		37.0		5	6					6	5.7				9.9	2	3.4
1125	15X247B9		MT1265/MT1532	176		35.0		5	6					7	6.0	tr	10		9.9	4	2.8
1126	15X247B34		MT1265/MT1532	178		32.3		6	5					5	5.3	5	15		9.7	4	2.8
1127	15X247B45		MT1265/MT1532	178		37.4		6	6					5	5.7	tr	15		10.8	4	3.4
1128	15X247B53		MT1265/MT1532	178		35.8		6	6					6	6.0	tr	10		11.6	4	4.1
1129	15X247B55		MT1265/MT1532	176		35.8		6	6					5	5.7	tr	5		11.2	4	3.6
1130	15X247B58		MT1265/MT1532	177		37.8		4	5					5	4.7	3	15		11.3	4	3.6
1131	15X247B64		MT1265/MT1532	177		36.2		5	6					6	5.7	tr	5		10.0	4	3.2
1132	15X256B1		FourOsix/MT1528	175		35.4		6	6					5	5.7	3	25		10.6	4	3.2
1133	w4 d 15X256B5		FourOsix/MT1528	175		35.8		6	6					6	6.0				10.4	4	3.0
1134	15X256B12		FourOsix/MT1528	175		35.0		5	5					6	5.3				10.3	4	3.4
1135	15X256B27		FourOsix/MT1528	171		32.7		6	5					5	5.3				11.6	4	3.6
1136	15X256B38		FourOsix/MT1528	174		35.8		5	6					5	5.3				10.9	4	2.8
1137	w4 d 15X256B42		FourOsix/MT1528	174		34.6		6	7					6	6.3				11.4	4	3.2
1138	15X256B51		FourOsix/MT1528	172		34.3		4	6					5	5.0	tr	20		12.0	4	3.8
1139	15X256B74		FourOsix/MT1528	175		34.3		6	5					5	5.3				12.0	4	3.6
1140	15X256B78		FourOsix/MT1528	172		31.5		5	5					6	5.3	tr			11.8	4	3.6
1141	15X256B84		FourOsix/MT1528	175		35.4		4	6					5	5.0	tr	5		12.3	5	2.8
1142	15X256B85		FourOsix/MT1528	175		36.2		4	5					5	4.7				12.3	4	3.6
1143	w4 d 15X256B88		FourOsix/MT1528	175		35.0		6	6					6	6.0				13.0	4	3.4
1144	15X256B90		FourOsix/MT1528	175		35.4		6	6					6	6.0	2			12.2	5	3.5
1145	15X226B19		Warhorse/Emerson	175		37.0		5	5					5	5.0				11.5	5	3.6
1146	15X226B24		Warhorse/Emerson	175		35.4		4	5					5	4.7				11.8	5	4.1
1147	15X226B27		Warhorse/Emerson	175		35.4		5	6					5	5.3				12.5	4	4.0
1148	15X226B32		Warhorse/Emerson	175		33.9		5	6					6	5.7	5			11.5	4	3.6
1149	15X226B42		Warhorse/Emerson	175		34.6		5	5					5	5.0				11.6	4	4.3
1150	15X226B53		Warhorse/Emerson	180		38.2		6	6					5	5.7				10.3	4	3.8
1151	Yellowstone		check	178		39.0		6	5					5	5.3	tr					
1152	Decade		check	174		36.2		6	5					4	5.0	5	50				
1153	15X226B62		Warhorse/Emerson	176		34.6		5	5					6	5.3	2			11.6	4	3.8
1154	15X226B82		Warhorse/Emerson	175		38.2		5	5					5	5.0	3	5		12.1	3	4.4
1155	h 15X255B1		MT1117/MT1504	176		35.8		6	7					7	6.7				11.0	3	3.4
1156	15X255B5		MT1117/MT1504	176		35.0		7	6					5	6.0				11.2	3	3.1
1157	15X255B10		MT1117/MT1504	177		36.2		5	6					5	5.3	20			12.2	3	3.2
1158	15X255B15		MT1117/MT1504	176		37.0		6	6					5	5.7				11.3	3	3.4
1159	15X255B25		MT1117/MT1504	176		37.0		5	7					6	6.0				11.3	3	3.4
1160	15X255B31		MT1117/MT1504	177		35.8		5	6					5	5.3	tr	15		11.2	3	3.4
1161	15X255B55		MT1117/MT1504	177		36.6		6	6					5	5.7	5			10.7	3	3.1
1162	15X255B58		MT1117/MT1504	177		37.0		6	6					5	5.7	tr			10.8	3	3.0
1163	15X255B71		MT1117/MT1504	177		36.6		7	7					7	7.0				11.6	3	4.0
1164	18JC1		MTCL1502/MTCL1329/Patwin 515	171		33.9															
1165	18JC2		Yellowstone/Loma/Decade/Patwin 515	176		34.6															
1166	18JC3		Loma//Yellowstone/3*Conan	177		35.8															

Table 150. 2019 Single Rep Observation 'A' Nursery (SROA): All Location data

Row/ Plot	wPPO h = harvested line d = low SDS and/or high PPO white, possible discard	ID	Pedigree	Heading date		Plant height		Agronomic Score						Stripe rust %		2018 HR data	
								PLB BZ	JEB BZ	PLB MC	JEB MC	PLB FE-CLO	JEB JEB	FE-Sr JEB	Aver- age		
				BZ	FE	BZ	FE	23-Jul	1-Aug	26-Jul	29-Jul	2-Aug	6-Aug	24-Jul	6-Aug	Prot-	PPO SDS
1167		18JC4	Warhorse//Yellowstone/3*Conan	176		35.4										ein	
1168		16X226A1	Rawhide/MT1665 F3	174		35.8											
1169		16X226A2	Rawhide/MT1665 F3	174		35.0											
1170		16X226A3	Rawhide/MT1665 F3	175		38.2											
1171		16X227A1	Rawhide/Bobcat	175		34.3											
1172		16X227A2	Rawhide/Bobcat	171		33.5											
1173		16X227A3	Rawhide/Bobcat	174		37.0											
Average				176.8		33.7		6.0	5.8	5.9	5.4	5.8	6.1	5.6	5.7	10.8	3 3.1

Table 151. 2019 Northern Regional Performance Nursery: Bozeman, MT

Entry #	Cultivar/ Line	Class	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Stem ^{1/} solidness (5-25)	Protein %
+ = new for 2019				RCB	RCB	RCB	RCB		bulk
43	SD14115-5	HRW	T154/SD07165	138.9	63.2	170.0	32.8		11.4
11	NE14696	HRW	NE05537/Overland	131.0	62.5	172.0	37.8		11.5
45	+ SD15205-1	HRW	Bearpaw/SD06156-1	128.0	62.6	172.7	38.1		11.1
6	+ NEDI4-4006	HRW	DANBY//HV9W02-846R/CIMMYT-06-3040	127.3	64.3	175.0	33.7		11.1
26	+ 18CP010156	HRW	(HATCHER/04BC574-2)@36	126.9	64.3	171.3	36.0		11.4
35	+ MT1683	HRW	Yellowstone*2/CDC Buteo	126.9	61.8	177.7	37.4		11.7
21	+ LCH12DH-21-50	HRWW		124.1	64.0	170.0	33.7		12.0
4	Jagalene	HRW	check	123.8	63.8	172.0	34.4		12.0
16	+ NW15443	HWW	OR 2060108/NW03681//NW03666	122.5	62.3	171.0	35.0		11.7
8	+ NEDI4-4039	HRW	DANBY//HV9W02-846R/CIMMYT-06-3040	121.8	63.9	171.7	34.3		10.8
25	+ 18CP010083	HRW	(BC01152-15/04BC574-2//SY WOLF)@27@B-B-I	121.8	62.2	170.0	29.4		12.7
40	+ SD13DHA02346	HRW	Smoky Hill/Redfield	121.8	62.9	175.0	35.8		12.6
19	+ ERYTHRO2420-	HRWW		121.6	62.5	167.3	28.9		11.4
7	+ NEDI4-4030	HRW	DANBY//HV9W02-846R/CIMMYT-06-3040	121.1	64.3	173.0	32.8		10.4
13	NE15410	HRW	Wesley * Madsen /TAM111	121.0	62.9	171.0	35.2		11.2
12	NI14729	HRW	NE05426/Harry	120.8	61.6	172.7	37.0		11.9
5	Jerry	HRW	check	119.9	62.5	171.7	37.4		12.2
22	+ ERYTHRO1939-	HRWW		119.7	60.8	170.3	32.7		11.3
46	+ AAC Wildfire	HRW	L99-1236/AC Bellatrix	119.3	61.9	182.3	36.6		12.9
18	+ NE16593	HRW	NE06545/KS011327M-2	119.0	63.1	171.0	33.9		12.6
36	+ SD12DHA01373	HRW	Radiant/SD06069	118.7	63.5	175.7	35.7		11.7
34	+ MT1642	HRW	Yellowstone*2/Madsen	118.6	62.0	179.7	35.3		12.1
39	+ SD13099-8	HRW	Redfield/SD05W012	117.8	62.2	170.7	37.5		12.4
37	+ SD12DHA03282	HRW	Striker/SD03184-4	117.5	63.9	176.0	34.1		11.9
42	SD14113-3	HRW	T154/SD06069	117.2	62.4	170.0	32.2		12.1
2	Overland	HRW	check	117.1	62.7	170.7	36.6		12.7
33	+ 17NORD-96	HRWW	Accipiter/Ideal	117.1	62.1	177.3	39.1		11.2
38	+ SD13062-2	HRW	Redfield/Lyman	116.7	62.1	171.7	37.7		12.6
44	+ SD15103-6	HRW	NI04427/SD03184-3//SD07126	115.1	63.2	170.7	37.4		12.8
20	+ DH12HRW44-144	HRWW		113.4	63.5	173.7	34.3		12.7
10	NE14691	HRW	SD05W138/NE01604	112.2	62.7	169.0	33.1		12.9
29	+ 17NORD-90	HRWW	Flourish/Hawken	110.3	61.1	177.3	38.5		11.9
9	+ MODI4-4919	HRW	PRYOR/MTS04120	110.1	61.1	177.7	35.0	14.3	12.2
14	NW15404	HWW	KS05HW15-2/NW03681	109.5	62.3	168.3	32.4		12.5
32	+ 17NORD-94	HRWW	Boomer/Ideal	109.4	60.9	176.3	36.9		11.9
47	+ AAC Goldrush	HRW	S98-11//Crimson/CDC Falcon	109.4	62.0	178.7	37.3		12.0
30	+ 17NORD-91	HRWW	NE10609/Accipiter	109.0	60.8	176.3	39.2		13.2
41	+ SD13DHA02489	HRW	Art/Redfield	108.3	62.2	173.3	35.2		12.4
15	+ NE15624	HRW	NE05537/KS05HW15-2	107.5	62.5	169.3	29.7		12.6
24	+ 18CP010076	HRW	(BC01138-42/Everest//SY WOLF)18-B-B-1-B-B-B	107.4	62.8	169.7	30.2		12.2
23	+ DH11HRW52-5	HRWW		107.1	62.0	171.0	31.9		11.5
48	Matterhorn	waxy	NW98S061/99Y1442	106.6	62.7	169.0	35.6		12.9
17	+ NE16562	HRW	HV9W02-942R/CAMELOT	106.0	62.2	169.7	31.4		12.2
3	Wesley	HRW	check	104.1	61.3	169.0	30.2		12.8
27	+ 18CP010160	HRW	(DUSTER/05BC083-29-2//SY WOLF)10-B-28-B-E	102.1	62.0	170.7	29.7		12.1
28	+ 18CP010094	HRW	(BEARPAW//BC98337-10-53/CDC FALCON/NE0	96.7	61.7	177.3	29.9	16.4	12.1
31	+ 17NORD-92	HRWW	TX09D1036/Decade	95.0	59.5	176.3	37.7		12.0
1	Kharkof	HRW	check	68.9	61.3	177.3	51.6		14.8
Average				115.1	62.4	172.9	35.0		12.1
LSD (0.05)				11.0	1.0	1.8	1.4		
C.V. (%)				5.9	1.0	0.6	2.5		
P-value (Varieties)				<.0001	<.0001	<.0001	<.0001		

Table 152. 2019 Northern Regional Performance Nursery: Moccasin, MT

Entry #	Cultivar/ Line	Class	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Protein %
+ = new for 2019				RCB	RCB	RCB	RCB	bulk
7 +	NEDI4-4030	HRW	DANBY//HV9W02-846R/CIMMYT-06-3040	73.2	64.7	170.3	28.3	10.8
13	NE15410	HRW	Wesley * Madsen /TAM111	70.6	61.5	169.0	32.7	10.3
35 +	MT1683	HRW	Yellowstone*2/CDC Buteo	70.6	61.3	174.3	32.3	10.7
33 +	17NORD-96	HRWW	Accipiter/Ideal	69.9	61.9	175.0	33.7	9.9
42	SD14113-3	HRW	T154/SD06069	67.6	62.1	168.0	29.7	11.3
46 +	AAC Wildfire	HRW	L99-1236/AC Bellatrix	66.7	61.5	178.0	33.3	11.5
36 +	SD12DHA01373	HRW	Radiant/SD06069	66.4	61.7	170.7	32.0	10.7
12	NI14729	HRW	NE05426/Harry	65.9	62.7	168.7	31.0	11.6
30 +	17NORD-91	HRWW	NE10609/Accipiter	65.3	59.1	172.0	33.3	12.5
37 +	SD12DHA03282	HRW	Striker/SD03184-4	65.1	63.0	173.7	30.0	11.9
9 +	MODI4-4919	HRW	PRYOR/MTS04120	64.7	61.1	175.3	29.0	9.4
45 +	SD15205-1	HRW	Bearpaw/SD06156-1	64.7	62.0	169.0	30.7	11.0
8 +	NEDI4-4039	HRW	DANBY//HV9W02-846R/CIMMYT-06-3040	64.5	63.5	171.3	30.0	10.0
25 +	18CP010083	HRW	(BC01152-15/04BC574-2//SY WOLF)@27@B-B-B-B-	64.5	62.1	168.3	26.0	11.1
38 +	SD13062-2	HRW	Redfield/Lyman	63.7	60.4	170.3	32.3	10.4
21 +	LCH12DH-21-50	HRWW		63.6	63.4	168.7	28.7	11.0
32 +	17NORD-94	HRWW	Boomer/Ideal	63.1	59.1	170.3	31.3	11.8
4	Jagalene	HRW	check	62.5	63.9	169.7	28.7	12.0
39 +	SD13099-8	HRW	Redfield/SD05W012	62.5	60.5	170.7	32.7	11.7
11	NE14696	HRW	NE05537/Overland	62.3	60.0	170.7	31.0	11.6
23 +	DH11HRW52-5	HRWW		62.3	61.4	168.0	26.7	10.3
19 +	ERYTHRO2420-	HRWW		62.2	61.8	167.7	25.3	11.2
28 +	18CP010094	HRW	(BEARPAW//BC98337-10-53/CDC FALCON/NE03458	62.0	62.1	174.0	27.3	11.4
41 +	SD13DHA02489	HRW	Art/Redfield	61.8	62.3	171.0	29.7	12.2
3	Wesley	HRW	check	61.4	61.2	167.0	26.0	12.6
18 +	NE16593	HRW	NE06545/KS011327M-2	61.4	61.6	167.3	28.0	11.1
22 +	ERYTHRO1939-	HRWW		61.2	60.6	169.3	29.7	10.8
16 +	NW15443	HWW	OR 2060108/NW03681//NW03666	61.1	61.3	168.7	31.0	10.4
6 +	NEDI4-4006	HRW	DANBY//HV9W02-846R/CIMMYT-06-3040	60.8	63.4	173.0	31.0	10.2
5	Jerry	HRW	check	60.2	60.9	169.3	32.7	11.1
20 +	DH12HRW44-144	HRWW		59.9	62.4	170.0	28.7	11.7
14	NW15404	HWW	KS05HW15-2/NW03681	59.5	62.0	167.7	27.7	11.5
29 +	17NORD-90	HRWW	Flourish/Hawken	59.3	59.4	175.0	34.0	10.3
34 +	MT1642	HRW	Yellowstone*2/Madsen	59.0	60.8	176.0	31.3	10.9
2	Overland	HRW	check	58.4	60.8	169.7	30.0	11.8
43	SD14115-5	HRW	T154/SD07165	58.1	61.6	168.0	26.0	11.1
15 +	NE15624	HRW	NE05537/KS05HW15-2	57.3	61.6	167.7	24.7	12.1
26 +	18CP010156	HRW	(HATCHER/04BC574-2)@36	57.2	63.5	169.0	29.7	10.7
47 +	AAC Goldrush	HRW	S98-11//Crimson/CDC Falcon	57.1	61.8	175.3	30.0	11.0
31 +	17NORD-92	HRWW	TX09D1036/Decade	56.3	59.8	171.0	33.3	11.4
17 +	NE16562	HRW	HV9W02-942R/CAMELOT	56.2	61.5	167.7	26.7	11.4
27 +	18CP010160	HRW	(DUSTER/05BC083-29-2//SY WOLF)10-B-28-B-B-B-	55.9	62.3	170.3	25.3	11.2
10	NE14691	HRW	SD05W138/NE01604	55.4	62.0	167.0	27.3	12.2
48	Matterhorn	waxy	NW98S061/99Y1442	54.6	61.9	167.3	31.0	12.3
40 +	SD13DHA02346	HRW	Smoky Hill/Redfield	54.5	62.0	170.7	28.3	11.1
24 +	18CP010076	HRW	(BC01138-42/Everest//SY WOLF)18-B-B-1-B-B-B-	53.4	62.1	168.3	24.3	11.3
44 +	SD15103-6	HRW	NI04427/SD03184-3//SD07126	47.1	61.4	168.0	30.7	11.4
1	Kharkof	HRW	check	40.2	61.1	173.7	39.0	12.4
Average				61.1	61.7	170.5	29.8	11.2
LSD (0.05)				12.6	0.6	2.1	2.5	
C.V. (%)				12.8	0.6	0.7	5.2	
P-value (Varieties)				0.0173	<.0001	<.0001	<.0001	

Table 153. 2019 Northern Regional Performance Nursery: Williston, ND

Entry #	Cultivar/ Line	Class	Pedigree	Yield bu/ac	Test weight lb/bu	Winter survival %	Heading date Julian	Plant height in	Protein %
+ = new for 2019				RCB	RCB	RCB	RCB	RCB	RCB
46	+ AAC Wildfire	HRW	L99-1236/AC Bellatrix	69.1	61.3	86.7	167.0	16.8	14.1
33	+ 17NORD-96	HRWW	Accipiter/Ideal	68.9	61.3	83.3	165.0	15.7	13.7
47	+ AAC Goldrush	HRW	S98-11//Crimson/CDC Falcon	67.3	61.6	83.3	165.0	16.1	16.3
16	+ NW15443	HWW	OR 2060108/NW03681//NW03666	65.5	60.8	71.7	161.0	16.7	15.6
34	+ MT1642	HRW	Yellowstone*2/Madsen	65.3	59.9	65.0	167.0	18.1	15.3
37	+ SD12DHA03282	HRW	Striker/SD03184-4	64.5	62.2	85.0	163.0	15.3	16.3
32	+ 17NORD-94	HRWW	Boomer/Ideal	60.0	59.6	63.3	162.0	16.9	15.7
26	+ 18CP010156	HRW	(HATCHER/04BC574-2)@36	59.9	63.2	85.0	161.0	14.0	15.3
35	+ MT1683	HRW	Yellowstone*2/CDC Buteo	58.1	61.1	70.0	163.0	17.9	15.1
28	+ 18CP010094	HRW	(BEARPAW//BC98337-10-53/CDC FALCON/NE0345)	57.8	61.3	76.7	163.0	14.3	16.2
29	+ 17NORD-90	HRWW	Flourish/Hawken	57.8	60.1	82.3	164.0	15.5	17.3
17	+ NE16562	HRW	HV9W02-942R/CAMELOT	57.7	60.6	63.3	159.0	16.2	15.9
9	+ MODI4-4919	HRW	PRYOR/MTS04120	57.6	60.3	66.7	166.0	15.3	14.9
21	+ LCH12DH-21-50	HRWW		57.2	63.6	80.0	160.0	13.6	16.9
12	NI14729	HRW	NE05426/Harry	56.9	60.0	81.7	161.0	16.7	16.7
31	+ 17NORD-92	HRWW	TX09D1036/Decade	56.7	59.9	81.0	163.0	15.3	16.2
38	+ SD13062-2	HRW	Redfield/Lyman	55.8	61.1	71.0	163.0	16.4	16.9
23	+ DH11HRW52-5	HRWW		54.7	61.0	71.7	161.0	13.9	15.2
8	+ NEDI4-4039	HRW	DANBY//HV9W02-846R/CIMMYT-06-3040	54.4	63.1	65.0	162.0	15.3	15.0
2	Overland	HRW	check	53.7	60.6	81.7	161.0	14.6	18.5
40	+ SD13DHA02346	HRW	Smoky Hill/Redfield	52.6	60.8	75.0	161.0	15.6	17.8
7	+ NEDI4-4030	HRW	DANBY//HV9W02-846R/CIMMYT-06-3040	51.5	63.5	60.0	162.0	13.6	15.5
1	Kharkof	HRW	check	50.9	61.2	80.0	165.0	18.1	17.9
41	+ SD13DHA02489	HRW	Art/Redfield	50.9	60.6	75.0	161.0	14.6	18.5
5	Jerry	HRW	check	50.8	60.8	80.0	161.0	15.7	16.8
42	SD14113-3	HRW	T154/SD06069	50.8	60.6	70.0	161.0	12.8	17.7
13	NE15410	HRW	Wesley * Madsen /TAM111	50.6	60.7	80.0	160.0	14.1	17.1
11	NE14696	HRW	NE05537/Overland	50.4	59.3	80.0	161.0	14.8	19.6
45	+ SD15205-1	HRW	Bearpaw/SD06156-1	50.2	61.3	75.0	161.0	13.7	17.4
39	+ SD13099-8	HRW	Redfield/SD05W012	50.2	60.7	75.0	161.0	16.8	15.0
25	+ 18CP010083	HRW	(BC01152-15/04BC574-2//SY WOLF)@27@B-B-B-B-	48.7	60.3	65.0	161.0	13.3	16.4
18	+ NE16593	HRW	NE06545/KS011327M-2	48.4	61.5	81.7	158.0	14.9	17.4
6	+ NEDI4-4006	HRW	DANBY//HV9W02-846R/CIMMYT-06-3040	48.3	63.2	63.3	164.0	17.6	15.7
20	+ DH12HRW44-144	HRWW		47.9	61.1	76.7	161.0	13.5	19.4
24	+ 18CP010076	HRW	(BC01138-42/Everest//SY WOLF)18-B-B-1-B-B-B-	47.4	61.0	76.7	159.0	12.8	17.5
3	Wesley	HRW	check	47.4	60.8	78.3	160.0	14.0	18.3
22	+ ERYTHRO1939-	HRWW		47.1	58.6	68.3	161.0	16.5	15.6
27	+ 18CP010160	HRW	(DUSTER/05BC083-29-2//SY WOLF)10-B-28-B-B-B-	46.6	60.1	65.0	161.0	12.1	16.8
30	+ 17NORD-91	HRWW	NE10609/Accipiter	46.6	59.7	81.7	162.0	15.3	19.2
10	NE14691	HRW	SD05W138/NE01604	44.4	59.6	71.7	159.0	15.2	17.6
44	+ SD15103-6	HRW	NI04427/SD03184-3//SD07126	42.7	59.3	78.3	158.0	14.7	20.0
36	+ SD12DHA01373	HRW	Radiant/SD06069	40.1	59.9	66.7	163.0	15.0	16.4
4	Jagalene	HRW	check	38.1	61.0	55.0	162.0	13.8	18.2
19	+ ERYTHRO2420-	HRWW		37.8	59.7	65.0	158.0	14.7	16.3
15	+ NE15624	HRW	NE05537/KS05HW15-2	37.4	59.2	76.7	158.0	12.4	20.7
43	SD14115-5	HRW	T154/SD07165	36.6	61.2	70.0	161.0	14.1	17.8
14	NW15404	HWW	KS05HW15-2/NW03681	36.6	59.2	71.7	159.0	14.0	19.0
48	Matterhorn	waxy	NW98S061/99Y1442	35.8	58.5	56.7	159.0	16.4	17.1
Average				53.5	60.8	73.6	161.5	15.1	16.9
LSD (0.05)				13.3	1.3	17.3	1.7	2.8	1.9
C.V. (%)				15.4	1.3	14.5	0.7	11.5	6.8
P-value (Varieties)									

Table 154. 2019 Southern Regional Performance Nursery (SRPN): Bozeman, MT

Ent-ry #	Line + = new for 2019	Market Class	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height cm	Stripe rust ≥ 5%	Lodging score (0-9)	Protein %
								19-Jul	19-Jul	
1	Kharkof	HRW	check	55.2	60.6	179	134		8	15.2
2	Scout66	HRW	check	77.6	62.1	172	115		7	13.8
3	TAM-107	HRW	check	82.5	62.2	169	85	25		12.2
4	Jagalene	HRW	check	113.6	63.7	174	90			12.0
5	+ NEDI4-4006	HRW	DANBY//HV9W02-846R/CIMMYT-06-3040	127.5	64.2	176	85			10.8
6	+ NEDI4-4030	HRW	DANBY//HV9W02-846R/CIMMYT-06-3040	130.7	65.0	175	82			10.5
7	+ NEDI4-4066	HRW	HV9W09-0918/BC01007-7	107.2	62.3	175	73			11.3
8	+ NEDI4-4802	HRW	(EVEREST/HITCH:0002)/HV9W09-0918	114.4	62.8	170	66			11.9
9	KS14HW106-6-6	HWW	KS05HW122-5-2//KS05HW15-2-2/ KS06HW46-3 = KS Silverado	121.3	64.7	171	79			12.2
10	+ KS15H116-6-1	HRW	KS08HW112-6(DANBY/KS03HW149-1)//TX03A0148/ DANBY TR = KS Dallas	133.2	63.4	175	87			12.0
11	+ KS15H161-1-4	HRW	Byrd/KS05HW121-2 = KS Western Star	122.9	63.1	171	84			11.9
12	NHH144913-3	HRW	SETTLER CL/NE07457//Brawl CL	126.5	60.9	172	76			12.8
13	NE15624	HRW	NE05537/KS05HW15-2	108.3	62.8	172	76			12.9
14	+ NE16562	HRW	HV9W02-942R/CAMELOT	115.8	62.3	172	79			12.2
15	+ NI17410	HRW	TX06A001281/NI04420	121.9	63.2	172	86			12.2
16	+ CO13D0787	HRW	Antero/Snowmass//Byrd = Gaurdian	124.3	63.7	175	84			11.9
17	+ CO15D098R	HRW	TAM 114/Antero//Byrd	143.8	64.0	171	92			11.0
18	+ CO15SFD107	HRW	Byrd/Bearpaw//Byrd = Fortify SF	109.9	62.1	172	86	25		11.3
19	CO13D1479	HWW	CO07W722-F5/Antero//Snowmass	127.4	63.2	174	88			11.7
20	+ LCH13DH-46-15	HRWW		119.4	61.9	176	85			10.7
21	+ LCH13DH-47-16	HRWW		119.5	64.7	171	82			12.2
22	+ DH11HRW55-4	HRWW		125.1	63.9	172	83			12.1
23	+ LCH15ACC-8-21	HRWW		126.8	63.6	170	81			11.0
24	TX14A001249	HRW	TX01V5134WC-2/TX06A001236	116.9	63.7	169	84		1	12.3
25	TX14A001035	HRW	OK03522/TX03A0563	129.4	64.1	169	83		1	11.5
26	TX14M7061	HRW	TAM 113/TX03A0148	127.4	61.7	170	70			12.3
27	+ TX15A001482	HRW	TX06A001431/TX06A001281	130.2	62.7	170	85			12.0
28	+ TX14V70214	HRW	Art/TAM 401	123.9	63.3	171	92			12.4
29	+ TX09V7446-16A	HRW	TAM 112/KS03HW156-3	136.9	64.2	171	84	5	1	11.7
30	+ TX15M8024	HRW	TAM 203/Duster	122.8	63.4	171	90			12.1
31	+ TX15M8023	HRW	TAM 203/Duster	113.5	61.0	168	79			12.0
32	+ TX15M8456	HRW	X08A586S [=ME-1-1/TX04M410164)]/TX01V5134RC-3	115.8	61.3	169	76			11.8
33	+ 18CP010073	HRW	(JACKPOT/DUSTER)	129.0	63.5	172	82			12.0
34	+ 18CP010085	HRW	(BC03212-20/06BC796#8//SY WOLF)@82	109.2	63.6	168	70			13.0
35	+ 18CP010155	HRW	(DUSTER/05BC083-29-2//SY WOLF)10-	121.2	62.3	171	74			12.3
36	+ 18CP010129	HRW	(06BC796#68/04BC574-2)@60	120.3	64.2	170	77			11.5
37	KS080093K-18	HRW	KS980554-12--9/KS020363WM~1	120.4	62.7	171	78			11.8
38	KS090049K-8	HRW	Duster/KS06O3A~57	123.7	62.4	170	79			12.0
39	KS090387K-20	HRW	Winterhawk/KS011020-6//Hitch	111.7	63.3	171	76			13.1
40	+ KS12DH0156-88	HRW	KS040477K-12/Gallagher	105.6	62.6	174	75			12.3
41	NF97117	HRW	Tomahawk/Coker 9803//NF165	103.9	61.7	176	119		3	12.8
42	+ OK14P212	HRW	OK01307/OK93P656H3299-99//OK06822W	120.6	64.1	172	91			11.9
43	+ OK16D101073	HRW	OK12621/Bentley	116.3	61.5	171	83		1	13.0
44	+ OK16D101089	HRW	OK12621/Bentley	104.1	63.4	170	84		1	12.3
45	+ OK14P736W	HWW	(V18/Marfedert//2*WestoniaRht5)/2*OKBullet	123.3	63.9	170	84			11.3
46	+ OK16729W	HWW	LA98149BUB-3-4-B/Billings//OK07231	125.0	64.3	171	97			11.9
47	+ NE14691	HRW	SD05W138/NE01604	109.7	62.7	169	86			12.7
48	+ OK1059018-129	HRW	Duster/Billings.	121.3	63.6	170	91		1	12.2
49	+ TX04CS231-12			108.8	60.1	168	76			11.8
Average				117.3	63.0	171.6	84.6			12.1

planted: 10/1/2018

harvested: 8/28/2019

Crop Year Rainfall (Sept 2018 - Aug 2019): 16.47 in (62 year Avg = 15.92 in)

Table 155. 2019 Western Regional Hard Winter Wheat Test (Exp. 0101): Bozeman, MT

Entry #	Cultivar/Line	Class	Pedigree	Yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Protein %
+ = new for 2019				LAT	LAT	LAT	RCB	bulk
lattice efficiency relative to RCB				106%	113%	121%	91%	
3	LCS Jet	HRW	check	139.8	60.3	177.3	30.4	11.6
12	+ 05PN044-20	HRW	UN 99 24-1W98-263	134.6	62.0	174.9	30.8	11.7
4	OR2130118H	HWW	Norwest 553/OR2050332H	129.8	63.4	177.5	31.2	11.5
9	OR2140074R	HRW	OR2070182H/Norwest553	128.0	58.7	179.7	32.5	13.3
6	IDO1706 (A0709W-44)	HWW	IDO658/IDO660	127.5	60.7	177.4	33.6	11.2
15	+ OR2150169R	HWW	WH1200553/OR952577//Norwest 553	126.3	61.0	178.5	31.9	11.7
13	+ OR2140119H	HWW	OR2070014H/Norwest553	121.0	62.7	179.2	32.5	11.4
7	HRW11044-2-DH-2-4	HRW	Norwest 553/Compile	119.9	61.2	179.7	29.5	12.0
8	OR2130021R	HRW	BC97ROM41W/OR2052055H//Norwest 553	118.3	62.4	180.2	31.4	12.0
14	+ OR2150100R	HWW	Norwest 553/AP05TW2821	117.8	61.6	176.9	30.6	12.1
16	+ OR2150168H	HWW	WH1200553/OR952577//Norwest 553	115.8	59.5	180.1	27.0	11.8
11	+ HRW11012-2-DH-27-1	HRW	Bermude/Norwest 553	112.5	60.1	180.1	28.6	11.5
2	Whetstone	HRW	check	109.1	62.9	175.2	32.4	12.1
5	IDO1506	HWW	Dongxuan3/DW Red F7	108.7	60.2	177.3	24.9	11.6
1	Kharkof	HRW	check	108.6	62.1	178.3	50.4	13.7
10	+ HRW11012-2-DH-16-1	HRW	Bermude/Norwest 553	104.3	60.4	180.0	28.3	11.8
Average				120.1	61.2	178.3	31.6	11.9
LSD (0.05)				16.7	0.8	1.0	1.3	
C.V. (%)				7.8	0.7	0.3	2.4	
P-value (Varieties)				0.0075	<.0001	<.0001	<.0001	

bold = indicates highest value within a column**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

planted: 10/2/2018

harvested: 8/29/2019

Crop Year Rainfall (Sept 2018 - Aug 2019): 16.47 in (62 year Avg = 15.92 in)

Table 156. 2019 Winter Cereals Forage Test (Exp. WCF1): Bozeman, MT

Entry #	Cultivar/ Line + = new for 2019	Forage type	Grain yield bu/ac	Test weight lb/bu	Heading date Julian	Plant height in	Lodg- ing (0-9)	Forage Yield		Grain Protein %
								tons/a	g/3' sample	
1	Trical 102	triticale	80.7	50.5	177.8	57.2	5.5	5.52	345	12.8
2	T1310-221	triticale	82.3	54.5	174.0	62.3	2.8	6.24	390	12.2
3	WCF 1078	triticale	83.3	53.9	175.0	63.7	3.3	5.67	354	12.0
4	Willow Creek	wheat	61.7	60.3	188.0	54.5	2.5	7.38	462	15.2
5	FX 1001 (WCF 1060)	triticale	76.9	51.8	177.0	63.0	2.0	6.47	405	13.4
6	T1310-230	triticale	92.9	54.9	175.3	62.4	2.8	5.90	369	12.0
7	T1310-218	triticale	82.3	54.0	173.3	61.1	3.3	6.11	382	12.3
8	Ray	wheat	88.1	59.1	182.8	39.4	0.0	5.77	361	13.0
9	T14	triticale	88.7	56.7	175.8	59.1	0.5	6.08	380	12.2
10	PI 197732	wheat	62.6	57.5	187.8	49.4	0.0	5.45	341	13.1
Average			79.9	55.3	178.7	57.2	2.3	6.1	378.9	12.8
LSD (0.05)			17.2	2.8	1.2	3.2	2.5	0.8		0.5
C.V. (%)			14.9	3.5	0.5	3.9	76.8	9.5		2.9
P-value (Varieties)			0.0114	<.0001	<.0001	<.0001	0.0027	0.0031		<.0001

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

planted: 10/10/2018

harvested: 9/14/2019

Crop Year Rainfall (Sept 2018 - Aug 2019): 16.47 in (62 year Avg = 15.92 in)

Table 157. 2019 Forage Observation Nursery (FO): Post Farm (Y9 Field)

Row/ wPPO	2020 ID	ID	Pedigree	Heading date	Plant height	Forage ton/a	Lodge Score	Stripe Rust %	2018 HR data		
Plot	d = low SDS and/or high PPO white, possible discard					Avg	BZ 19-Jul	FE-Sr 24-Jul	BZ-r1 19-Jul	Prot- PPO	SDS
1		check	Willow Creek	check	188	52.6	6.79				
2		check	Ray	check	181.5	43.7	7.26				
3	w2	JY-16	Judee/1074-26/Yellowstone/1074-76	171.5	44.9	7.85		tr	10	13.1	2
4	w0 d	JY-162	Yellowstone/1074-76-17/Judee/1074-10:	170	44.9	7.91				14.5	0
5	w0	JY-38	Judee/1074-125-28/Yellowstone/1074-7i	175	49.2	8.17	1	3	tr	13.2	0
6	w0	JY-44	Judee/1074-125-28/Yellowstone/1074-7i	176	48.2	8.10	2	2	tr	12.9	0
7	w0	JY-52	Judee/1074-125-28/Yellowstone/1074-7i	176	49.0	7.44	3	2		14.3	0
8	d	12X137cE6	MT0871*2/(SD06156-1, Redfield sib)	182	49.6	6.51			40	9.7	0
9	d	12X137cE12	MT0871*2/(SD06156-1, Redfield sib)	182	50.8	6.63			20	9.4	2
10		12X137cE20	MT0871*2/(SD06156-1, Redfield sib)	181	51.6	7.40				10.6	5
11		12X137cE28	MT0871*2/(SD06156-1, Redfield sib)	181.5	50.6	7.47	3	1	tr	11.2	5
12	d	12X137cE34	MT0871*2/(SD06156-1, Redfield sib)	180.5	51.4	7.32	1		tr	11.1	5
13		12X137cE38	MT0871*2/(SD06156-1, Redfield sib)	179.5	46.9	8.06	4			10.8	4
14		12X137cE47	MT0871*2/(SD06156-1, Redfield sib)	181.5	52.6	7.48	2		tr	11.5	5
15		12X137cE59	MT0871*2/(SD06156-1, Redfield sib)	179.5	46.7	6.24				12.3	5
16	d	12X137cE69	MT0871*2/(SD06156-1, Redfield sib)	182	48.0	6.44				9.8	0
17	d	12X137cE78	MT0871*2/(SD06156-1, Redfield sib)	181.5	50.2	6.73			tr	10.4	0
18	d	12X137cE84	MT0871*2/(SD06156-1, Redfield sib)	182.5	49.6	6.89			tr	9.2	1
19	d	12X137cE112	MT0871*2/(SD06156-1, Redfield sib)	182.5	48.4	6.75			tr	10.4	0
20		12X137cE119	MT0871*2/(SD06156-1, Redfield sib)	180	50.2	7.75	1			12.2	5
21		12X175E1	MTF1232/WB3768	182	49.2	6.08			3	9.9	2
22		12X175E21	MTF1232/WB3768	181	49.2	7.03			2	10.7	0
23	MTF20186	12X175E23	MTF1232/WB3768	181	49.8	8.42				11.4	3
24		12X175E36	MTF1232/WB3768	183	51.0	7.15				10.0	1
25		12X175E62	MTF1232/WB3768	182	50.0	6.41			tr	12.9	0
26		12X175E65	MTF1232/WB3768	181	49.2	7.11				12.7	3
27	2020FO-3	12X175E97	MTF1232/WB3768	181	48.2	7.53				11.2	4
28	2020FO-5	12X175E100	MTF1232/WB3768	181.5	48.0	7.54				11.1	3
29		12X175E115	MTF1232/WB3768	180.5	48.6	6.89				10.1	4
30	d	12X175E121	MTF1232/WB3768	180	49.2	7.25			tr	11.0	4
31		12X201E118	MT1088/CH-111.14098	176	28.3					9.8	4
32		12X203E18	Overland//TCI 001744	175.5	45.1	7.44	1			9.7	1
33	MTF20187	12X203E23	Overland//TCI 001744	175	45.9	7.90	1			9.9	1
34		12X203E36	Overland//TCI 001744	175.5	47.0	7.36	1			10.4	1
35		12X203E41	Overland//TCI 001744	173.5	48.2	7.27	2			10.2	1

Table 157. 2019 Forage Observation Nursery (FO): Post Farm (Y9 Field)

Row/ wPPO	2020 ID	Pedigree	Heading date	Plant height	Forage ton/a	Lodge Score	Stripe Rust %	2018 HR data
Plot	d = low SDS and/or high PPO white, possible discard				Avg	BZ 19-Jul	FE-Sr 24-Jul	Prot- PPO SDS
						19-Jul	24-Jul	ein
36	d	12X203E62	178	47.4	7.74		tr	9.7 0 2.4
37	d	12X203E80	176.5	49.6	6.73	1		10.2 2 2.4
38	d	12X203E82	173.5	49.0	7.54	1		10.9 1 2.5
39	2020FO-18	11X148cE35-1	180	52.8	8.07			11.9 4 3.4
40		11X148cE46-3	180	50.2	6.88		tr	10.0 1 3.0
41	MTF20188	11X148cE68-2	179	53.1	8.36			10.9 3 3.5
42		11X148cE95-2	179.5	54.1	8.57			9.2 3 3.1
43	MTF20189	11X148cE99-1	180	52.8	7.77			11.2 1 3.3
44	PI 197732-1		187	49.4	6.22			12.2 1 2.7
Average			179.5	48.7	7.31			11.0 2.1 2.9

Table 158. 2016-2018 Montana Intrastate Winter Wheat (Exp. 35): Cereal Quality Evaluations

ID	Whole Kernel			Flour			L*		
	PPO	Hardness		Protein %		Yield %	Protein %		
	2018	2yr	3yr	2018	2yr	3yr	2018	2yr	3yr
AAC Wildfire	0.266								
Bobcat	0.257	0.234		no data	71.8		12.2	12.5	89.8
Brawl CLP	0.266	0.275	0.275	75.5	69.3		12.2	12.5	90.0
Byrd CL Plus	0.258	0.277		69.3			12.1	12.0	90.4
Decade	0.254	0.265	0.251	78.4	74.1		12.1	12.0	90.5
Flathead	0.235	0.247		74.2			12.4	12.1	90.4
FourOsix	0.225	0.246	0.246	77.7	71.1		12.0	12.0	90.2
Incline AX	0.228						12.3	12.3	89.9
Judee	0.236	0.239	0.239	78.5	76.5		10.2		90.2
Keldin	0.297	0.311	0.318	68.0	64.6		12.8	12.6	90.0
LCS Chrome	0.204	0.239		82.1			12.0	11.7	90.0
LCS Jet	0.248	0.278		69.8			12.1	12.0	90.0
LCS Zoom	0.262						11.3	11.5	89.9
Loma	0.141	0.154	0.149	79.5	77.3		11.5		89.4
Long Branch	0.268	0.281		79.3			12.0	11.9	89.7
MT1642	0.130						10.7	11.0	89.9
MT1683	0.227						12.3		89.9
MTCS1601	0.278						12.2	12.2	89.7
MTW1491	0.129	0.113	0.111	79.2	74.0		12.1	11.8	90.1
Northern	0.160	0.100	0.105	85.6	81.6		12.1	11.8	89.7
Oahe	0.264						12.3	12.1	89.4
Ray	0.130	0.114		77.6			11.9		89.9
SY 517 CL2	0.224	0.241		71.5			12.5	12.3	89.3
SY Clearstone 2CL	0.263	0.273	0.269	75.5	71.5		11.6	11.6	90.6
SY Legend CL2	0.309						11.7	11.8	90.1
SY Monument	0.147	0.207	0.191	80.1	74.2		11.2		89.8
Warhorse	0.261	0.264	0.254	89.0	86.5		10.9	11.1	90.1
Yellowstone ^{1/}	0.247						12.9	12.7	89.9
Average	0.229	0.229	0.219	77.0	74.6		12.2		89.8
LSD (0.05)	0.051	0.039	0.031	5.3	4.2		11.8	11.9	90.0
C.V.	15.7	17.3	17.5	4.8	5.6		0.7	0.5	0.3
							4.1	4.4	0.3
							4.6	4.6	0.4

^{1/} = Yellowstone misplanted in 2017

bold, bold-underlined, ns denotes statistical significance at P <= 0.05, highest value, and non-significance within column, respectively

Table 158. 2016-2018 Montana Intrastate Winter Wheat (Exp. 35): Cereal Quality Evaluations

ID	Flour color			b*			Whole Wheat Ash (%)			Flour Ash (%)			Tolerance			Mixograph		
	a*																	
	2018	2yr	3yr	2018	2yr	3yr	2018	2yr	3yr	2018	2yr	3yr	2018	2yr	3yr	2018	2yr	3yr
AAC Wildfire	-1.78			11.7			1.47			0.41			3.8			5.2		
Bobcat	-2.00	-1.87		12.1	11.8		1.43	1.42		0.38	0.40		3.5	3.1		5.2	6.1	
Brawl CLP	-1.76	-1.78	-1.82	9.8	10.5	10.5	1.37	1.38	1.38	0.38	0.39	0.39	2.5	2.9	2.8	3.8	4.0	4.1
Byrd CL Plus	-1.74	-1.77		10.2	10.9		1.35	1.39		0.37	0.38		2.8	2.4		4.4	4.7	
Decade	-1.27	-1.30	-1.36	8.6	9.0	9.0	1.30	1.38	1.39	0.39	0.40	0.40	2.8	3.0	3.3	5.6	6.8	6.6
Flathead	-1.07	-1.13		8.5	9.0		1.41	1.37		0.41	0.41		4.0	3.9		7.7	9.1	
FourOsix	-1.39	-1.45	-1.48	9.8	10.3	10.3	1.38	1.38	1.39	0.41	0.42	0.42	2.8	2.6	2.7	4.9	5.2	5.4
Incline AX	-1.81			10.7			1.49			0.39			3.3			4.5		
Judee	-1.43	-1.54	-1.60	9.8	10.5	10.6	1.43	1.42	1.43	0.40	0.41	0.41	3.0	3.3	3.3	5.3	5.0	5.1
Keldin	-1.21	-1.32	-1.37	9.2	9.8	9.7	1.31	1.33	1.34	0.43	0.44	0.44	2.5	2.8	2.8	4.8	5.1	4.9
LCS Chrome	-1.30	-1.36		9.3	9.9		1.45	1.42		0.41	0.41		1.5	2.1		3.3	3.4	
LCS Jet	-1.50	-1.52		10.4	11.0		1.35	1.32		0.38	0.39		3.3	3.1		5.5	5.3	
LCS Zoom	-1.16			9.8			1.38			0.42			2.8			5.1		
Loma	-1.96	-1.97	-2.04	12.0	12.6	12.8	1.51	1.43	1.41	0.39	0.40	0.41	3.5	3.1	3.2	5.8	6.4	6.6
Long Branch	-1.86	-1.88		11.4	11.9		1.31	1.33		0.40	0.40		2.3	2.5		2.6	3.5	
MT1642	-1.29			9.5			1.43			0.41			3.8			7.2		
MT1683	-1.48			10.4			1.47			0.43			3.5			7.2		
MTCS1601	-1.48			11.2			1.36			0.38			3.3			4.2		
MTW1491	-1.23	-1.27	-1.34	9.6	10.0	9.9	1.46	1.39	1.37	0.41	0.40	0.40	4.0	3.8	3.7	6.9	8.0	7.7
Northern	-1.33	-1.43	-1.44	10.3	11.0	10.9	1.41	1.41	1.41	0.46	0.45	0.45	3.0	2.8	2.8	3.2	3.4	3.6
Oahe	-1.19			8.9			1.39			0.42			1.5			2.1		
Ray	-1.44	-1.53		11.3	11.8		1.54	1.48		0.42	0.42		3.3	3.1		9.5	9.9	
SY 517 CL2	-1.68	-1.74		9.6	10.0		1.44	1.41		0.38	0.38		1.8	2.4		3.1	3.4	
SY Clearstone 2CL	-1.50	-1.54	-1.59	9.9	10.5	10.5	1.44	1.43	1.43	0.40	0.41	0.41	3.3	3.5	3.5	5.5	5.7	5.4
SY Legend CL2	-1.64			11.0			1.39			0.40			2.8			3.9		
SY Monument	-1.38	-1.43	-1.46	9.6	10.1	10.2	1.34	1.36	1.36	0.38	0.40	0.40	3.8	3.5	3.6	7.5	7.9	8.1
Warhorse	-1.45	-1.51	-1.56	10.0	10.6	10.7	1.39	1.38	1.39	0.42	0.42	0.43	2.3	2.4	2.3	4.3	4.3	4.4
Yellowstone ^{1/}	-1.35			9.9			1.43			0.42			3.8			7.2		
Average	-1.49	-1.54	-1.55	10.2	10.6	10.5	1.41	1.39	1.39	0.40	0.41	0.42	3.0	3.0	3.1	5.2	5.6	5.6
LSD (0.05)	0.19	0.12	0.07	0.6	0.5	0.3	0.11	0.08	NS	0.02	0.02	0.01	0.9	0.8	0.5	1.4	1.3	0.9
C.V.	9.0	7.9	5.7	4.2	4.9	3.8	5.6	6.0	5.9	3.2	3.7	4.0	21.9	26.5	21.1	19.2	24.0	20.1

^{1/} = Yellowstone
misplanted in 2017

bold, bold-underlined, ns denotes statistical significance at P <= 0.05, highest value, and non-significance within column, respectively

Table 158. 2016-2018 Montana Intrastate Winter Wheat (Exp. 35): Cereal Quality Evaluations

ID	Test Bake									
	Absorption %			Mix time (min.)			Absorption %			Bake
	2018	2yr	3yr	2018	2yr	3yr	2018	2yr	3yr	
AAC Wildfire	67.7			12.2			78.3			1073
Bobcat	67.1	68.3		10.7	13.1		77.6	78.6		1068
Brawl CLP	67.1	65.5	65.6	6.3	6.4	7.5	76.9	75.4	75.6	1048
Byrd CL Plus	64.4	64.8		7.2	8.2		73.8	74.5		1010
Decade	69.5	69.0	67.4	13.5	15.9	17.3	79.3	79.2	77.5	1079
Flathead	68.4	68.1		15.6	17.1		78.7	78.6		1061
FourOsix	67.5	67.8	67.3	9.7	10.3	11.6	77.2	77.8	77.1	1103
Incline AX	63.7			8.9			73.5			986
Judee	68.1	65.9	65.3	8.3	7.7	9.2	78.0	75.8	75.1	1131
Keldin	66.5	65.2	64.5	7.6	7.8	8.5	76.4	75.2	74.7	1019
LCS Chrome	65.7	65.1		3.9	4.5		74.9	74.3		1060
LCS Jet	66.1	66.0		8.6	8.5		76.9	76.5		958
LCS Zoom	63.0			7.8			73.3			955
Loma	67.3	66.7	66.3	12.4	12.3	14.3	78.0	77.2	76.9	1158
Long Branch	61.8	63.1		3.2	5.3		70.8	72.2		948
MT1642	70.2			13.0			80.7			1140
MT1683	68.7			12.4			78.8			1084
MTCS1601	66.8			7.5			77.2			1095
MTW1491	67.4	67.3	65.7	14.8	15.6	16.1	78.3	78.2	76.8	1094
Northern	65.4	64.9	64.7	5.0	4.6	5.4	75.1	74.3	74.4	1083
Oahe	64.7			2.5			73.9			938
Ray	68.4	67.5		21.1	18.4		78.9	78.1		1073
SY 517 CL2	65.5	64.7		4.4	4.6		74.4	73.6		1031
SY Clearstone 2CL	66.7	65.7	65.3	8.6	8.0	8.8	76.5	75.5	75.3	1061
SY Legend CL2	64.8			5.0			74.7			1054
SY Monument	66.6	66.0	65.5	14.9	14.4	15.6	76.1	76.1	75.8	1014
Warhorse	67.3	66.0	66.0	6.1	6.1	7.0	77.3	76.1	75.9	1096
Yellowstone ^{1J}	68.2			12.0			78.4			1093
Average	66.6	66.2	65.8	9.4	9.9	11.0	76.6	76.2	75.9	1054
LSD (0.05)	2.2	1.9	1.6	3.6	3.2	2.2	2.6	2.0	1.6	52
C.V.	2.4	2.9	3.0	27.1	32.1	25.0	2.1	2.6	2.7	3.5
										3.6
										4.5
										13.7
										13.8
										14.2

^{1J} = Yellowstone
misplanted in 2017

bold, bold-underlined, ns denotes statistical significance at $P < 0.05$, highest value, and non-significance within column, respectively

2018 Winter Wheat Cereal Quality Data

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Mill and Bake (Bozeman, Havre, Huntley, and Conrad)	12-15	291-294
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Laboratory Procedures & Interpretation

Sample Preparation: Incoming wheat samples are cleaned on a Carter dockage tester to remove foreign material and then scoured in a Forster scourer to remove light dust and chaff. Samples are then placed in pre-labeled cans for quality analysis.

Whole Grain Analysis: Wheat samples are analyzed using an Infratec 1225 Grain Analyzer. This is a near infrared transmittance (NIT) instrument for simultaneous and accurate determination of protein and moisture in whole grain samples. The measurement is based on the fact that these constituents in grain absorb electromagnetic radiation in the near-infrared region of the spectrum. NIT-analysis, like all other spectrophotometric measurements, is an indirect method. Having a good calibration for reliable analysis is essential. Our instrument utilizes a calibration provided by the manufacturer. The LECO FP-528 combustion method nitrogen analyzer is used as a reference method. Wheat protein is corrected to a 12% moisture basis.

Milling: Once the moisture is determined (Infratec 1225), a calculated amount of water is added to the sample. The sample is rotated for 30 minutes to provide proper mixing and uniform distribution of moisture. Twenty-four hours before milling the wheat is tempered; spring wheat is tempered to 15.5% moisture and winter wheat is tempered to 15% moisture.

Samples submitted for milling and test bake and Asian noodle evaluation are milled on the Brabender Automat Mill. Approximately 600 g to 1000g of wheat sample is milled, to obtain flour, bran, and shorts/middlings. This mill recovers at least 98% of the wheat as flour, bran, shorts and middlings. Protein and moisture content and physical dough tests are determined using the flour fraction. The flour is then baked to determine bake absorption, mixing time, bread volume and crumb grain score. These are all indicators of baking quality. Selected flours are also evaluated for Asian noodle quality.

Micromilling: Early generation samples submitted for mixograph data can be milled using a Brabender Junior. Samples are tempered 24 hours prior to milling. Spring wheats are tempered to 15.5% moisture and winter wheats are tempered to 15% moisture. Approximately 100 g of wheat sample is milled to obtain two fractions, flour and bran (exosperm). The flour is shifted through a #100 screen to remove shorts then protein and moisture content and mixograph properties are determined using the flour fraction.

Whole Wheat Milling: Samples submitted for whole wheat bake tests are ground using a UDY Cyclone mill with a 0.5 mm screen. SDS sedimentation, whole wheat ash, evaluation and moisture by oven samples are ground on the Perten 3303, which does not dry the samples.

Flour Yield: Percent flour yield is calculated by dividing the flour by the total product (flour, bran, and shorts/middlings).

Flour Color: Flour color is measured using a Minolta Color Meter, and L* (brightness), a* (green – red) and b* (blue – yellow) attached with Minolta Granular-Materials Attachment (CR-A50).

Flour Ash: The mineral content of the flour or an evaluation of much outer layers (i.e. aleurone, pericarp, bran, etc.) are in the flour. The approximate ash content of the endosperm is 0.30 - 0.50% and whole wheat is 1.2 - 1.8%. The percent ash from a 3-5 g sample of flour ignited and heated for 18 hours at 580°C in a muffle furnace. Percent ash = (weight of residue)/(weight of sample) x 100. Flour ash is corrected to a 14% moisture basis (AACC Method 08-01). Whole wheat ash is reported AS IS basis according to oven moisture data.

Flour Moisture: The INF 1241 Grain Analyzer (near infrared reflectance) system is used for routine flour moisture determination. The reference method uses 2-3 g of flour heated in an aluminum dish in a mechanical-convection oven for 1 hr at 130°C, allowed to cool in a desiccator and weighed (AACC Method 44-15A).

Flour Protein: The INF 1241 Grain Analyzer system is used for routine flour protein determination. The combustion method is used as the reference method. The LECO FP-528 nitrogen analyzer, combusts 0.25 g flour in an oxygen atmosphere followed by a series of catalytic reactions that result in nitrogen gas. The gas is utilized for determining the total protein. Percent crude protein = % nitrogen x 5.70. Flour protein is corrected to a 14% moisture basis. AACC Method 46-30.

SDS Sedimentation: This test is a measure of protein quality; giving a good correlation with loaf volume. A 0.45 g (14% m.b.) whole meal sample is placed in a 10 ml graduated cylinder and 5 ml water containing Methylene Blue is added. Cylinders are vortexed at 0, 2 and 4 minutes. Immediately after the last vortex, 5 ml SDS-lactic reagent is added and cylinders are mixed by gentle inversion (4 times) using an aliquot mixer. Inversion is repeated at 2, 4 and 6 minutes. Contents of the cylinders were allowed to settle for 20 minutes before the sedimentation volumes were read. SDS Sedimentation is a very important test in breeders' early generation samples. Because it is more efficient than running mixographs and requires less than a gram of flour, it has become the method of choice for early generation material.

Mixogram:

This is a test of the mixing properties of a dough. The quality of a loaf of bread is strongly dependent on the mixing, and for each combination of flour and mixer it is possible to find an optimum stage of dough development. Ten grams of flour on a 14% moisture basis are weighed and mixed at optimum water absorption. As long as there is only flour mixing in the mixograph there is no resistance. When water is added, the dough development starts, and this is seen as an ascending part of the mixing curve. The mixograph curve suggests mixing time requirement, tolerance and optimum water absorption. Depending on the dough strength of the flour, the curve will reach a maximum; either as a well-defined peak or as a plateau. After further mixing, a decrease in the mixing curve is recorded and the breakdown starts. Dough breakdown behavior is

reflected in the tail of the curve when mixing continues beyond the mixing peak and is commonly referred to as mixing tolerance. A dough with good mixing tolerance will have a broader “window of opportunity” for a baker to stop the dough at optimum development. Good dough mixing tolerance would also indicate that bread dough should be elastic after mixing. The point of optimum dough development is at the maximum in the mixing curve or slightly after the peak. The rate of breakdown shows the stability of the dough and its sensitivity to mechanical treatment. Attached is an example of a graded mixogram. The mixogram is still an important test in breeders’ early generation samples. It tells us if the sample will have good mixing properties and can therefore be screened at a very early stage without actually baking. (AACC Method 54-40)

For desirable bread-type flour with adequate flour protein, a mixogram should indicate high water absorption, moderate mixing times (3-6 minutes), strong gluten strength, and good dough mixing tolerance. The mixograms are visually evaluated for correct water absorption, gluten strength and mixing time. Mixogram curves of bread-type flours with undesirable traits (low flour protein, extreme mixing times, poor mixing tolerance, weak gluten strength and low water absorption) are often eliminated from the breeding program.

- **Mixogram Absorption:** Optimum flour water absorption is visually evaluated by the swings of the mixogram curve. Absorption is reported as percent by weight, corrected to a 14% flour moisture basis. Mixogram absorption is a function of protein content, variety, flour moisture and environment. Mixogram absorption is used to estimate the bread baking absorption.
- **Mixogram Mixing Time:** The time in minutes required for optimum dough development. It is the maximum point on the mixing curve or slightly after the peak. Mixogram mixing time is largely a function of protein content and environment. Extremely long mixing time is considered undesirable because the power and time requirements would not be economical for a commercial bakery. Also, extremely long mixing time is often associated with tough, bucky doughs, which do not perform properly in a mechanized bakery. Mixogram mixing time is used to approximate the optimum bread dough mixing time.
- **Mixogram Type:** The desirable qualities of good bread wheat are largely associated with the quantity and quality of its protein. The quantity is influenced mainly by environmental factors, but the quality of protein is mainly a heritable characteristic. A high-quality variety produces good bread over a fairly wide range of protein percentages, whereas a low-quality variety may produce relatively poor-quality bread even when its protein content is high. Mixograms are typed according to protein content/quality and tolerance. Protein content/quality is divided into three categories: Low (less than 10%), Medium (10% - 12.9%) and High (13% or greater). The mixogram of an 11% protein flour may be classified as high if the height of the curve reflects that of a flour with a 13% or better protein; meaning the protein in the flour is of a higher quality. Tolerance is scored 0-9(weak to strong). Tolerance is measured between

the 3rd and 4th minute after the mixogram has come to a peak, which was determined by intersecting lines crossing in the middle of the mixogram envelope Front to Back.

Bread Baking:

Baking 100 g flour loaves is applicable to determine effect of environment, variety, and wheat flour components. This procedure provides an optimized bread-making method for evaluating bread wheat flour quality. All ingredients are incorporated in the initial mixing step. The method is a 90 min, sugar-based, fermented dough system. The bread formula contains 100 g (flour corrected to 14% moisture basis), 6 g sugar, 3.5 g shortening, 1.8 g yeast, 1.5 g salt, 180 ppm Doh-Tone (fungal alpha-amylase), and 150 ppm ascorbic acid as an oxidant. In the test, mixing time, oxidation level, fermentation time, and water absorption are optimized and balanced. (AACC Method 10-10B)

- **Bake Absorption:** The amount of water required to make a dough of proper consistency for bread baking when mixed to optimum conditions based on the feel and appearance of the dough as judged by an experienced baker.
- **Bake Mixing Time:** The time required in minutes for dough to reach point of minimum mobility. The test baker determines optimum mixing time. The appearance of the dough changes during mixing. The lumpy mass obtained after initial wetting is transformed into a coherent mass that exhibits elasticity. When optimum development is reached, the dough has elastic properties and appears smooth across the pins. If mixing is continued beyond the peak of development (over mixed), the dough becomes very sticky, extensible, and appears shiny.
- **Bake Volume:** The volume of a loaf of bread is determined by canola seed displacement. Loaf volume is a good measurement of protein quality.
- **Crumb Grain Score:** Subjective judgement of crumb grain quality is determined by an experienced baker. The bread is allowed to cool on racks 2 hours before the appearance of the loaf is noted and the crumb grain graded. The general appearance and inside cellular structure is what determines a quality crumb grain. Scoring values are rated from unsatisfactory to excellent numerically evaluated 1-5, 5 being the best.
- **Bread Color:** Bread color is measured using a Minolta Color Meter, and L* (brightness), a* (green – red) and b* (blue – yellow). First the bread is cut into approx. 1 inch slices and the crust is cut away. The internal pieces of the bread is then pressed through the smooth roller of an Atlas Pasta Maker. Two bread “sheets” are stacked for bread color measurement.
- **Visual** – This is a subjective evaluation of the color of the internal crumb of the bread. 1 = gray; 2 = dull; 3 = yellow; 4 = creamy; 5 = bright white.

Chinese Raw Noodle Making:

This method was selected because it emphasizes differences in noodle color between flours. Formula contains 100 g flour (14% moisture basis) and 29.2 g salt water solution (4.29% w/v). Water absorption is held constant. Dough sheets and noodles are prepared using an Otake Laboratory Noodle Machine. (Oriental Noodle Technology – 1998 AACC Short Course, Wheat Marketing Center, Portland, OR)

- **Noodle Score:** The score is a subjective evaluation of noodle processing in addition to color stability. The score is additive, incorporating Machining (Mixing, Sheeting and Slitting) = Sample Score X 20 points, Dough sheet appearance = Sample Score X 5 points, and Color stability = Sample Score X 20 points. The higher the number the better the performance. The standard control flour, comparable to Australian Premium Hard White Wheat (APH), is assigned a score of 7 for each measurement evaluated. (140+35+140=315 total points). Experimental samples are scored (1-10) against the standard control flour.
- **Noodle Color:** A bright and creamy color is desirable for Chinese raw noodles. Noodle color is evaluated by instrumental measurement at 0 and 24 hours after noodles are made. The noodle sheets color is measured using the Minolta Color Meter, and L* (brightness), a* (green – red) and b* (blue – yellow) values are taken. It has been found that the L* value of noodle sheet is positively correlated with the noodle sensory brightness score, namely, the higher the L* value, the better the noodle color. The value for a* is negatively correlated with noodle brightness and should be minimized for better noodle color. For bamee or hokkien style noodles, it is important to maximize b* for a more yellow noodle.
- **Noodle Texture Profile Analysis:** The TA.XT2 Texture Analyzer is used to measures the textural properties of cooked noodles. This involves two passes of a ¼ inch flat probe into five strands of noodles. A curve is generated by which many factors can be determined to provide an accurate assessment of the noodle characteristics. Noodles were cooked in boiling water for 5 minutes, drained and cooled in ice water prior to analysis. A subset of noodles was returned to hot water for an additional 5 minutes then cooled and analyzed to determine cooking tolerance. Results for each set of noodles are labeled as 0M and 5M, respectively.
 - ◆ **Noodle firmness** (hardness) – the peak force during the first compression on noodles by the probe. This parameter is related to sensory noodle bite.
 - ◆ **Noodle springiness** – indicates the degree of recovery after compression by the probe. This parameter is related to sensory noodle springiness.
 - ◆ **Noodle cohesiveness** – is a measure of the extent to which noodle structure is disrupted during the first compression by the probe. This parameter may be associated with sensory noodle bite and springiness.
 - ◆ **Noodle adhesiveness** – is the negative force between the first and the second peak (work necessary to overcome the attractive forces between

the surface of the noodle and the surface of the probe), and it is theoretically related to noodle stickiness to teeth at biting. However, this parameter usually has large experimental variations, and can be misleading.

- ◆ **Resilience** – is how much the noodle fights to regain its shape.
- ◆ Note: **Chewiness** (applies to solid products) and **Gumminess** (applies to semi-solid products) are mutually exclusive and are artificial artifacts. Considered to be poor tests.

References:

American Association of Cereal Chemists. Approved Methods of the AACCC, 9th ed. The Association: St. Paul, MN. (1995).

Table 1. 2018 Winter Wheat Cereal Quality Lab Entries: Mill & Bake (and Noodle) lines

CQL Sample #	Class	2018 WW Entry #	Cultivar/Line	Pedigree	Mill & Noodle Bake	
Intrastate Winter Wheat (Exp. 35): Bozeman, Havre, Huntley, and Conrad						
INT-1	HRW	1	Yellowstone	Montana, 2005	x	x
INT-2	HRW	2	Judee	Montana, 2011	x	
INT-3	HRW	3	Warhorse	Montana, 2013	x	
INT-4	HRW	4	Brawl CLP	Colorado Wheat Res. Fdn., 2011	x	
INT-5	HRW	5	Decade	Montana/North Dakota, 2010	x	
INT-6	HRW	6	SY Clearstone 2CL	Montana/Syngenta, 2012	x	
INT-7	HRW	7	Northern	Montana, 2015	x	x
INT-8	HRW	9	SY Monument	Syngenta (AgriPro), 2015	x	
INT-9	HRW	11	SY 517 CL2	Syngenta (AgriPro), 2017	x	
INT-10	HRW	12	07CL046-2 (SY Legend CL2)	Syngenta, 2018: now SY Legend CL2	x	
INT-11	HRW	13	Keldin	WestBred, 2011	x	x
INT-12	HRW	18	LCS Chrome	Limagrain Cereal Seeds, 2016	x	
INT-13	HRW	21	LCS Jet	Limagrain Cereal Seeds, 2015	x	
INT-14	HRW	23	LCS Zoom	Limagrain, 2018	x	
INT-15	HRW	24	Long Branch	Dyna-Gro Wheat, 2015	x	
INT-16	HRW	25	Loma	Montana, 2016	x	
INT-17	HRW	27	Incline AX	Colorado Wheat Res. Fdn., 2017	x	
INT-18	HRW	29	Byrd CL Plus	Colorado, 2018	x	
INT-19	HRW	30	AAC Wildfire	Alberta; (SECAN), 2015	x	x
INT-20	HRW	31	FourOsix	Montana, 2018	x	x
INT-21	HWW	32	MTW1491	MT08189//MT08187/(MTW08166, WB3768 sib)	x	x
INT-22	HRW	33	Ray	Montana, 2018	x	x
INT-23	HRW	37	Flathead (MT1564)	Yellowstone*2/PI640431	x	x
INT-24	HRW	38	Bobcat (MTS1588)	MT0598/98X366E29-1	x	x
INT-25	HRW	39	MTCS1601	MTS0531/7/MTS0532/6/96X17E69/3/MTCL0309/CDC	x	
INT-26	HRW	40	MT1642	Yellowstone/Madsen//Yellowstone	x	x
INT-27	HRW	42	MT1683	Yellowstone(L)*2/CDC Buteo	x	x
INT-28	HRW	48	Oahe	South Dakota, 2016	x	x

Advanced Winter Wheat (Exp. 14): Bozeman, Havre, Huntley, and Conrad

ADV-1	HRW	1	Yellowstone	check	x	x
ADV-2	HRW	2	Judee	check	x	
ADV-3	HRW	3	Decade	check	x	
ADV-4	HRW	4	Warhorse	check	x	
ADV-5	HWW	10	MTS1731	MTS0531*2//PI640431/MTS04114	x	x
ADV-6	HRW	11	MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/MTCL01158/CDC T	x	x
ADV-7	HRW	12	MTCL1737	YLL-2CL/3/YLL*2/Pelsart//PROM/3*YLL	x	x
ADV-8	HRW	14	MT1745	Decade*2/NI06732	x	x
ADV-9	HRW	15	MT1746	MT06103//MTW0881/SD06W166	x	x
ADV-10	HRW	16	MT1747	MT06103//MTW0881/SD06W166	x	x
ADV-11	HRW	18	MT1750	MT08185//YLL(L)/NX05M4391	x	x
ADV-12	HRW	21	MT1764	YLL*3/NE01533//PROM/3*YLL/3/YLL*2/Pelsart//PROI	x	x
ADV-13	HRW	25	MT1773	MTS04114*2/PI640431	x	x
ADV-14	HRW	29	MT1782	MT0859//MT0860/MT0885	x	x
ADV-15	HRW	31	MT1787	MT08185//YLL*2/PI640431/3/PROM/3*YLL//YLL*2/Pe	x	x
ADV-16	HRW	34	MT1793	Decade/WesleyFHB1-106BC2F4-10	x	x
ADV-17	HRW	35	MT1796	Decade/WesleyFHB1-106BC2F4-15	x	x

Table 1. 2018 Winter Wheat Cereal Quality Lab Entries: Mill & Bake (and Noodle) lines

CQL Sample #	Class	2018 WW Entry #	Cultivar/Line	Pedigree	Mill & Noodle Bake

Sawfly Winter Wheat (Exp. 58): Bozeman, Havre, and Big Sandy

SF-1	HRW	1	Yellowstone	check	all tests from here on, are mill and bake only
SF-2	HRW	2	Judee	check	
SF-3	HRW	4	Decade	check	
SF-4	HRW	7	Warhorse	check	
SF-5	HRW	8	Loma	check	
SF-6	HRW	10	Bobcat	MT0598/98X366E29-1	
SF-7	HRW	11	MTCS1601	MTS0531/7/MTS0532/6/96X17E69/3/MTCL0309/CDC	
SF-8	HWW	16	MTS1731	MTS0531*2//PI640431/MTS04114	
SF-9	HRW	17	MTS1801	Judee//MTS0907/MTS0827	
SF-10	HRW	18	MTS1802	Warhorse*2/Accipiter	
SF-11	HRW	20	MTS1804	Warhorse*2/Accipiter	
SF-12	HRW	25	MTS1809	08X350-A6/Warhorse	
SF-13	HRW	26	MTS1810	08X350-A6/Warhorse	
SF-14	HRW	27	MTS1830	MTS0907/MTS0827	
SF-15	HRW	47	MTS1831	MTS0907/MTS0827	

Preliminary A Winter Wheat (Exp. 36): Bozeman, Huntley, Conrad and Moccasin

PreA-1	HRW	1	Yellowstone	check
PreA-2	HRW	2	Decade	check
PreA-3	HRW	3	Judee	check
PreA-4	HRW	4	SY Wolf	check
PreA-5	HRW	16	MT1845	Yellowstone/493-22(Reeder/6*Paul)
PreA-6	HRW	19	MT1848	Northern//MT08184/MT0887
PreA-7	HRW	25	MT1854	08X350-A2/MT0890
PreA-8	HRW	26	MT1855	05X438-aC71(MT0097*2//Jagalene/Choteau)/Roughrider
PreA-9	HRW	37	MT1866	MT0859//00X83cE45/MT0698
PreA-10	HRW	38	MT1867	MT0859//00X83cE45/MT0698
PreA-11	HRW	43	MT1872	MT0859//MT0840/MT0873
PreA-12	HRW	53	MT1882	Decade//YLL (L)/TX05V071040
PreA-13	HRW	60	MT1889	Decade*2/MT0849

Preliminary B Winter Wheat (Exp. 37): Bozeman

PreB-1	HRW	1	Yellowstone	check
PreB-2	HRW	2	Decade	check
PreB-3	HRW	3	Judee	check
PreB-4	HRW	4	SY Wolf	check
PreB-5	HRW	6	MT1895	MT08185//YLL*2/PI640431/3/PROM/3*YLL//YLL*2/Pelsart
PreB-6	HRW	8	MT1897	MT08185//YLL*2/PI640431/3/PROM/3*YLL//YLL*2/Pelsart
PreB-7	HWW	20	MT18109	MTS0531*3//PI640431/MTS04114

Table 1. 2018 Winter Wheat Cereal Quality Lab Entries: Mill & Bake (and Noodle) lines

CQL Sample #	Class	2018 WW Entry #	Cultivar/Line	Pedigree	Mill & Noodle Bake

Preliminary C Winter Wheat (Exp. 39): Bozeman and Big Sandy

PreC-1	HRW	1	Yellowstone	check
PreC-2	HRW	2	Judee	check
PreC-3	HRW	3	Warhorse	check
PreC-4	HRW	4	Loma	check
PreC-5	HRW	7	MTS18149	Loma*2/AAC Gateway
PreC-6	HRW	25	MTS18167	Loma*2/AAC Gateway
PreC-7	HRW	27	MTS18169	Loma*2/AAC Gateway

Preliminary D Winter Wheat (Exp. 40): Bozeman

PreD-1	HRW	1	Yellowstone	check
PreD-2	HRW	2	Judee	check
PreD-3	HRW	3	Warhorse	check
PreD-4	HRW	4	Loma	check
PreD-5	HRW	6	MTS18116	Loma*2/Warhorse
PreD-6	HRW	7	MTS18117	Loma*2/Warhorse
PreD-7	HRW	33	MTS18143	Loma*2/Warhorse

Preliminary E Winter Wheat (Exp. 41): Bozeman

PreE-1	HRW	1	Clearstone	check
PreE-2	HRW	2	Warhorse	check
PreE-3	HRW	6	MTCS18195	MTCS1204*4/MT1138
PreE-4	HRW	22	MTCS18211	MTS1597//MTCS1301/MTS1412
PreE-5	HRW	23	MTCS18222	Judee//Warhorse/MTCS1204

Sawfly Observation (SFO): Bozeman

SFO-1	HRW	SFO-2	Warhorse	check
SFO-2	HRW	26	MTCS1901	Judee*2/MTCS1301
SFO-3	HRW	32	MTS1902	(Judee sib, MTS0819)//08X350-A6/Warhorse
SFO-4	HRW	44	MTS1903	(Judee sib, MTS0819)//08X350-A6/Warhorse
SFO-5	HRW	49	MTS1904	MTS1054//Warhorse/MTS1008
SFO-6	HRW	66	MTS1905	MT10105/Warhorse//MTS1011
SFO-7	HRW	79	MTS1906	MT10105/Warhorse//MTS1011
SFO-8	HWW	123	MTS1907	Judee//16FAWWON-Irr-87/(MT0977, Northern sib)
SFO-9	HRW	193	MTS1908	(Judee sib, MTS0819)//08X350-A6/Warhorse
SFO-10	HRW	199	MTS1909	(Judee sib, MTS0819)//08X350-A6/Warhorse
SFO-11	HRW	202	Warhorse	check
SFO-12	HRW	207	MTS1910	MTS1054//Warhorse/MTS1008
SFO-13	HRW	217	MTS1911	(Colter sib, MT08177)/MTS0916//MTS0826
SFO-14	HRW	234	MTS1912	MT10105/Warhorse//MTS1011
SFO-15	HRW	335	MTS1913	Loma*2/AAC Gateway
SFO-16	HRW	340	MTS1914	MTS1585//Loma/AAC Gateway
SFO-17	HRW	357	MTS1915	MTS1596//Emerson/Spur
SFO-18	HRW	370	MTS1916	MTS1596//Emerson/Spur
SFO-19	HRW	402	Warhorse	check
SFO-20	HRW	481	MTS1917	Judee//MTS0907/MTS0827
SFO-21	HRW	483	MTS1918	Judee//MTS0907/MTS0827
SFO-22	HRW	516	MTS1919	Warhorse*2/Accipiter

Table 1. 2018 Winter Wheat Cereal Quality Lab Entries: Mill & Bake (and Noodle) lines

CQL Sample #	Class	2018 WW Entry #	Cultivar/Line	Pedigree	Mill & Noodle Bake
SFO-23	HRW	521	MTS1920	Warhorse*2/Accipiter	
SFO-24	HRW	555	MTS1921	Warhorse//MTS0910/DH01-29-125	
SFO-25	HRW	572	MTS1922	08X350-A6/Warhorse	
SFO-26	HRW	575	MTS1923	08X350-A6/Warhorse	
SFO-27	HRW	602	Warhorse	check	
SFO-28	HRW	621	MTS1924	03X273cE8/MTS0826	
SFO-29	HRW	623	MTS1925	03X139cE98/MT0866	

Single Rep. Observation 'A' (SROA): Bozeman

SROA-1	HRW	SROA-2	Yellowstone	check
SROA-2	HWW	12	MTW19146	Bearpaw//16FAWWON-Irr-61/MT0871
SROA-3	HWW	16	MTW19147	MT10121*2/16FAWWON-Irr-67
SROA-4	HRW	46	MTCL19148	MTCL1125/Northern
SROA-5	HRW	66	MTCL19149	MTCL1125/MT1091
SROA-6	HRW	71	MTCL19150	MTCL1125/MT10128
SROA-7	HRW	72	MTCL19151	MT0871/(06X445B1-2, SY Clearstone sib)
SROA-8	HRW	78	MTCL19152	MT0871/(06X445B1-2, SY Clearstone sib)
SROA-9	HRW	88	MTCL19153	MT0871/(06X445B1-2, SY Clearstone sib)
SROA-10	HRW	132	MT19154	08X349-A5/MT0954/MT1078
SROA-11	HRW	137	MT19155	08X349-A5/MT0954/MT1078
SROA-12	HRW	174	MT19156	Yellowstone//((493-22, Reeder/6*Paul)/3/MT0871
SROA-13	HRW	190	MT19157	Northern//02X22cE38/MT10121
SROA-14	HRW	193	MT19158	Northern//02X22cE38/MT10121
SROA-15	HRW	195	MT19159	Northern//02X22cE38/MT10121
SROA-16	HRW	199	MT19160	Northern//02X22cE38/MT10121
SROA-17	HRW	217	MT19161	Accipiter//MT0871/02X159E41
SROA-18	HRW	227	MT19162	Accipiter//MT0871/02X159E41
SROA-19	HRW	251	Yellowstone	check
SROA-20	HRW	298	MT19163	Colter//03X273cEx/MT10105
SROA-21	HRW	304	MT19164	Colter//03X273cEx/MT10105
SROA-22	HRW	345	MT19165	MT10121//Yellowstone/SD08W015
SROA-23	HRW	362	MT19166	MT1141//Yellowstone/HV9W06-975
SROA-24	HRW	427	MT19167	06X424B20//Yellowstone/Garrison
SROA-25	HRW	429	MT19168	06X424B20//Yellowstone/Garrison
SROA-26	HRW	435	MT19169	06X424B20//Yellowstone/Garrison
SROA-27	HRW	501	Yellowstone	check
SROA-28	HRW	520	MT19170	MT1091/Accipiter
SROA-29	HRW	530	MT19171	MT1145/MT0866
SROA-30	HRW	578	MT19172	MT0871/MT1151
SROA-31	HRW	591	MT19173	HV9W04-1594R/Accipiter
SROA-32	HRW	614	MT19174	MT0871/(SD06156-1, Redfield sib)
SROA-33	HRW	629	MT19175	SD08198/Northern
SROA-34	HRW	672	MT19176	MTW1098//Yellowstone-Lr41/Decade
SROA-35	HRW	709	MT19177	(Northern sib, MT0977)//MT0859/MT0938
SROA-36	HRW	744	MT19178	Northern//MT0861/CDC Falcon
SROA-37	HRW	751	Yellowstone	check
SROA-38	HRW	756	MT19179	MT0951//MT0861/MT0754
SROA-39	HRW	761	MT19180	MT1090//MT0861/MT0887
SROA-40	HRW	766	MT19181	MT10104//MT0861/MT0890
SROA-41	HRW	789	MT19182	MT1078//AAC Gateway/MT1265

Table 1. 2018 Winter Wheat Cereal Quality Lab Entries: Mill & Bake (and Noodle) lines

CQL Sample #	Class	2018 WW Entry #	Cultivar/Line	Pedigree	Mill & Noodle Bake
SROA-42	HRW	791	MT19183	MT1078//AAC Gateway/MT1265	
SROA-43	HRW	796	MT19184	MT1078//AAC Gateway/MT1265	
SROA-44	HRW	806	MT19185	MT1078//Colter/Emerson	
SROA-45	HRW	826	MT19186	MT1090//MT08185/MT0742	
SROA-46	HRW	842	MT19187	MT1084//MT0859/SD06069	
SROA-47	HRW	844	MT19188	MT0866//MT08184/NE06549	
SROA-48	HRW	863	MT19189	MT1084//MT08184/CO04575(cl)	
SROA-49	HRW	867	MT19190	MT0871/02X159E41	
SROA-50	HRW	869	MT19191	MT0871/02X159E41	
SROA-51	HRW	871	MT19192	Yellowstone/SD08W015	
SROA-52	HRW	873	MT19193	Yellowstone/SD08W015	
SROA-53	HRW	887	MT19194	Yellowstone/493-22(Reeder/6*Paul)	
SROA-54	HRW	906	MT19195	MT10116//MTW0880/MT0950	
SROA-55	HRW	908	MT19196	Northern//Yellowstone/MTW0880	
SROA-56	HRW	911	MT19197	Northern//Yellowstone/MTW0880	
SROA-57	HRW	914	MT19198	Northern//Yellowstone/MTW0880	
SROA-58	HRW	939	MT19199	08X349-A3/Yellowstone	
SROA-59	HRW	943	MT19200	08X349-A3/Yellowstone	
SROA-60	HRW	945	MT19201	08X350-A2/MT0890	
SROA-61	HRW	950	MT19202	08X350-A2/MT0890	
SROA-62	HRW	970	MT19203	Yellowstone/KS07HW25	
SROA-63	HRW	974	MT19204	Yellowstone/KS07HW25	
SROA-64	HRW	982	MT19205	Yellowstone/HV9W06-975	

Table 2. 2018 Bozeman, MT (Exp. 3501) Intrastate Winter Wheat Nursery - Mill & Bake and Noodle Data

VARIETY	x = in 2020 test	CLASS	PPO	Single Kernel Hardness	Wheat protein, % (12 m.b.)	Flour Yield %	Flour Protein%(14% m.b)	Flour Color			Wheat Ash, %	Flour Ash, %	Type	Mixograph			Test Bake			
								L*brightness	A*green-red	B*blue-yellow				Tolerance	Mixing Time Min	Water Absorption%	Mixing Time Min	Water Absorption%	Loaf Volume	Crumb Grain
AAC Wildfire	x	HRW	0.294		12.6	72.5	11.4	90.1	-1.93	11.6	1.48	0.39	M	3	3.9	65.5	9.2	75.2	1020	5
Bobcat	x	HRW	0.259		12.0	74.5	10.9	90.2	-2.10	12.0	1.49	0.38	M	4	4.2	63.9	7.8	74.6	965	5
Brawl CLP	x	HRW	0.280		13.6	71.8	12.3	90.3	-1.73	9.6	1.38	0.38	M	2	3.9	67.3	6.5	77.0	1020	5
Byrd CL Plus	x	HRW	0.249		11.1	71.7	9.8	90.7	-1.74	9.8	1.49	0.37	M	3	3.2	62.8	6.5	72.5	945	5
Decade		HRW	0.295		12.5	72.2	11.5	90.4	-1.30	8.4	1.48	0.39	M	2	4.6	68.8	11.3	77.5	975	5
Flathead	x	HRW	0.268		12.2	74.6	11.2	90.5	-1.14	8.3	1.42	0.41	M	4	6.8	66.8	17.6	77.5	1025	6
FourOsix	x	HRW	0.239		11.8	73.9	10.9	90.1	-1.50	9.5	1.42	0.41	M	2	3.8	65.8	7.2	75.5	1045	5
Incline AX	x	HRW	0.247		11.0	70.7	9.6	89.8	-2.11	12.2	1.46	0.35	M	3	4.3	61.3	7.4	72.0	1020	7
Judee	x	HRW	0.222		12.1	72.7	10.9	90.0	-1.54	9.8	1.45	0.39	M	3	4.7	67.3	8.7	77.0	1075	5
Keldin	x	HRW	0.335		12.1	72.1	10.9	90.3	-1.27	8.8	1.34	0.40	M	3	4.2	65.8	6.8	76.5	950	5
LCS Chrome		HRW	0.197		13.2	71.5	11.7	90.2	-1.32	8.9	1.56	0.41	M	1	2.6	64.8	2.7	72.5	1055	6
LCS Jet	x	HRW	0.235		11.8	73.0	10.4	90.4	-1.86	10.4	1.42	0.39	M	3	5.7	64.9	9.4	75.6	935	5
LCS Zoom		HRW	0.278		11.8	72.9	10.5	89.8	-1.24	9.3	1.50	0.40	M	3	5.2	59.6	7.3	70.8	940	5
Loma	x	HRW	0.152		11.9	73.9	10.7	90.6	-1.80	10.0	1.49	0.39	MH	4	5.7	63.9	14.1	76.1	1100	6
Long Branch	x	HRW	0.338		12.0	71.8	10.6	90.0	-1.86	11.1	1.35	0.39	M	2	2.4	61.9	2.7	69.6	955	6
MT1642	x	HRW	0.169		12.0	71.9	10.8	90.2	-1.32	9.1	1.53	0.41	M	3	6.5	65.8	11.1	76.5	1085	7
MT1683	x	HRW	0.240		12.4	72.2	11.1	90.2	-1.58	9.9	1.48	0.41	M	4	5.2	64.9	9.2	73.6	1040	5
MTC51601	x	HRW	0.330		12.7	72.8	11.5	90.3	-1.80	10.7	1.46	0.38	M	3	3.8	65.7	6.8	77.4	1035	5
MTW1491		HWW	0.123		11.9	74.1	10.8	90.3	-1.34	9.1	1.51	0.40	M	4	5.6	66.5	15.4	77.7	1030	6
Northern	x	HRW	0.310		11.9	72.3	11.1	89.4	-1.30	10.0	1.42	0.46	MH	3	2.5	63.8	4.1	72.5	1025	4
Oahe		HRW	0.300		12.9	73.1	11.7	90.1	-1.16	8.5	1.38	0.42	M	2	1.8	58.9	2.0	69.6	900	3
Ray		HRW	0.124		12.7	73.6	11.6	89.7	-1.52	10.9	1.52	0.39	M	4	7.6	66.5	19.8	77.2	1045	5
SY 517 CL2	x	HRW	0.175		12.6	72.4	11.5	90.7	-1.76	9.6	1.58	0.37	LM	1	2.9	65.8	4.1	73.5	1005	5
SY Clearstone 2CL	x	HRW	0.277		12.3	70.3	10.8	90.3	-1.52	9.4	1.54	0.38	M	3	4.8	67.7	8.7	77.4	1055	6
SY Legend CL2	x	HRW	0.333		12.1	71.0	10.5	89.9	-1.62	10.5	1.47	0.42	M	3	3.5	62.1	4.0	71.8	1025	7
SY Monument	x	HRW	0.102		11.5	73.0	10.1	90.1	-1.44	9.4	1.41	0.35	M	4	6.8	67.1	15.9	72.8	945	5
Warhorse	x	HRW	0.285		12.7	71.5	11.6	90.0	-1.56	9.8	1.41	0.42	M	2	4.0	66.5	5.6	75.2	1005	6
Yellowstone	x	HRW	0.249		12.0	72.5	11.0	89.9	-1.38	9.4	1.46	0.41	M	4	5.7	68.7	13.6	79.4	1020	5
MIN			0.102		11.0	70.3	9.6	89.4	-2.11	8.3	1.34	0.35		1	1.8	58.9	2.0	69.6	900	3
MAX			0.338		13.6	74.6	12.3	90.7	-1.14	12.2	1.58	0.46		4	7.6	68.8	19.8	79.4	1100	7
AVG			0.247		12.2	72.5	11.0	90.2	-1.56	9.9	1.46	0.39		2.9	4.5	65.0	8.8	74.8	1009	5.4

Table 3. 2018 Havre, MT (Exp. 3502) Intrastate Winter Wheat Nursery - Mill & Bake and Noodle Data

VARIETY	x = in 2020 test	CLASS	PPO	Single Kernel Hardness	Wheat protein, % (12 m.b.)	Flour Yield %	Flour Color			Flour Ash, %	Type	Mixograph			Test Bake					
							L*brightness	A*green-red	B*blue-yellow			Tolerance	Mixing Time Min	Water Absorption%	Mixing Time Min	Water Absorption%	Loaf Volume	Crumb Grain		
AAC Wildfire	x	HRW	0.236		13.8	72.9	12.9	89.3	-1.71	12.5	1.49	0.44	MH	4	4.9	66.7	8.5	76.4	1150	7
Bobcat	x	HRW	0.254		14.3	72.5	13.1	89.7	-1.84	12.1	1.39	0.40	M	4	4.9	66.9	8.6	77.6	1115	5
Brawl CLP	x	HRW	0.193		14.0	71.8	12.8	90.2	-1.55	9.9	1.45	0.39	MH	3	3.7	66.9	6.5	76.6	1085	5
Byrd CL Plus	x	HRW	0.222		12.6	72.4	10.8	90.0	-1.45	10.1	1.27	0.38	M	3	4.5	64.1	6.1	73.8	1050	6
Decade		HRW	0.196		14.5	72.2	13.2	89.9	-1.07	8.6	1.35	0.40	MH	3	5.1	71.5	13.3	81.2	1120	6
Flathead	x	HRW	0.215		13.6	73.3	12.3	89.7	-0.89	8.7	1.37	0.41	M	4	7.8	68.4	12.9	78.6	1065	5
FourOsix	x	HRW	0.173		14.5	72.2	13.3	89.3	-1.14	9.9	1.38	0.43	MH	3	4.0	65.9	8.6	75.6	1080	6
Incline AX	x	HRW	0.199		12.6	70.0	11.0	90.0	-1.46	9.9	1.57	0.42	M	3	4.8	63.8	6.0	73.5	1050	6
Judee	x	HRW	0.250		15.2	71.4	14.3	89.4	-1.09	9.6	1.52	0.42	MH	3	4.4	68.8	6.2	78.5	1150	6
Keldin	x	HRW	0.325		13.6	71.5	12.4	89.6	-1.09	9.4	1.25	0.45	M	2	4.6	64.9	6.1	74.6	1040	5
LCS Chrome		HRW	0.166		14.4	71.1	12.7	89.6	-1.07	9.3	1.29	0.42	M	2	3.3	64.8	4.1	74.5	1085	6
LCS Jet	x	HRW	0.246		13.7	73.1	12.2	89.5	-1.22	10.4	1.34	0.38	M	3	4.6	65.3	6.8	75.5	980	5
LCS Zoom		HRW	0.226		13.8	72.6	12.5	89.1	-0.94	9.7	1.30	0.44	M	3	3.8	62.0	5.7	71.7	945	6
Loma	x	HRW	0.122		14.2	72.4	12.7	89.3	-1.91	13.0	1.58	0.40	MH	3	4.7	67.4	8.4	77.6	1220	6
Long Branch	x	HRW	0.203		12.1	72.0	11.0	89.5	-1.74	11.7	1.21	0.41	M	2	2.5	60.8	3.0	69.5	935	4
MT1642	x	HRW	0.086		15.1	70.1	13.7	89.7	-1.10	9.6	1.49	0.41	MH	4	6.1	72.4	9.9	82.6	1145	6
MT1683	x	HRW	0.212		14.3	70.6	13.0	89.2	-1.25	10.6	1.49	0.45	MH	4	5.9	69.5	10.1	80.7	1095	6
MTCS1601	x	HRW	0.222		14.5	72.8	13.0	89.5	-1.51	11.1	1.35	0.39	M	3	4.0	66.9	6.2	77.6	1115	6
MTW1491		HWW	0.204		14.0	71.4	13.1	89.5	-1.03	9.7	1.40	0.43	MH	4	6.2	67.5	11.7	79.7	1055	6
Northern	x	HRW	0.100		14.1	70.7	13.0	89.0	-1.13	10.5	1.32	0.47	MH	4	2.9	64.3	4.7	74.5	1080	5
Oahe		HRW	0.214		14.1	71.7	12.8	89.2	-0.84	8.9	1.42	0.42	M	1	2.0	68.0	2.5	76.7	965	4
Ray		HRW	0.118		14.1	72.1	13.0	89.0	-1.29	11.6	1.65	0.44	M	3	7.3	68.8	14.2	78.5	1070	6
SY 517 CL2	x	HRW	0.212		14.0	72.3	12.9	90.2	-1.50	9.4	1.39	0.37	M	1	3.0	65.9	3.8	74.6	1060	5
SY Clearstone 2CL	x	HRW	0.242		14.1	70.2	12.7	89.5	-1.23	10.1	1.47	0.43	M	4	5.3	68.7	8.7	78.4	1040	6
SY Legend CL2	x	HRW	0.290		13.9	70.0	12.0	89.2	-1.38	11.0	1.37	0.40	MH	2	3.8	65.9	4.8	75.6	1050	6
SY Monument	x	HRW	0.129		12.7	73.1	11.4	89.7	-1.23	9.7	1.27	0.39	MH	4	5.8	65.8	12.9	75.5	1040	5
Warhorse	x	HRW	0.278		14.8	70.2	14.0	89.5	-1.16	9.8	1.35	0.43	MH	2	4.5	67.7	6.7	78.4	1130	5
Yellowstone	x	HRW	0.237		14.1	70.5	13.1	89.4	-1.17	10.2	1.49	0.43	M	3	6.8	69.8	10.9	79.5	1065	5
MIN			0.086		12.1	70.0	10.8	89.0	-1.91	8.6	1.21	0.37		1	2.0	60.8	2.5	69.5	935	4
MAX			0.325		15.2	73.3	14.3	90.2	-0.84	13.0	1.65	0.47		4	7.8	72.4	14.2	82.6	1220	7
AVG			0.206		14.0	71.7	12.7	89.5	-1.29	10.3	1.40	0.42		3.0	4.7	66.8	7.8	76.7	1071	5.5

Table 4. 2018 Huntley, MT (Exp. 3508) Intrastate Winter Wheat Nursery - Mill & Bake and Noodle Data

VARIETY	CLASS	PPO	Single Kernel Hardness	Wheat protein, % (12 m.b.)	Flour Yield %	Flour Protein%(14m.b)	Flour Color			Wheat Ash, %	Type	Mixograph			Test Bake				
							L*brightness	A*green-red	B*blue-yellow			Tolerance	Mixing Time Min	Water Absorption%	Mixing Time Min	Water Absorption%	Loaf Volume	Crumb Grain	
AAC Wildfire	HRW	0.232		13.1	70.8	11.9	90.0	-1.88	11.2	1.53	0.42	M	4	4.5	66.8	9.0	78.5	1010	6
Bobcat	HRW	0.267		12.8	73.8	11.4	90.1	-2.03	11.8	1.53	0.39	M	3	4.5	65.9	10.1	76.6	1025	4
Brawl CLP	HRW	0.282		13.2	71.2	11.7	90.9	-1.86	9.7	1.48	0.38	M	2	3.6	66.2	5.8	76.4	1010	5
Byrd CL Plus	HRW	0.259		11.2	71.1	9.9	91.1	-1.85	9.8	1.48	0.37	LM	2	4.8	63.9	7.1	73.6	1010	2
Decade	HRW	0.223		12.5	71.5	11.2	90.7	-1.40	8.5	1.05	0.39	M	3	5.6	65.7	11.6	76.4	1030	6
Flathead	HRW	0.235		11.7	73.7	10.6	90.6	-1.28	8.6	1.47	0.41	M	4	7.9	64.9	14.9	75.6	975	6
FourOsix	HRW	0.218		13.1	73.1	11.8	90.3	-1.52	9.6	1.50	0.42	M	2	4.0	64.8	6.5	74.5	1110	4
Incline AX	HRW	0.250		11.1	70.0	9.5	91.0	-1.88	9.8	1.58	0.39	M	3	4.0	63.3	13.2	72.5	825	3
Judee	HRW	0.221		12.8	72.3	11.6	90.4	-1.60	9.9	1.48	0.40	M	3	5.4	63.9	7.4	74.6	1125	6
Keldin	HRW	0.250		12.5	72.5	11.3	90.4	-1.31	8.9	1.40	0.44	LM	2	4.0	64.9	5.6	74.6	1010	5
LCS Chrome	HRW	0.233		12.7	71.2	11.0	90.4	-1.54	9.5	1.52	0.40	LM	2	3.4	63.8	3.3	73.5	975	5
LCS Jet	HRW	0.240		11.9	73.0	10.5	90.1	-1.57	10.2	1.37	0.40	M	4	5.4	64.7	8.9	77.4	930	4
LCS Zoom	HRW	0.264		12.4	72.9	11.3	89.2	-1.14	9.5	1.50	0.44	M	3	4.6	62.8	7.7	73.5	960	5
Loma	HRW	0.145		12.3	72.6	11.2	89.6	-2.23	12.8	1.55	0.41	M	4	5.4	64.7	9.2	75.4	1115	6
Long Branch	HRW	0.282		11.1	71.5	9.7	90.5	-2.04	11.6	1.48	0.39	M	3	2.9	60.8	3.8	70.5	875	5
MT1642	HRW	0.161		12.8	72.3	11.5	90.0	-1.32	9.2	1.46	0.42	M	4	6.5	68.8	12.9	79.5	1120	4
MT1683	HRW	0.242		12.8	71.3	11.4	89.9	-1.58	10.2	1.53	0.44	LM	3	6.2	66.9	9.6	77.6	1030	5
MTCS1601	HRW	0.263		12.8	73.7	11.7	90.2	-1.83	10.7	1.58	0.39	M	3	4.0	65.9	6.1	75.6	1050	6
MTW1491	HWW	0.113		12.6	73.1	11.5	89.3	-1.33	9.7	1.53	0.42	M	4	5.0	63.9	9.9	74.6	1085	6
Northern	HRW	0.119		12.5	71.1	11.7	89.6	-1.53	10.5	1.53	0.47	M	3	3.1	62.8	4.1	72.5	1045	5
Oahe	HRW	0.272		12.4	71.9	10.7	90.6	-1.42	8.7	1.43	0.42	M	3	2.0	62.9	2.5	71.6	875	4
Ray	HRW	0.146		13.4	73.0	12.4	89.4	-1.53	11.3	1.58	0.44	M	3	7.6	66.7	15.8	78.4	1050	5
SY 517 CL2	HRW	0.302		11.6	69.5	10.3	91.1	-1.67	9.2	1.52	0.38	M	4	3.1	62.9	5.0	72.6	980	6
SY Clearstone 2CL	HRW	0.258		12.3	70.5	10.9	90.6	-1.68	9.8	1.53	0.42	M	3	4.9	61.0	5.8	71.2	1025	6
SY Legend CL2	HRW	0.337		12.0	70.2	10.5	89.9	-1.76	10.7	1.42	0.40	M	4	3.7	62.2	5.3	72.4	980	7
SY Monument	HRW	0.160		11.9	72.6	10.5	90.7	-1.46	9.3	1.38	0.40	M	4	7.5	62.7	12.8	74.4	960	5
Warhorse	HRW	0.243		13.5	71.2	12.2	90.3	-1.58	9.9	1.45	0.42	M	2	3.7	64.3	4.7	74.5	1100	7
Yellowstone	HRW	0.230		12.8	71.6	11.5	90.0	-1.43	9.7	1.46	0.44	M	4	6.1	64.0	8.1	74.7	1110	5
MIN		0.113		11.1	69.5	9.5	89.2	-2.23	8.5	1.05	0.37		2	2.0	60.8	2.5	70.5	825	2
MAX		0.337		13.5	73.8	12.4	91.1	-1.14	12.8	1.58	0.47		4	7.9	68.8	15.8	79.5	1125	7
AVG		0.230		12.4	71.9	11.1	90.2	-1.62	10.0	1.48	0.41		3.1	4.8	64.4	8.1	74.8	1014	5.1

Table 5. 2018 Conrad, MT (Exp. 3518) Intrastate Winter Wheat Nursery - Mill & Bake and Noodle Data

VARIETY	x = in 2020 test	CLASS	PPO	Single Kernel Hardness	Wheat protein, % (12 m.b.)	Flour Yield %	Flour Protein(14% m.b)	Flour Color			Wheat Ash, %	Flour Ash, %	Type	Mixograph			Test Bake			
								L*brightness	A*green-red	B*blue-yellow				Tolerance	Mixing Time Min	Water Absorption%	Mixing Time Min	Water Absorption%	Loaf Volume	Crumb Grain
AAC Wildfire	x	HRW	0.304		13.8	72.1	12.6	89.6	-1.60	11.4	1.38	0.38	MH	4	7.4	71.9	22.0	83.1	1110	5
Bobcat	x	HRW	0.250		14.4	71.8	13.3	90.1	-2.02	12.3	1.30	0.36	M	3	7.0	71.7	16.1	81.4	1165	6
Brawl CLP	x	HRW	0.309		13.1	70.3	11.4	90.4	-1.88	10.1	1.16	0.36	MH	3	3.9	68.0	6.4	77.7	1075	6
Byrd CL Plus	x	HRW	0.301		11.7	69.9	10.4	90.3	-1.91	11.3	1.17	0.37	M	3	4.9	66.7	8.9	75.4	1035	5
Decade		HRW	0.304		14.9	70.9	13.5	90.4	-1.29	8.7	1.33	0.37	M	3	6.9	71.9	17.9	82.1	1190	6
Flathead	x	HRW	0.224		14.9	72.5	14.0	90.0	-0.95	8.6	1.36	0.39	M	4	8.4	73.4	17.1	83.1	1180	6
FourOsix	x	HRW	0.269		14.1	72.4	13.1	89.7	-1.41	10.1	1.22	0.38	M	4	7.6	73.4	16.3	83.1	1175	6
Incline AX	x	HRW	0.218		12.1	68.7	10.5	90.0	-1.78	11.0	1.35	0.39	LM	4	4.9	66.4	9.0	76.1	1050	5
Judee	x	HRW	0.249		14.9	70.6	14.2	90.2	-1.48	10.0	1.27	0.37	M	3	6.7	72.3	10.7	82.0	1175	7
Keldin	x	HRW	0.279		13.9	67.7	13.2	89.8	-1.18	9.6	1.24	0.42	M	3	6.3	70.3	12.0	80.0	1075	5
LCS Chrome		HRW	0.222		12.8	70.7	12.8	89.7	-1.28	9.6	1.42	0.39	M	1	3.7	69.4	5.5	79.1	1125	6
LCS Jet	x	HRW	0.273		13.8	72.4	12.1	89.8	-1.34	10.6	1.26	0.35	LM	3	6.4	69.4	9.1	79.1	985	5
LCS Zoom		HRW	0.281		12.7	72.1	11.6	89.5	-1.33	10.6	1.20	0.40	LM	2	6.6	67.5	10.4	77.2	975	5
Loma	x	HRW	0.146		14.7	72.2	13.4	89.4	-1.89	12.4	1.43	0.36	M	3	7.5	73.2	18.0	82.9	1195	6
Long Branch	x	HRW	0.248		13.1	69.4	11.4	89.6	-1.80	11.2	1.21	0.39	M	2	2.5	63.8	3.2	73.5	1025	5
MT1642	x	HRW	0.105		14.4	70.2	13.3	89.8	-1.40	10.0	1.25	0.38	M	4	9.8	73.8	18.2	84.0	1210	5
MT1683	x	HRW	0.213		14.5	70.3	13.1	89.5	-1.50	10.8	1.39	0.40	M	3	11.5	73.5	20.7	83.2	1170	5
MTC51601	x	HRW	0.297		13.9	71.6	12.6	90.4	-0.79	12.4	1.06	0.37	M	4	4.8	68.5	10.8	78.2	1180	6
MTW1491		HWW	0.078		14.0	71.2	12.8	89.7	-1.21	9.7	1.39	0.38	M	4	10.8	71.5	22.2	81.2	1205	6
Northern	x	HRW	0.109		14.5	69.4	13.2	89.5	-1.35	10.4	1.37	0.42	M	2	4.2	70.8	6.9	81.0	1180	5
Oahe		HRW	0.271		13.3	72.4	12.4	89.6	-1.33	9.5	1.32	0.42	LM	0	2.4	68.9	2.8	77.6	1010	4
Ray		HRW	0.131		14.0	73.1	12.9	89.2	-1.40	11.6	1.39	0.40	M	3	15.4	71.7	34.5	81.4	1125	6
SY 517 CL2	x	HRW	0.206		13.0	71.0	11.5	90.3	-1.78	10.2	1.26	0.38	LM	1	3.4	67.3	4.6	77.0	1080	5
SY Clearstone 2CL	x	HRW	0.275		14.1	68.7	12.3	90.0	-1.56	10.5	1.22	0.38	M	3	6.8	69.4	11.0	79.1	1125	6
SY Legend CL2	x	HRW	0.278		13.3	68.9	11.9	90.0	-1.80	11.7	1.28	0.39	M	2	4.6	68.8	5.9	79.0	1160	6
SY Monument	x	HRW	0.197		12.8	72.6	11.7	90.0	-1.38	9.8	1.30	0.38	M	3	9.7	70.8	17.9	81.5	1110	5
Warhorse	x	HRW	0.239		14.8	69.2	13.7	89.7	-1.49	10.3	1.35	0.39	M	3	5.1	70.8	7.2	81.0	1150	7
Yellowstone	x	HRW	0.271		14.5	70.0	13.2	90.0	-1.40	10.3	1.30	0.39	M	4	10.0	70.2	15.4	79.9	1175	6
MIN			0.078		11.7	67.7	10.4	89.2	-2.02	8.6	1.06	0.35		0	2.4	63.8	2.8	73.5	975	4
MAX			0.309		14.9	73.1	14.2	90.4	-0.79	12.4	1.43	0.42		4	15.4	73.8	34.5	84.0	1210	7
AVG			0.234		13.8	70.8	12.6	89.9	-1.48	10.5	1.29	0.38		2.9	6.8	70.2	12.9	80.0	1122	5.6

Table 6. 2018 Means across 4 locations (Exp. 35) Intrastate Winter Wheat Nursery - Mill & Bake and Noodle Data

VARIETY	X = in 2020 test	CLASS	PPO	Single Kernel Hardness	Wheat protein, % (12 m.b.)	Flour Yield %	Flour Protein%(14% m.b)	Flour Color			Mixograph			Test Bake					
								L*brightness	A*green-red	B*blue-yellow	Wheat Ash, %	Flour Ash, %	Tolerance	Mixing Time Min	Water Absorption%	Mixing Time Min	Water Absorption%	Loaf Volume	Crumb Grain
AAC Wildfire	X	HRW	0.266		13.3	72.1	12.2	89.8	-1.78	11.7	1.47	0.41	3.8	5.2	67.7	12.2	78.3	1073	5.8
Bobcat	X	HRW	0.257		13.4	73.2	12.2	90.0	-2.00	12.1	1.43	0.38	3.5	5.2	67.1	10.7	77.6	1068	5.0
Brawl CLP	X	HRW	0.266		13.5	71.3	12.1	90.4	-1.76	9.8	1.37	0.38	2.5	3.8	67.1	6.3	76.9	1048	5.3
Byrd CL Plus	X	HRW	0.258		11.7	71.3	10.2	90.5	-1.74	10.2	1.35	0.37	2.8	4.4	64.4	7.2	73.8	1010	4.5
Decade		HRW	0.254		13.6	71.7	12.4	90.4	-1.27	8.6	1.30	0.39	2.8	5.6	69.5	13.5	79.3	1079	5.8
Flathead	X	HRW	0.235		13.1	73.5	12.0	90.2	-1.07	8.5	1.41	0.41	4.0	7.7	68.4	15.6	78.7	1061	5.8
FourOsix	X	HRW	0.225		13.4	72.9	12.3	89.9	-1.39	9.8	1.38	0.41	2.8	4.9	67.5	9.7	77.2	1103	5.3
Incline AX	X	HRW	0.228		11.7	69.9	10.2	90.2	-1.81	10.7	1.49	0.39	3.3	4.5	63.7	8.9	73.5	986	5.3
Judee	X	HRW	0.236		13.8	71.8	12.8	90.0	-1.43	9.8	1.43	0.40	3.0	5.3	68.1	8.3	78.0	1131	6.0
Keldin	X	HRW	0.297		13.0	71.0	12.0	90.0	-1.21	9.2	1.31	0.43	2.5	4.8	66.5	7.6	76.4	1019	5.0
LCS Chrome		HRW	0.204		13.3	71.1	12.1	90.0	-1.30	9.3	1.45	0.41	1.5	3.3	65.7	3.9	74.9	1060	5.8
LCS Jet	X	HRW	0.248		12.8	72.9	11.3	89.9	-1.50	10.4	1.35	0.38	3.3	5.5	66.1	8.6	76.9	958	4.8
LCS Zoom		HRW	0.262		12.7	72.6	11.5	89.4	-1.16	9.8	1.38	0.42	2.8	5.1	63.0	7.8	73.3	955	5.3
Loma	X	HRW	0.141		13.3	72.8	12.0	89.7	-1.96	12.0	1.51	0.39	3.5	5.8	67.3	12.4	78.0	1158	6.0
Long Branch	X	HRW	0.268		12.1	71.2	10.7	89.9	-1.86	11.4	1.31	0.40	2.3	2.6	61.8	3.2	70.8	948	5.0
MT1642	X	HRW	0.130		13.6	71.1	12.3	89.9	-1.29	9.5	1.43	0.41	3.8	7.2	70.2	13.0	80.7	1140	5.5
MT1683	X	HRW	0.227		13.5	71.1	12.2	89.7	-1.48	10.4	1.47	0.43	3.5	7.2	68.7	12.4	78.8	1084	5.3
MTCS1601	X	HRW	0.278		13.5	72.7	12.2	90.1	-1.48	11.2	1.36	0.38	3.3	4.2	66.8	7.5	77.2	1095	5.8
MTW1491		HWW	0.129		13.1	72.5	12.1	89.7	-1.23	9.6	1.46	0.41	4.0	6.9	67.4	14.8	78.3	1094	6.0
Northern	X	HRW	0.160		13.3	70.9	12.3	89.4	-1.33	10.3	1.41	0.46	3.0	3.2	65.4	5.0	75.1	1083	4.8
Oahe		HRW	0.264		13.2	72.3	11.9	89.9	-1.19	8.9	1.39	0.42	1.5	2.1	64.7	2.5	73.9	938	3.8
Ray		HRW	0.130		13.6	73.0	12.5	89.3	-1.44	11.3	1.54	0.42	3.3	9.5	68.4	21.1	78.9	1073	5.5
SY 517 CL2	X	HRW	0.224		12.8	71.3	11.6	90.6	-1.68	9.6	1.44	0.38	1.8	3.1	65.5	4.4	74.4	1031	5.3
SY Clearstone 2CL	X	HRW	0.263		13.2	69.9	11.7	90.1	-1.50	9.9	1.44	0.40	3.3	5.5	66.7	8.6	76.5	1061	6.0
SY Legend CL2	X	HRW	0.309		12.8	70.0	11.2	89.8	-1.64	11.0	1.39	0.40	2.8	3.9	64.8	5.0	74.7	1054	6.5
SY Monument	X	HRW	0.147		12.2	72.8	10.9	90.1	-1.38	9.6	1.34	0.38	3.8	7.5	66.6	14.9	76.1	1014	5.0
Warhorse	X	HRW	0.261		14.0	70.5	12.9	89.9	-1.45	10.0	1.39	0.42	2.3	4.3	67.3	6.1	77.3	1096	6.3
Yellowstone	X	HRW	0.247		13.4	71.2	12.2	89.8	-1.35	9.9	1.43	0.42	3.8	7.2	68.2	12.0	78.4	1093	5.3
MIN			0.229		13.1	71.7	11.8	90.0	-1.49	10.2	1.41	0.40	3.0	5.2	66.6	9.4	76.6	1054	5.4
LSD			0.051		0.7	1.0	0.7	0.3	0.19	0.6	0.11	0.02	0.9	1.4	2.2	3.6	2.6	52	1.0
CV%			15.7		3.7	1.0	4.1	0.3	9.00	4.2	5.60	3.20	21.9	19.2	2.4	27.1	2.1	4	13.7

Table 7. 2018 (Exp. 3501) Intrastate Winter Wheat Nursery Noodles
Location: Bozeman, MT

		Noodle Color						Noodle Score	Texture Profile Analysis											
		L* at 0 hour (Brightness)	a* at 0 hour (Green - Red)	b* at 0 hour (Blue - Yellow)	L* at 24 hour (Brightness)	a* at 24 hour (Green - Red)	b* at 24 hour (Blue - Yellow)		Springiness at 0 min	Cohesiveness at 0 min	Adhesiveness at 0 min	Hardness, g at 0 min	Chewiness at 0 min	Springiness at 5 min	Cohesiveness at 5 min	Adhesiveness at 5 min	Hardness, g at 5 min	Chewiness at 5 min		
	x = in 2020 test	AAC Wildfire	86.1	-0.23	17.8	76.2	0.34	27.1	9.9	293	0.92	0.57	-41.4	1364	719	0.92	0.55	-43.5	1042	525
		Bobcat	86.6	-0.60	17.9	75.9	0.51	26.8	10.6	275	0.88	0.56	-91.1	1716	854	0.92	0.53	-61.5	1334	647
		Brawl CLP																		
		Byrd CL Plus																		
		Decade																		
		Flathead	86.9	0.46	12.7	76.8	1.17	18.7	10.1	271	0.83	0.59	-63.7	1530	749	0.92	0.57	-52.5	1143	598
		FourOsix	86.1	0.11	15.4	76.6	0.85	21.4	9.5	294	0.88	0.59	-42.8	1231	645	0.90	0.55	-39.6	956	475
		Incline AX																		
		Judee																		
		Keldin	86.5	0.31	14.9	77.0	1.12	21.4	9.5	294	0.91	0.58	-34.1	1270	668	0.92	0.54	-40.5	1058	526
		LCS Chrome																		
		LCS Jet																		
		LCS Zoom																		
		Loma																		
		Long Branch																		
		MT1642	86.2	0.28	15.2	77.1	0.81	21.3	9.1	294	0.89	0.57	-68.3	1658	845	0.93	0.54	-59.8	1341	670
		MT1683	86.9	0.09	14.3	77.2	0.99	21.9	9.8	294	0.85	0.57	-77.6	1610	780	0.80	0.54	-69.8	1342	586
		MTCS1601																		
		MTW1491	87.6	0.01	14.3	80.6	0.83	20.5	7.1	336	0.91	0.60	-40.8	1299	702	0.90	0.56	-41.3	1050	522
		Northern	87.3	0.21	14.1	79.0	1.21	21.3	8.3	316	0.90	0.58	-37.3	1283	671	0.90	0.54	-37.9	1009	492
		Oahe	85.1	0.47	15.0	76.4	1.21	20.2	8.7	313	0.85	0.54	-82.2	1697	784	0.83	0.53	-69.8	1329	588
		Ray	85.0	0.38	17.0	76.1	1.45	23.7	8.9	311	0.85	0.59	-60.5	1537	777	0.89	0.57	-51.0	1212	617
		SY 517 CL2																		
		SY Clearstone 2CL																		
		SY Legend CL2																		
		SY Monument																		
		Warhorse																		
		Yellowstone	87.2	0.12	13.8	78.6	1.13	19.9	8.6	315	0.90	0.59	-39.4	1350	715	0.91	0.56	-37.9	1046	533
		MIN	85.0	-0.60	12.7	75.9	0.34	18.7	7.1	271	0.83	0.54	-91.1	1231	645	0.80	0.53	-69.8	956	475
		MAX	87.6	0.47	17.9	80.6	1.45	27.1	10.6	336	0.92	0.60	-34.1	1716	854	0.93	0.57	-37.9	1342	670
		AVG	86.5	0.13	15.2	77.3	0.95	22.0	9.2	301	0.88	0.58	-56.6	1462	742	0.90	0.55	-50.4	1155	565

Table 8. 2018 (Exp. 3502) Intrastate Winter Wheat Nursery Noodles
Location: Havre, MT

		Noodle Color						Noodle Score	Texture Profile Analysis											
		L* at 0 hour (Brightness)	a* at 0 hour (Green - Red)	b* at 0 hour (Blue - Yellow)	L* at 24 hour (Brightness)	a* at 24 hour (Green - Red)	b* at 24 hour (Blue - Yellow)		24 hour L * Stability (0hr-24hr)	Springiness at 0 min	Cohesiveness at 0 min	Adhesiveness at 0 min	Hardness, g at 0 min	Chewiness at 0 min	Springiness at 5 min	Cohesiveness at 5 min	Adhesiveness at 5 min	Hardness, g at 5 min	Chewiness at 5 min	
7		x = in 2020 test																		
	AAC Wildfire	x	84.5	0.05	19.5	74.7	1.09	27.6	9.8	288	0.90	0.56	-105.0	1837	918	0.91	0.51	-91.0	1645	763
	Bobcat	x	84.0	-0.21	20.7	73.7	0.58	27.6	10.3	272	0.95	0.59	-60.9	1670	938	0.89	0.56	-58.9	1346	662
	Brawl CLP	x																		
	Byrd CL Plus	x																		
	Decade																			
	Flathead	x	85.7	0.67	14.7	76.7	1.61	19.4	9.0	290	0.88	0.59	-64.1	1555	804	0.89	0.54	-51.1	1334	640
	FourOsix	x	83.8	0.70	16.5	74.3	2.08	22.2	9.5	287	0.87	0.57	-88.3	1951	970	0.89	0.56	-68.7	1382	691
	Incline AX	x																		
	Judee	x																		
	Keldin	x	84.8	0.68	15.7	76.5	1.72	21.4	8.3	308	0.91	0.57	-101.6	1874	972	0.86	0.52	-79.4	1604	715
	LCS Chrome																			
	LCS Jet	x																		
	LCS Zoom																			
	Loma	x																		
	Long Branch	x																		
	MT1642	x	84.2	0.66	17.1	74.7	1.69	23.1	9.5	291	0.92	0.59	-54.6	1566	852	0.93	0.57	-45.5	1274	678
	MT1683	x	83.4	0.51	18.2	74.1	1.92	23.5	9.3	294	0.84	0.58	-83.2	1880	903	0.89	0.53	-78.4	1599	751
	MTCS1601	x																		
MTW1491		85.3	0.58	15.8	77.8	1.88	21.4	7.5	327	0.81	0.58	-76.4	1722	810	0.87	0.55	-74.8	1408	677	
Northern	x	84.9	0.65	15.9	76.2	1.83	22.6	8.7	311	0.79	0.57	-88.2	1668	749	0.83	0.52	-72.5	1402	605	
Oahe		84.4	0.80	15.0	76.0	1.80	19.9	8.4	313	0.91	0.57	-53.7	1555	806	0.89	0.53	-46.0	1270	597	
Ray		84.5	0.42	17.8	75.9	1.77	24.3	8.6	309	0.94	0.60	-69.6	1678	946	0.95	0.55	-52.8	1316	692	
SY 517 CL2	x																			
SY Clearstone 2CL	x																			
SY Legend CL2	x																			
SY Monument	x																			
Warhorse	x																			
Yellowstone	x	85.7	0.56	14.7	76.6	1.77	21.5	9.1	290	0.87	0.56	-108.8	2092	1018	0.84	0.53	-100.7	1693	761	
MIN			83.4	-0.21	14.7	73.7	0.58	19.4	7.5	272	0.79	0.56	-108.8	1555	749	0.83	0.51	-100.7	1270	597
MAX			85.7	0.80	20.7	77.8	2.08	27.6	10.3	327	0.95	0.60	-53.7	2092	1018	0.95	0.57	-45.5	1693	763
AVG			84.6	0.51	16.8	75.6	1.65	22.9	9.0	298	0.88	0.58	-79.5	1754	891	0.89	0.54	-68.3	1439	686

Table 9. 2018 (Exp. 3508) Intrastate Winter Wheat Nursery Noodles
Location: Huntley, MT

VARIETY	Noodle Color							Noodle Score	Texture Profile Analysis																			
	24 hour L * Stability (0hr-24hr)								Springiness at 0 min				Cohesiveness at 0 min				Adhesiveness at 0 min				Hardness, g at 0 min				Chewiness at 0 min			
	L* at 0 hour (Brightness)	a* at 0 hour (Green - Red)	b* at 0 hour (Blue - Yellow)	L* at 24 hour (Brightness)	a* at 24 hour (Green - Red)	b* at 24 hour (Blue - Yellow)	24 hour L * Stability (0hr-24hr)		Springiness at 0 min	Cohesiveness at 0 min	Adhesiveness at 0 min	Hardness, g at 0 min	Chewiness at 0 min	Springiness at 5 min	Cohesiveness at 5 min	Adhesiveness at 5 min	Hardness, g at 5 min	Chewiness at 5 min										
AAC Wildfire	x	86.4	-0.17	16.7	77.0	0.73	25.8	9.5	293	0.92	0.59	-50.0	1321	710	0.92	0.57	-49.6	1108	578									
Bobcat	x	86.6	-0.33	17.0	75.9	0.06	26.6	10.7	273	0.93	0.61	-45.8	1340	751	0.93	0.56	-38.5	1116	585									
Brawl CLP	x																											
Byrd CL Plus	x																											
Decade																												
Flathead	x	88.1	0.37	11.8	79.6	1.19	17.6	8.5	314	0.90	0.62	-38.5	1183	659	0.92	0.55	-40.9	982	498									
FourOsix	x	86.4	0.34	13.4	75.7	1.41	21.0	10.7	273	0.93	0.60	-43.0	1171	654	0.90	0.56	-37.6	952	479									
Incline AX	x																											
Judee	x																											
Keldin	x	86.2	0.38	14.2	77.1	1.40	20.5	9.0	292	0.94	0.60	-42.4	1330	747	0.92	0.56	-42.9	1057	539									
LCS Chrome																												
LCS Jet	x																											
LCS Zoom																												
Loma	x																											
Long Branch	x																											
MT1642	x	86.4	0.48	14.1	76.6	1.19	21.6	9.8	289	0.89	0.59	-49.3	1382	731	0.92	0.56	-43.4	1130	583									
MT1683	x	87.1	0.24	13.4	77.1	1.40	21.1	10.0	270	0.89	0.59	-51.0	1385	729	0.88	0.57	-47.8	1096	546									
MTC51601	x																											
MTW1491		87.7	0.20	13.2	79.3	1.28	20.8	8.4	317	0.92	0.59	-46.1	1341	733	0.94	0.57	-50.6	1091	588									
Northern	x	85.7	0.39	14.8	78.4	1.36	21.0	7.3	330	0.92	0.59	-41.9	1342	721	0.91	0.55	-46.6	1076	540									
Oahe		87.2	0.22	13.5	79.0	0.95	19.6	8.2	317	0.93	0.57	-50.4	1306	689	0.89	0.51	-33.2	1016	465									
Ray		85.6	0.60	15.4	75.3	2.15	23.4	10.3	271	0.93	0.62	-36.5	1206	696	0.94	0.58	-40.9	1028	561									
SY 517 CL2	x																											
SY Clearstone 2CL	x																											
SY Legend CL2	x																											
SY Monument	x																											
Warhorse	x																											
Yellowstone	x	85.4	0.56	13.8	76.4	1.75	20.2	9	292	0.91	0.62	-47.2	1348	754	0.87	0.58	-48.8	1077	543									
MIN		85.4	-0.33	11.8	75.3	0.06	17.6	7.3	270	0.89	0.57	-51.0	1171	654	0.87	0.51	-50.6	952	465									
MAX		88.1	0.60	17.0	79.6	2.15	26.6	10.7	330	0.94	0.62	-36.5	1385	754	0.94	0.58	-33.2	1130	588									
AVG		86.6	0.27	14.3	77.3	1.24	21.6	9.3	294	0.92	0.60	-45.2	1304	715	0.91	0.56	-43.4	1061	542									

Table 10. 2018 (Exp. 3518) Intrastate Winter Wheat Nursery Noodles
Location: Conrad, MT

VARIETY		Noodle Color							Noodle Score	Texture Profile Analysis										
		L* at 0 hour (Brightness)	a* at 0 hour (Green - Red)	b* at 0 hour (Blue - Yellow)	L* at 24 hour (Brightness)	a* at 24 hour (Green - Red)	b* at 24 hour (Blue - Yellow)	24 hour L* Stability (0hr-24hr)		Springiness at 0 min	Cohesiveness at 0 min	Adhesiveness at 0 min	Hardness, g at 0 min	Chewiness at 0 min	Springiness at 5 min	Cohesiveness at 5 min	Adhesiveness at 5 min	Hardness, g at 5 min	Chewiness at 5 min	
VARIETY	AAC Wildfire	x	83.8	0.46	18.9	74.3	1.24	27.2	9.5	292	0.88	0.58	-50.7	1451	742	0.88	0.55	-42.9	1178	574
	Bobcat	x	83.4	-0.18	22.0	71.9	0.47	29.8	11.5	246	0.94	0.58	-31.3	1294	702	0.94	0.56	-31.8	1095	573
	Brawl CLP	x																		
	Byrd CL Plus	x																		
	Decade																			
	Flathead	x	84.6	1.03	14.6	73.4	2.15	20.8	11.2	252	0.90	0.60	-59.5	1491	800	0.91	0.57	-45.6	1189	617
	FourOsix	x	84.5	0.50	16.5	73.6	1.52	23.8	10.9	269	0.91	0.60	-38.6	1263	691	0.93	0.56	-36.5	1089	573
	Incline AX	x																		
	Judee	x																		
	Keldin	x	85.0	0.72	16.2	74.7	1.90	24.1	10.3	270	0.88	0.59	-58.1	1528	792	0.89	0.56	-39.2	1161	572
	LCS Chrome																			
	LCS Jet	x																		
	LCS Zoom																			
	Loma	x																		
	Long Branch	x																		
	MT1642	x	84.9	0.55	16.9	74.2	1.45	24.3	10.7	271	0.88	0.59	-46.8	1425	739	0.89	0.55	-32.7	1114	544
MT1683	x	84.5	0.51	17.2	73.8	1.76	24.5	10.7	264	0.91	0.61	-46.3	1449	809	0.91	0.56	-41.9	1177	603	
MTCs1601	x																			
MTW1491		85.9	0.53	15.6	76.8	1.66	23.6	9.1	294	0.88	0.59	-42.0	1393	724	0.90	0.56	-40.0	1178	592	
Northern	x	84.9	0.55	16.4	75.5	1.72	24.2	9.4	290	0.87	0.56	-46.7	1479	720	0.86	0.51	-50.6	1224	540	
Oahe		85.4	0.56	15.4	76.2	1.38	21.8	9.2	292	0.89	0.58	-44.2	1322	684	0.89	0.52	-37.1	1038	481	
Ray		84.5	0.64	17.1	75.1	2.04	24.6	9.4	292	0.91	0.59	-38.9	1428	773	0.91	0.57	-42.2	1170	601	
SY 517 CL2	x																			
SY Clearstone 2CL	x																			
SY Legend CL2	x																			
SY Monument	x																			
Warhorse	x																			
Yellowstone	x	85.3	0.6	15.8	75.0	1.78	23.9	10.2	273	0.84	0.61	-49.0	1496	761	0.90	0.57	-54.5	1327	680	
MIN			83.4	-0.18	14.6	71.9	0.47	20.8	9.1	246	0.84	0.56	-59.5	1263	684	0.86	0.51	-54.5	1038	481
MAX			85.9	1.03	22.0	76.8	2.15	29.8	11.5	294	0.94	0.61	-31.3	1528	809	0.94	0.57	-31.8	1327	680
AVG			84.7	0.54	16.9	74.5	1.59	24.4	10.2	275	0.89	0.59	-46.0	1418	745	0.90	0.55	-41.3	1162	579

Table 11. 2018 (Exp. 35) Intrastate Winter Wheat Nursery Noodles
Combined 4 Location Data

VARIETY		Texture Profile Analysis																	
		24 hour L * Stability (0hr-24hr)					Noodle Score												
		L* at 0 hour (Brightness)	a* at 0 hour (Green - Red)	b* at 0 hour (Blue - Yellow)	L* at 24 hour (Brightness)	a* at 24 hour (Green - Red)	b* at 24 hour (Blue - Yellow)	Springiness at 0 min	Cohesiveness at 0 min	Adhesiveness at 0 min	Hardness, g at 0 min	Chewiness at 0 min	Springiness at 5 min	Cohesiveness at 5 min	Adhesiveness at 5 min	Hardness, g at 5 min	Chewiness at 5 min		
AAC Wildfire	x	85.2	0.03	18.2	75.6	0.85	26.9	9.7	292	0.90	0.57	-61.8	1493	772	0.91	0.54	-56.7	1243	610
Bobcat	x	85.1	-0.33	19.4	74.4	0.41	27.7	10.8	267	0.92	0.58	-57.3	1505	811	0.92	0.55	-47.7	1223	617
Brawl CLP	x																		
Byrd CL Plus	x																		
Decade																			
Flathead	x	86.3	0.63	13.4	76.6	1.65	19.1	9.7	282	0.88	0.60	-56.4	1440	753	0.91	0.56	-47.5	1162	588
FourOsix	x	85.2	0.41	15.5	75.1	1.47	22.1	10.2	281	0.90	0.59	-53.2	1404	740	0.91	0.56	-45.6	1095	555
Incline AX	x																		
Judee	x																		
Keldin	x	85.6	0.52	15.3	76.3	1.54	21.8	9.3	291	0.91	0.59	-59.0	1501	795	0.89	0.54	-50.5	1220	588
LCS Chrome																			
LCS Jet	x																		
LCS Zoom																			
Loma	x																		
Long Branch	x																		
MT1642	x	85.4	0.49	15.8	75.7	1.29	22.6	9.8	286	0.89	0.59	-54.7	1508	792	0.92	0.55	-45.4	1214	619
MT1683	x	85.5	0.34	15.8	75.5	1.52	22.8	10.0	281	0.87	0.59	-64.5	1581	805	0.87	0.55	-59.5	1304	621
MTC51601	x																		
MTW1491		86.6	0.33	14.7	78.6	1.41	21.6	8.0	319	0.88	0.59	-51.3	1438	742	0.90	0.56	-51.7	1182	595
Northern	x	85.7	0.45	15.3	77.3	1.53	22.3	8.4	312	0.87	0.57	-53.5	1443	715	0.88	0.53	-51.9	1178	544
Oahe		85.5	0.51	14.7	76.9	1.34	20.4	8.6	309	0.89	0.57	-57.6	1470	741	0.88	0.52	-46.6	1163	533
Ray		84.9	0.51	16.8	75.6	1.85	24.0	9.3	296	0.91	0.60	-51.4	1462	798	0.92	0.57	-46.8	1182	618
SY 517 CL2	x																		
SY Clearstone 2CL	x																		
SY Legend CL2	x																		
SY Monument	x																		
Warhorse	x																		
Yellowstone	x	85.9	0.46	14.5	76.6	1.61	21.4	9.2	293	0.88	0.59	-61.1	1572	812	0.88	0.56	-60.5	1286	629
Average		85.6	0.36	15.8	76.2	1.37	22.7	9.4	292	0.89	0.59	-56.8	1485	773	0.90	0.55	-50.9	1204	593
LSD (0.05)		1.0	0.19	1.0	1.3	0.32	0.8	0.8	16	ns	0.02	ns	ns	ns	ns	0.02	ns	ns	ns
C.V.		0.8	35.6	4.3	1.2	16.2	2.4	5.8	3.9	3.6	2.0	28.5	9.8	7.5	3.0	2.4	23.4	9.7	7.9

Table 12. 2018 Advanced Winter Wheat Nursery Mill & Bake (Exp. 1401)
Location: Bozeman, MT

Sample No.	Variety	Class	PO	Single kernel hardness	Wheat Protein, % (12% m.b.)	Flour Yield, %	Flour Protein, % (14% m.b.)	L* Brightness	a* Green - Red	b* Blue - Yellow	Wheat Ash, %	Flour Ash, %	Mixograph Type	Mixing Tolerance	Mixing Time, min	Mixing Water Absorption, %	Bake Mixing Time, min	Bake Water Absorption, %	Loaf Volume	Crumb Grain Score
1	x Yellowstone	HRW	0.226		12.2	72.2	10.6	90.0	-1.49	9.7	1.45	0.42	M	4	4.8	66.9	12.1	77.6	1120	5
2	x Judee	HRW	0.196		12.3	72.2	10.6	90.3	-1.65	9.9	1.50	0.38	M	3	4.8	67.0	11.8	76.7	1185	6
3	x Decade	HRW	0.199		12.5	72.5	10.7	90.4	-1.29	8.3	1.42	0.38	M	3	4.4	68.8	12.1	80.5	1100	5
4	x Warhorse	HRW	0.190		12.8	71.0	11.2	90.1	-1.52	9.7	1.42	0.40	M	1	3.5	65.8	4.5	75.5	1100	5
5	MTS1731	HWW	0.251		12.4	74.7	11.0	90.2	-0.93	7.6	1.38	0.40	M	4	3.6	67.9	16.0	79.6	1080	4
6	x MTCL1732	HRW	0.282		11.8	71.9	10.2	90.0	-1.01	8.1	1.37	0.40	M	3	4.4	68.1	9.4	78.8	1055	3
7	x MTCL1737	HRW	0.088		11.9	71.7	10.5	90.0	-1.57	10.0	1.46	0.43	M	2	3.1	63.9	5.4	73.6	1095	5
8	x MT1745	HRW	0.282		11.9	71.9	10.3	90.1	-1.45	9.7	1.39	0.39	M	4	5.9	69.1	15.2	79.8	975	4
9	x MT1746	HRW	0.071		12	71.4	10.4	90.5	-1.60	9.5	1.27	0.40	M	3	4.1	68.0	7.3	77.7	1045	4
10	MT1747	HRW	0.071		12.1	70.8	10.8	90.6	-1.62	9.4	1.36	0.39	M	3	4	68.9	10.4	79.6	955	3
11	MT1750	HRW	0.142		12.2	69.2	10.5	90.4	-1.86	10.6	1.50	0.41	M	3	2.6	63.9	4.4	73.6	1070	5
12	MT1764	HRW	0.266		12	74	10.6	89.6	-1.10	9.2	1.51	0.43	M	3	4	64.7	8.4	75.4	1065	3
13	MT1773	HRW	0.202		11.7	71.5	10.2	90.0	-1.92	10.7	1.31	0.41	M	3	3	64.9	4.4	74.6	1075	6
14	MT1782	HRW	0.197		13.1	72.3	10.5	89.3	-1.44	10.5	1.46	0.43	M	4	4.4	67.2	8.6	76.9	1040	5
15	x MT1787	HRW	0.215		12.2	72.7	11.8	90.0	-1.45	9.3	1.45	0.40	M	2	4.7	71.9	10.2	81.6	1095	5
16	x MT1793	HRW	0.203		13.4	71.6	11.9	90.0	-1.06	8.1	1.28	0.40	M	1	4.3	69.8	10.9	79.5	1145	5
17	MT1796	HRW	0.197		13.6	71.1	12.1	90.1	-0.99	7.6	1.44	0.40	M	2	6.2	74.8	20.5	84.5	1160	6
MIN			0.071		11.7	69.2	10.2	89.3	-1.92	7.6	1.27	0.38		1	2.6	63.9	4.4	73.6	955	3
MAX			0.282		13.6	74.7	12.1	90.6	-0.93	10.7	1.51	0.43		4	6.2	74.8	20.5	84.5	1185	6
AVE			0.193		12.4	71.9	10.8	90.1	-1.41	9.3	1.41	0.40		2.8	4.2	67.7	10.1	78.0	1080	4.6

Table 13. 2018 Advanced Winter Wheat Nursery Mill & Bake (Exp. 1402)
Location: Havre, MT

Sample No.	Variety	Class	PPO	Single kernel hardness	Wheat Protein, % (12% m.b.)	Flour Yield, %	Flour Protein, % (14% m.b.)	L* Brightness	a* Green - Red	b* Blue - Yellow	Wheat Ash, %	Flour Ash, %	Mixograph Type	Mixing Tolerance	Mixing Time, min	Mixing Water Absorption, %	Bake Mixing Time, min	Bake Water Absorption, %	Loaf Volume	Crumb Grain Score
1	x Yellowstone	HRW	0.134		14.0	70.5	12.8	89.0	-1.18	10.3	1.57	0.45	M	4	5.9	69.8	10.9	79.5	1055	6
2	x Judee	HRW	0.185		14.6	70.7	13.1	89.4	-1.29	10.0	1.32	0.40	M	3	4.3	69.8	7.1	80.5	1155	5
3	x Decade	HRW	0.193		14.5	70.0	13.6	89.3	-1.28	10.0	1.28	0.41	M	2	4.6	71.4	7.5	81.1	1125	6
4	x Warhorse	HRW	0.205		14.3	70.4	13	89.4	-1.26	9.7	1.42	0.42	MH	2	4.8	69.7	7.9	80.4	1100	6
5	MTS1731	HWW	0.208		13.7	73.5	12.7	89.8	-0.80	8.0	1.40	0.41	M	2	5.4	68.7	12.1	79.4	1120	5
6	x MTCL1732	HRW	0.216		13.6	71.3	12.8	89.2	-0.88	8.8	1.30	0.39	M	3	5.4	68.7	9.6	85.4	1095	5
7	x MTCL1737	HRW	0.202		14.6	69.6	12.9	89.0	-1.39	10.9	1.46	0.49	M	2	4.7	67.9	7.9	77.6	1105	7
8	x MT1745	HRW	0.218		13.3	70.2	11.5	89.3	-1.28	10.3	1.40	0.41	M	4	5.8	68.8	9.6	78.5	1080	6
9	x MT1746	HRW	0.077		13.4	69.8	12.1	89.8	-1.44	9.9	1.46	0.44	M	3	6.0	70.8	9.7	80.5	1070	5
10	MT1747	HRW	0.077		13.5	69.3	12.0	89.8	-1.45	9.7	1.50	0.39	M	3	6	69.7	9.2	80.4	1095	5
11	MT1750	HRW	0.126		14	69.5	12.0	89.5	-1.31	10.3	1.54	0.41	M	2	4.4	68.4	7.1	78.1	1115	7
12	MT1764	HRW	0.162		14	70.0	12.6	89.3	-1.18	10.1	1.45	0.42	M	2	5	70.5	7.6	80.2	1120	6
13	MT1773	HRW	0.195		13.6	69.5	12.2	89.2	-1.74	11.4	1.39	0.44	M	3	4.1	67.2	4.9	77.4	1095	4
14	MT1782	HRW	0.165		13.6	71.6	12.6	89.5	-1.35	9.8	1.51	0.44	M	2	4.5	67.7	6.1	77.4	1095	5
15	x MT1787	HRW	0.188		14.1	70.8	13.0	88.9	-1.22	11.0	1.33	0.42	M	3	5.3	68.4	8.0	78.1	1100	6
16	x MT1793	HRW	0.200		14.8	71.0	13.8	89.3	-0.90	8.5	1.34	0.45	M	2	4.9	71.4	11.2	81.1	1200	6
17	MT1796	HRW	0.179		15.2	70.1	14.0	89.3	-0.84	8.2	1.35	0.43	M	3	6.5	74.4	17.0	85.1	1190	5

Table 14. 2018 Advanced Winter Wheat Nursery Mill & Bake (Exp. 1408)
Location: Huntley, MT

Sample No.	Variety	Class	PP0	Single kernel hardness	Wheat Protein, % (12% m.b.)	Flour Yield, %	Flour Protein, % (14% m.b.)	L* Brightness	a* Green - Red	b* Blue - Yellow	Wheat Ash, %	Flour Ash, %	Mixograph Type	Mixing Tolerance	Mixing Time, min	Mixing Water Absorption, %	Bake Mixing Time, min	Bake Water Absorption, %	Loaf Volume	Crumb Grain Score
1	x Yellowstone	HRW	0.202		13.0	71.4	11.2	89.7	-1.50	10.2	1.46	0.42	M	3	4.8	63.4	9.8	74.1	1150	5
2	x Judee	HRW	0.210		13	71.6	11.4	89.8	-1.69	10.4	1.51	0.41	M	3	4.2	63.4	7.5	73.1	1190	5
3	x Decade	HRW	0.232		12.9	72.0	11.1	90.4	-1.48	8.8	1.49	0.38	M	4	4.8	66.8	14.8	78.5	1020	3
4	x Warhorse	HRW	0.215		13.3	70.5	11.6	90.2	-1.68	9.9	1.42	0.41	M	3	3.2	64.5	5.1	74.2	1150	6
5	MTS1731	HWW	0.285		13.1	74.9	11.3	90.2	-0.98	7.9	1.57	0.38	M	4	5.1	63.2	13.9	74.9	1110	5
6	x MTCL1732	HRW	0.274		12.4	70.8	11	89.9	-1.18	8.6	1.46	0.43	M	4	4.4	60.2	7.9	71.9	1090	5
7	x MTCL1737	HRW	0.182		12.7	71.0	11.1	89.7	-1.81	11.0	1.55	0.43	MH	4	3.3	65.0	7.4	74.7	1075	6
8	x MT1745	HRW	0.246		12.3	71.1	10.5	90.3	-1.62	10.1	1.23	0.40	M	4	5.1	60.7	8.1	71.4	1005	5
9	x MT1746	HRW	0.087		12.4	69.6	10.8	90.5	-1.71	9.6	1.59	0.41	M	3	3.8	63.1	5.5	72.8	1025	6
10	MT1747	HRW	0.102		12.7	68.1	10.8	90.7	-1.72	9.0	1.48	0.40	M	3	4	62.5	6.2	73.2	1025	4
11	MT1750	HRW	0.151		13.2	67.7	11.4	90.3	-1.83	10.1	1.54	0.40	M	3	2.3	60.9	3.7	70.6	1100	5
12	MT1764	HRW	0.275		12.4	72.4	11.0	89.8	-1.27	9.6	1.46	0.41	M	3	4.7	64.7	9.7	74.4	1100	6
13	MT1773	HRW	0.251		12.3	71.0	10.3	90.0	-2.05	11.1	1.45	0.43	M	4	4.9	62.5	4.8	72.2	1070	6
14	MT1782	HRW	0.177		12.7	72.2	11.1	90.2	-1.60	9.2	1.59	0.40	M	3	3.4	63.1	5.1	72.8	1075	5
15	x MT1787	HRW	0.224		12.6	71.9	11.1	89.6	-1.51	10.5	1.50	0.46	M	3	5.1	61.4	7.1	72.1	1060	5
16	x MT1793	HRW	0.223		12.5	71.8	11.1	90.1	-1.22	8.4	1.49	0.41	M	2	4.4	64.9	8.4	74.6	1060	5
17	MT1796	HRW	0.226		12.7	71.8	10.8	90.0	-1.26	8.5	1.38	0.42	M	3	6.9	67.5	23.4	81.2	965	5

Table 15. 2018 Advanced Winter Wheat Nursery Mill & Bake (Exp. 1418)
Location: Conrad, MT

Sample No.	Variety	Class	PO	Single kernel hardness	Wheat Protein, % (12% m.b.)	Flour Yield, %	Flour Protein, % (14% m.b.)	L* Brightness	a* Green - Red	b* Blue - Yellow	Wheat Ash, %	Flour Ash, %	Mixograph Type	Mixing Tolerance	Mixing Time, min	Mixing Water Absorption, %	Bake Mixing Time, min	Bake Water Absorption, %	Loaf Volume	Crumb Grain Score
1	x Yellowstone	HRW	0.134		14.2	70.1	13	89.6	-1.53	10.7	1.36	0.40	M	4	7.7	69.3	16.3	79.0	1205	6
2	x Judee	HRW	0.242		14.2	70.2	13.2	89.9	-1.62	10.3	1.37	0.37	M	3	6.2	69.5	8.8	76.2	1210	6
3	x Decade	HRW	0.257		13.8	71.1	12.8	90.4	-1.45	8.8	1.40	0.37	M	3	8.3	72.5	19.0	83.2	1130	6
4	x Warhorse	HRW	0.230		14.9	69.2	13.8	89.6	-1.49	10.3	1.36	0.40	M	2	5.6	71.3	7.3	82.0	1210	6
5	MTS1731	HWW	0.284		14.0	72.5	13.1	90.1	-0.98	7.8	1.28	0.39	M	3	6.9	69.9	18.7	79.6	1100	5
6	x MTCL1732	HRW	0.327		13.1	68.8	12.1	89.7	-1.22	9.2	1.38	0.42	M	4	4.6	65.7	7.9	76.4	1150	5
7	x MTCL1737	HRW	0.179		12.9	70.7	12	89.7	-1.87	11.4	1.42	0.40	M	3	4.1	63.8	7.0	73.5	1165	6
8	x MT1745	HRW	0.258		12.9	69.9	11.8	89.9	-1.59	10.5	1.36	0.37	M	5	7.3	66.7	14.9	78.4	1065	5
9	x MT1746	HRW	0.074		14	68.1	12.9	90.3	-1.64	9.8	1.43	0.41	M	4	5.4	68.7	8.2	78.4	1195	6
10	MT1747	HRW	0.098		13.4	67.5	12.3	90.2	-1.83	10.6	1.45	0.40	M	4	6.1	68.5	9.1	79.2	1125	6
11	MT1750	HRW	0.145		14.5	68	13.3	90.4	-1.90	10.7	1.55	0.41	M	2	4	69.7	6.8	79.4	1175	5
12	MT1764	HRW	0.200		14	70.9	12.8	89.6	-1.18	9.9	1.43	0.42	M	3	7	71.7	12.7	81.4	1205	6
13	MT1773	HRW	0.274		13.9	69.9	12.8	90.1	-2.24	12.0	1.35	0.38	M	3	6.7	70.7	10.1	80.4	1210	6
14	MT1782	HRW	0.187		13.7	71.5	12.6	90.1	-1.64	10.0	1.50	0.40	M	3	4.8	69.7	7.7	79.4	1115	6
15	x MT1787	HRW	0.186		13.6	72.2	12.7	89.5	-1.55	11.3	1.40	0.40	M	2	6.5	69.8	10.9	79.5	1085	6
16	x MT1793	HRW	0.264		14.6	71.4	13.6	90.1	-1.24	8.7	1.32	0.39	M	2	5.7	73.5	13.9	84.2	1160	5
17	MT1796	HRW	0.266		14.2	71.7	13.1	90.1	-1.17	8.2	1.30	0.39	M	3	7.5	73.7	21.0	84.4	1175	6

Table 16. 2018 Advanced Winter Wheat Nursery Mill & Bake (Exp. 14)
Location: Means Across Locations

Sample No.	Variety	Class	PO	Single kernel hardness	Wheat Protein, % (12% m.b.)	Flour Yield, %	Flour Protein, % (14% m.b.)	L* Brightness	a* Green - Red	b* Blue - Yellow	Wheat Ash, %	Flour Ash, %	Mixing Tolerance	Mixing Time, min	Mixing Water Absorption, %	Bake Mixing Time, min	Bake Water Absorption, %	Loaf Volume	Crumb Grain Score
1	x Yellowstone	HRW	0.174		13.4	71.1	11.9	89.6	-1.43	10.2	1.46	0.42	3.8	5.8	67.4	12.3	77.6	1133	5.5
2	x Judee	HRW	0.208		13.5	71.2	12.1	89.8	-1.56	10.2	1.43	0.39	3.0	4.9	67.4	8.8	76.6	1185	5.5
3	x Decade	HRW	0.220		13.4	71.4	12.1	90.1	-1.38	9.0	1.40	0.39	3.0	5.5	69.9	13.4	80.8	1094	5.0
4	x Warhorse	HRW	0.210		13.8	70.3	12.4	89.8	-1.49	9.9	1.41	0.41	2.0	4.3	67.8	6.2	78.0	1140	5.8
5	MTS1731	HRW	0.257		13.3	73.9	12.0	90.1	-0.92	7.8	1.41	0.40	3.3	5.3	67.4	15.2	78.4	1103	4.8
6	x MTCL1732	HRW	0.275		12.7	70.7	11.5	89.7	-1.07	8.7	1.38	0.41	3.5	4.7	65.7	8.7	78.1	1098	4.5
7	x MTCL1737	HRW	0.163		13.0	70.8	11.6	89.6	-1.66	10.8	1.47	0.44	2.8	3.8	65.2	6.9	74.9	1110	6.0
8	x MT1745	HRW	0.251		12.6	70.8	11.0	89.9	-1.49	10.1	1.35	0.39	4.3	6.0	66.3	12.0	77.0	1031	5.0
9	x MT1746	HRW	0.077		13.0	69.7	11.6	90.3	-1.60	9.7	1.44	0.42	3.3	4.8	67.7	7.7	77.4	1084	5.3
10	MT1747	HRW	0.087		12.9	68.9	11.5	90.3	-1.66	9.7	1.45	0.40	3.3	5.0	67.4	8.7	78.1	1050	4.5
11	MT1750	HRW	0.141		13.5	68.6	11.8	90.1	-1.73	10.4	1.53	0.41	2.5	3.3	65.7	5.5	75.4	1115	5.5
12	MT1764	HRW	0.226		13.1	71.8	11.8	89.5	-1.18	9.7	1.46	0.42	2.8	5.2	67.9	9.6	77.9	1123	5.3
13	MT1773	HRW	0.230		12.9	70.5	11.4	89.8	-1.99	11.3	1.38	0.42	3.3	4.7	66.3	6.1	76.2	1113	5.5
14	MT1782	HRW	0.181		13.3	71.9	11.7	89.8	-1.51	9.9	1.52	0.42	3.0	4.3	66.9	6.9	76.6	1081	5.3
15	x MT1787	HRW	0.203		13.1	71.9	12.2	89.5	-1.43	10.5	1.42	0.42	2.5	5.4	67.9	9.1	77.8	1085	5.5
16	x MT1793	HRW	0.222		13.8	71.5	12.6	89.9	-1.11	8.4	1.36	0.41	1.8	4.8	69.9	11.1	79.9	1141	5.3
17	MT1796	HRW	0.217		13.9	71.2	12.5	89.9	-1.07	8.1	1.37	0.41	2.8	6.8	72.6	20.5	83.8	1123	5.5
Average			0.197		13.3	70.9	11.9	89.9	-1.43	9.7	1.42	0.41	3.0	5.0	67.6	9.9	77.9	1106	5.3
LSD (0.05)			0.040		0.5	1.0	0.6	0.3	0.11	0.5	0.10	0.02	0.8	0.9	2.4	2.9	2.8	60	ns
C.V.			14.3		2.9	1.0	3.4	0.2	5.5	3.8	4.8	3.9	19.6	13.4	2.5	20.9	2.5	3.8	14.7

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 17. 2017 Advanced Winter Wheat Nursery (Exp. 1401): Noodles

Location: Bozeman, MT			Noodle Color									Texture Profile Analysis																			
Sample No.	Variety	Class	L* at 0 hour (Brightness)		a* at 0 hour (Green - Red)		b* at 0 hour (Blue - Yellow)		L* at 24 hour (Brightness)	a* at 24 hour (Green - Red)	b* at 24 hour (Blue - Yellow)	24 hour L * Stability (0hr-24hr)	Noodle Score	Springiness at 0 min		Adhesiveness at 0 min		Hardness, g at 0 min		Chewiness at 0 min		Springiness at 5 min		Cohesiveness at 5 min		Adhesiveness at 5 min		Hardness, g at 5 min		Chewiness at 5 min	
1	x Yellowstone	HRW	88.1	0.19	12.6	79.3	0.99	20.2	8.8	315	0.90	0.60	-47.54	1407	752.2	0.89	0.56	-37.3	1117	554											
2	x Judee	HRW																													
3	x Decade	HRW																													
4	x Warhorse	HRW																													
5	MTS1731	HWW	88.2	0.43	11.3	78.2	0.99	17.9	10	275	0.90	0.61	-49.7	1376	762	0.91	0.58	-45.5	1142	594											
6	x MTCL1732	HRW	87.8	0.54	11.8	78.9	1.46	18.2	8.8	313	0.88	0.61	-47.7	1309	708	0.92	0.57	-39.0	1055	550											
7	x MTCL1737	HRW	87.1	-0.07	14.6	78.3	0.66	22.0	8.8	313	0.91	0.59	-40.3	1283	691	0.87	0.55	-43.0	1011	483											
8	x MT1745	HRW	88.5	-0.04	13.3	80.1	0.43	21.1	8.4	313	0.92	0.60	-47.8	1351	736	0.91	0.56	-45.2	1045	538											
9	x MT1746	HRW	88.3	-0.23	14.3	80.6	0.38	23.1	7.7	333	0.86	0.60	-45.9	1319	678	0.89	0.56	-40.6	1046	516											
10	MT1747	HRW	87.1	-0.29	16.0	80.2	0.31	23.2	6.9	353	0.91	0.61	-34.3	1221	682	0.91	0.56	-44.6	1041	527											
11	MT1750	HRW	87.5	-0.25	15.6	78.3	0.45	26.0	9.2	293	0.87	0.59	-52.1	1354	695	0.86	0.56	-44.4	980	474											
12	MT1764	HRW	87.4	0.47	12.8	78.2	1.29	20.2	9.2	292	0.91	0.61	-41.0	1305	719	0.91	0.56	-41.2	1070	550											
13	MT1773	HRW	87.9	-0.46	14.5	79.2	0.00	21.4	8.7	315	0.89	0.60	-41.1	1325	702	0.90	0.55	-37.8	1012	503											
14	MT1782	HRW	87.8	0.20	13.4	78.8	1.19	20.5	8.9	313	0.89	0.60	-51.6	1299	694	0.88	0.55	-45.0	1049	507											
15	x MT1787	HRW	87.6	0.00	14.1	79.3	0.83	21.1	8.2	314	0.91	0.61	-50.3	1314	723	0.93	0.56	-52.8	1106	574											
16	x MT1793	HRW	86.6	0.52	12.8	75.4	1.25	19.0	11.2	253	0.90	0.61	-53.9	1287	713	0.90	0.59	-45.1	1017	537											
17	MT1796	HRW	87.3	0.55	11.7	77.0	1.40	17.5	10.2	273	0.88	0.60	-56.8	1500	797	0.91	0.57	-44.5	1208	630											
	MIN		86.6	-0.46	11.3	75.4	0.00	17.5	6.9	253	0.86	0.59	-56.8	1221	678	0.86	0.55	-52.8	980	474											
	MAX		88.5	0.55	16.0	80.6	1.46	26.0	11.2	353	0.92	0.61	-34.3	1500	797	0.93	0.59	-37.3	1208	630											
	AVE		87.6	0.11	13.5	78.7	0.83	20.8	8.9	305	0.90	0.60	-47.2	1332	718	0.90	0.56	-43.3	1064	538											

Location: Havre, MT			Noodle Color					Texture Profile Analysis												
Sample No.	Variety	Class	Noodle Color					Texture Profile Analysis												
			L* at 0 hour (Brightness)	a* at 0 hour (Green - Red)	b* at 0 hour (Blue - Yellow)	L* at 24 hour (Brightness)	a* at 24 hour (Green - Red)	b* at 24 hour (Blue - Yellow)	24 hour L* Stability (0hr-24hr)	Noodle Score	Springiness at 0 min	Cohesiveness at 0 min	Adhesiveness at 0 min	Hardness, g at 0 min	Chewiness at 0 min	Springiness at 5 min	Cohesiveness at 5 min	Adhesiveness at 5 min	Hardness, g at 5 min	Chewiness at 5 min
1	x Yellowstone	HRW	85.1	0.86	14.9	75.7	2.06	22.0	9.4	294	0.92	0.59	-54.0	1617	882	0.88	0.56	-48.7	1260	620
2	x Judee	HRW																		
3	x Decade	HRW																		
4	x Warhorse	HRW																		
5	MTS1731	HWW	85.5	1.01	14.1	74.7	1.67	19.1	10.8	273	0.92	0.61	-45.8	1444	809	0.90	0.57	-50.2	1200	613
6	x MTCL1732	HRW	85.6	0.98	13.6	76.7	2.24	19.2	8.9	313	0.92	0.63	-53.5	1427	822	0.89	0.56	-50.0	1227	611
7	x MTCL1737	HRW	82.8	0.83	17.9	72.7	2.16	24.6	10.1	273	0.91	0.60	-52.6	1407	777	0.92	0.57	-41.1	1142	596
8	x MT1745	HRW	87.0	0.34	14.9	79.4	1.13	21.0	7.7	333	0.89	0.59	-50.9	1520	791	0.89	0.55	-52.7	1232	604
9	x MT1746	HRW	86.6	0.22	15.5	78.3	1.38	23.1	8.3	314	0.88	0.59	-51.6	1524	790	0.88	0.56	-50.5	1171	578
10	MT1747	HRW	87.0	0.12	15.0	79.4	1.04	22.2	7.6	333	0.88	0.61	-53.2	1468	783	0.91	0.56	-52.1	1232	630
11	MT1750	HRW	85.3	0.47	16.8	76.3	1.46	24.2	8.9	315	0.88	0.59	-53.3	1480	768	0.89	0.57	-48.9	1116	564
12	MT1764	HRW	85.2	0.64	16.2	75.8	1.71	23.6	9.3	295	0.89	0.60	-59.2	1553	829	0.91	0.57	-47.6	1205	617
13	MT1773	HRW	85.1	0.11	17.7	76.7	0.66	23.8	8.5	315	0.91	0.60	-49.4	1515	827	0.91	0.56	-37.4	1184	596
14	MT1782	HRW	86.8	0.28	14.3	78.5	1.26	20.8	8.3	315	0.89	0.59	-56.7	1407	742	0.88	0.54	-41.7	1090	522
15	x MT1787	HRW	85.2	0.63	16.3	75.7	1.86	23.0	9.5	295	0.87	0.59	-65.3	1587	823	0.86	0.56	-51.0	1203	582
16	x MT1793	HRW	84.9	0.73	13.0	74.9	1.80	19.5	10.0	272	0.89	0.60	-57.0	1600	860	0.90	0.57	-50.8	1293	660
17	MT1796	HRW	85.2	0.93	13.6	74.9	1.93	19.0	10.3	274	0.92	0.61	-74.8	1770	991	0.93	0.59	-44.5	1258	687

Table 19. 2017 Advanced Winter Wheat Nursery (Exp. 1408): Noodles

Location: Huntley, MT			Noodle Color						Texture Profile Analysis																						
Sample No.	Variety	Class	L* at 0 hour (Brightness)		a* at 0 hour (Green - Red)		b* at 0 hour (Blue - Yellow)		L* at 24 hour (Brightness)	a* at 24 hour (Green - Red)	b* at 24 hour (Blue - Yellow)	24 hour L * Stability (0hr-24hr)	Noodle Score	Springiness at 0 min		Adhesiveness at 0 min		Hardness, g at 0 min		Chewiness at 0 min		Springiness at 5 min		Cohesiveness at 5 min		Adhesiveness at 5 min		Hardness, g at 5 min		Chewiness at 5 min	
1	x Yellowstone	HRW	85.7	0.41	15.1	75.7	1.71	22.3	10.0	275	0.94	0.62	-50.6	1395	812	0.91	0.56	-46.5	1169	593											
2	x Judee	HRW																													
3	x Decade	HRW																													
4	x Warhorse	HRW																													
5	MTS1731	HWW	86.4	0.66	13.2	75.6	1.41	19.3	10.8	273	0.87	0.62	-49.5	1427	768	0.88	0.58	-41.5	1133	578											
6	x MTCL1732	HRW	86.0	0.68	13.8	76.5	2.00	20.6	9.5	294	0.88	0.61	-47.5	1344	717	0.89	0.57	-42.1	1097	551											
7	x MTCL1737	HRW	85.6	-0.02	16.6	75.8	1.10	24.5	9.8	295	0.92	0.59	-53.7	1445	779	0.93	0.56	-49.4	1117	575											
8	x MT1745	HRW	86.4	0.08	15.9	78.6	0.87	22.5	7.8	333	0.89	0.60	-42.8	1280	679	0.87	0.54	-47.1	1109	522											
9	x MT1746	HRW	87.3	-0.16	15.1	78.9	0.87	23.7	8.4	314	0.90	0.59	-42.4	1241	664	0.90	0.56	-42.8	1030	516											
10	MT1747	HRW	87.3	-0.23	15.0	79.7	0.62	22.6	7.6	333	0.91	0.61	-45.1	1297	720	0.86	0.54	-44.1	1099	511											
11	MT1750	HRW	86.4	-0.14	16.3	76.9	0.81	26.0	9.5	293	0.90	0.61	-51.5	1333	729	0.87	0.55	-37.7	1038	495											
12	MT1764	HRW	86.9	0.42	13.6	77.9	1.47	21.4	9.0	293	0.93	0.62	-48.9	1338	777	0.89	0.59	-40.6	1028	538											
13	MT1773	HRW	85.5	-0.45	17.5	76.8	0.45	23.8	8.7	315	0.89	0.59	-42.1	1329	693	0.92	0.56	-46.6	1072	547											
14	MT1782	HRW	87.9	-0.13	13.2	79.6	0.79	20.2	8.4	313	0.87	0.59	-53.4	1357	696	0.90	0.54	-46.3	1023	499											
15	x MT1787	HRW	86.3	0.26	14.6	76.4	1.48	22.0	10.0	274	0.88	0.60	-51.8	1335	706	0.93	0.57	-43.1	1114	589											
16	x MT1793	HRW	87.1	0.32	12.5	76.8	1.44	18.7	10.3	273	0.86	0.59	-50.2	1358	681	0.88	0.56	-40.1	1038	506											
17	MT1796	HRW	87.5	0.28	12.1	78.3	1.32	17.8	9.2	293	0.87	0.60	-70.8	1519	787	0.91	0.57	-55.6	1154	603											

Table 20. 2018 Advanced Winter Wheat Nursery (Exp. 1418): Noodles

Location: Conrad, MT			Noodle Color							Texture Profile Analysis										
Sample No.	Variety	Class	L* at 0 hour (Brightness)	a* at 0 hour (Green - Red)	b* at 0 hour (Blue - Yellow)	L* at 24 hour (Brightness)	a* at 24 hour (Green - Red)	b* at 24 hour (Blue - Yellow)	24 hour L * Stability (0hr-24hr)	Noodle Score	Springiness at 0 min	Cohesiveness at 0 min	Adhesiveness at 0 min	Hardness, g at 0 min	Chewiness at 0 min	Springiness at 5 min	Cohesiveness at 5 min	Adhesiveness at 5 min	Hardness, g at 5 min	Chewiness at 5 min
1	x Yellowstone	HRW	85.5	0.57	15.8	76.1	1.63	24.0	9.4	293	0.93	0.61	-59.5	1614	922	0.90	0.57	-51.4	1305	665
2	x Judee	HRW																		
3	x Decade	HRW																		
4	x Warhorse	HRW																		
5	MTS1731	HWW	85.5	0.82	14.4	75.2	1.33	19.8	10.3	274	0.87	0.59	-51.6	1566	797	0.89	0.57	-52.5	1223	620
6	x MTCL1732	HRW	85.6	0.78	14.7	75.5	1.86	21.9	10.1	274	0.91	0.60	-46.3	1507	824	0.88	0.57	-42.3	1160	580
7	x MTCL1737	HRW	85.5	0.09	17.3	75.4	0.94	26.0	10.1	274	0.93	0.60	-42.8	1361	759	0.87	0.56	-37.8	1066	516
8	x MT1745	HRW	87.8	0.10	15.2	79.2	0.71	23.5	8.6	314	0.92	0.60	-44.8	1442	794	0.90	0.56	-48.6	1213	606
9	x MT1746	HRW	86.5	0.09	16.6	77.7	1.26	25.7	8.8	313	0.87	0.60	-44.4	1428	735	0.93	0.57	-58.3	1200	640
10	MT1747	HRW	86.7	-0.03	16.9	79.1	0.74	25.6	7.6	333	0.90	0.59	-54.7	1541	819	0.91	0.55	-49.1	1283	642
11	MT1750	HRW	85.3	0.04	18.9	75.6	1.10	28.7	9.8	292	0.91	0.60	-53.0	1463	804	0.92	0.58	-53.8	1198	633
12	MT1764	HRW	85.8	0.76	15.1	76.7	1.73	23.0	9.1	295	0.86	0.60	-58.3	1524	786	0.88	0.58	-51.2	1230	625
13	MT1773	HRW	86.0	-0.32	18.4	75.9	0.35	28.2	10.1	273	0.92	0.60	-55.7	1449	799	0.90	0.56	-47.0	1234	615
14	MT1782	HRW	86.9	0.02	15.6	78.4	0.90	23.0	8.5	314	0.93	0.60	-48.9	1323	737	0.91	0.56	-47.2	1095	557
15	x MT1787	HRW	85.6	0.37	17.2	75.5	1.48	24.9	10.0	273	0.92	0.60	-48.6	1456	805	0.88	0.57	-41.9	1092	551
16	x MT1793	HRW	85.5	0.60	14.8	74.6	1.44	21.4	10.9	273	0.93	0.61	-49.4	1380	778	0.91	0.57	-40.6	1140	591
17	MT1796	HRW	86.3	0.57	13.7	75.9	1.35	19.8	10.4	272	0.90	0.61	-46.1	1412	778	0.91	0.59	-42.3	1149	617

Table 21. 2018 Advanced Winter Wheat Nursery (Exp. 14): Noodles
Location: 4 Location Means

			Noodle Color							Texture Profile Analysis														
Sample No.	Variety	Class	24 hour L * Stability (0hr-24hr)						Noodle Score	Springiness at 0 min					Hardness, g at 0 min					Chewiness at 0 min				
			L* at 0 hour (Brightness)	a* at 0 hour (Green - Red)	b* at 0 hour (Blue - Yellow)	L* at 24 hour (Brightness)	a* at 24 hour (Green - Red)	b* at 24 hour (Blue - Yellow)		Springiness at 0 min	Cohesiveness at 0 min	Adhesiveness at 0 min	Hardness, g at 0 min	Chewiness at 0 min	Springiness at 5 min	Cohesiveness at 5 min	Adhesiveness at 5 min	Hardness, g at 5 min	Chewiness at 5 min					
1	x Yellowstone	HRW	86.1	0.51	14.6	76.7	1.60	22.1	9.4	294	0.92	0.61	-52.9	1508	842	0.90	0.56	-46.0	1213	608				
2	x Judee	HRW																						
3	x Decade	HRW																						
4	x Warhorse	HRW																						
5	MTS1731	HWW	86.4	0.73	13.3	75.9	1.35	19.0	10.5	274	0.89	0.61	-49.2	1453	784	0.90	0.57	-47.4	1175	601				
6	x MTS1732	HRW	86.3	0.75	13.5	76.9	1.89	20.0	9.3	299	0.90	0.61	-48.8	1397	768	0.89	0.57	-43.4	1135	573				
7	x MTS1737	HRW	85.3	0.21	16.6	75.6	1.22	24.3	9.7	289	0.92	0.60	-47.4	1374	752	0.90	0.56	-42.8	1084	543				
8	x MT1745	HRW	87.4	0.12	14.8	79.3	0.79	22.0	8.1	323	0.90	0.60	-46.6	1398	750	0.89	0.55	-48.4	1150	568				
9	x MT1746	HRW	87.1	-0.02	15.4	78.9	0.97	23.9	8.3	319	0.88	0.59	-46.1	1378	717	0.90	0.56	-48.1	1112	562				
10	MT1747	HRW	87.1	-0.11	15.7	79.6	0.68	23.4	7.4	338	0.90	0.61	-46.8	1381	751	0.90	0.55	-47.5	1164	578				
11	MT1750	HRW	86.1	0.03	16.9	76.8	0.96	26.2	9.4	298	0.89	0.60	-52.5	1408	749	0.89	0.56	-46.2	1083	542				
12	MT1764	HRW	86.3	0.57	14.4	77.1	1.55	22.0	9.2	294	0.90	0.61	-51.9	1430	778	0.90	0.57	-45.2	1133	582				
13	MT1773	HRW	86.1	-0.28	17.0	77.1	0.37	24.3	9.0	305	0.90	0.60	-47.1	1404	755	0.91	0.55	-42.2	1126	565				
14	MT1782	HRW	87.4	0.09	14.1	78.8	1.04	21.2	8.5	314	0.89	0.60	-52.7	1347	717	0.89	0.55	-45.0	1064	521				
15	x MT1787	HRW	86.2	0.32	15.5	76.7	1.41	22.8	9.4	289	0.90	0.60	-54.0	1423	764	0.90	0.57	-47.2	1129	574				
16	x MT1793	HRW	86.0	0.54	13.3	75.4	1.48	19.7	10.6	268	0.90	0.60	-52.6	1406	758	0.90	0.57	-44.1	1122	573				
17	MT1796	HRW	86.6	0.58	12.8	76.5	1.50	18.5	10.0	278	0.89	0.60	-62.1	1550	838	0.92	0.58	-46.7	1192	634				
Average			86.5	0.29	14.9	77.2	1.20	22.1	9.2	299	0.90	0.60	-50.7	1418	766	0.90	0.56	-45.7	1134	573				
LSD (0.05)			0.9	0.18	1.0	1.3	0.3	1.2	0.7	17	ns	ns	8.0	98	51	ns	0.01	ns	71	47				
C.V.			0.7	43.1	4.9	1.1	16.2	3.9	5.1	4.1	2.5	1.5	11.1	4.8	4.6	2.4	1.5	11.0	4.3	5.7				

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 22. 2018 Sawfly Winter Wheat Nursery Mill & Bake (Exp. 5801)
Location: Bozeman, MT

Sample No.	Variety	Class	PPD	Single kernel hardness	Wheat Protein, % (12% m.b.)	Flour Yield, %	Flour Protein, % (14% m.b.)	L* Brightness	a* Green - Red	b* Blue - Yellow	Wheat Ash, %	Flour Ash, %	Mixograph Type	Mixing Tolerance	Mixing Time, min	Mix Water Absorption, %	Bake Mixing Time, min	Bake Water Absorption, %	Loaf Volume	Crumb Grain Score
1	x Yellowstone	HRW	0.223		12.3	72.7	11.1	90.1	-1.48	9.5	1.49	0.40	M	4	5.3	63.7	9.6	74.4	1110	6
2	x Judee	HRW	0.243		11.8	72.4	10.5	90.3	-1.67	9.9	1.52	0.40	MH	5	4.7	63.4	6.8	73.1	1150	7
3	Decade	HRW	0.276		12.5	72.2	10.9	90.5	-1.36	8.3	1.50	0.38	M	3	4.1	65.5	9.4	77.2	1035	6
4	x Warhorse	HRW	0.306		12.7	71.3	11	90.1	-1.62	9.7	1.48	0.40	M	2	3.8	63.7	4.3	73.4	1115	6
5	x Loma	HRW	0.125		12.1	74.7	10.7	89.5	-2.07	12.0	1.46	0.40	M	3	6.6	67.4	14.9	79.1	1080	5
6	x Bobcat	HRW	0.310		12.2	74.1	10.7	90.3	-2.19	12.1	1.61	0.38	M	3	4.2	64.5	9.9	76.2	1030	5
7	x MTS1601	HRW	0.230		12.6	73.8	11.4	90.1	-1.86	10.7	1.49	0.38	M	4	2.7	66.5	8	80.2	1030	3
8	MTS1731	HWW	0.290		12.4	74.7	11.0	90.5	-1.09	7.6	1.54	0.40	M	4	4.8	65.4	11.8	77.1	1120	3
9	MTS1801	HRW	0.231		12.1	73.0	10.3	90.1	-1.75	10.4	1.40	0.38	M	3	3.4	60.9	5.3	70.6	1100	5
10	MTS1802	HRW	0.275		13.3	72.2	11.6	90.6	-1.48	8.8	1.45	0.39	M	3	2.9	61.5	4.0	72.2	1130	5
11	MTS1804	HRW	0.236		13.3	71.9	11.7	90.1	-1.55	9.6	1.43	0.40	M	2	4.5	65.3	5.0	75	1180	7
12	MTS1809	HRW	0.250		12.7	70.3	10.9	90.7	-1.47	8.4	1.46	0.38	M	3	3.0	61.4	3.2	71.1	1025	7
13	x MTS1810	HRW	0.193		12.2	72.1	11.0	90.4	-1.85	10.3	1.43	0.39	LM	2	2.4	59.7	3.2	69.4	1060	5
14	MTS1830	HRW	0.210		11.3	72.5	9.6	90.5	-1.79	9.4	1.47	0.40	LM	2	4.7	59.8	6.1	69.5	1075	6
15	x MTS1831	HRW	0.202		11.4	73.7	9.8	90.7	-1.71	9.1	1.50	0.39	M	4	7.3	61.5	20.9	74.2	1050	5
	MIN		0.125		11.3	70.3	9.6	89.5	-2.19	7.6	1.40	0.38		2	2.4	59.7	3.2	69.4	1025	3
	MAX		0.310		13.3	74.7	11.7	90.7	-1.09	12.1	1.61	0.40		5	7.3	67.4	20.9	80.2	1180	7
	AVE		0.240		12.3	72.8	10.8	90.3	-1.66	9.7	1.48	0.39		3.1	4.3	63.3	8.2	74.2	1086	5.4

Table 23. 2018 Sawfly Winter Wheat Nursery Mill & Bake (Exp. 5802)
Location: Havre, MT

Sample No.	Variety	Class	PPD	Single kernel hardness	Wheat Protein, % (12% m.b.)	Flour Yield, %	Flour Protein, % (14% m.b.)	L* Brightness	a* Green - Red	b* Blue - Yellow	Wheat Ash, %	Flour Ash, %	Mixograph Type	Mixing Tolerance	Mixing Time, min	Mixing Water Absorption, %	Bake Mixing Time, min	Bake Water Absorption, %	Loaf Volume	Crumb Grain Score
1	x Yellowstone	HRW	0.111		13.7	71.5	13.2	89.3	-1.35	10.3	1.36	0.40	LM	3	8.3	65.9	11.4	75.6	1085	4
2	x Judee	HRW	0.147		15.0	70.6	13	89.5	-1.35	10.0	1.44	0.40	M	4	4.0	68	5.5	77.7	1260	5
3	Decade	HRW	0.156		14.3	72.5	12.9	89.9	-1.21	8.7	1.41	0.39	M	2	5.7	70.8	13.9	80.5	1140	4
4	x Warhorse	HRW	0.148		15.1	69.8	13.3	89.3	-1.24	9.7	1.39	0.41	M	2	4.8	71.9	7.3	82.6	1215	6
5	x Loma	HRW	0.079		13.7	73.1	13	89.2	-2.12	13.1	1.40	0.39	M	2	5.9	70.1	13.4	79.8	1130	5
6	x Bobcat	HRW	0.179		13.7	74.1	12.9	89.8	-2.00	12.2	1.35	0.37	M	3	6.2	69	12.3	78.7	1160	6
7	x MTS1601	HRW	0.210		13.6	73.4	13.2	89.6	-1.74	11.5	1.33	0.38	M	4	4.5	66.1	8.6	76.8	1085	6
8	MTS1731	HWW	0.169		14.0	74.1	13.3	90.0	-0.93	7.9	1.40	0.37	M	2	5.7	68.6	14.4	78.3	1120	5
9	MTS1801	HRW	0.117		14.2	71.1	12.9	89.2	-1.45	10.5	1.37	0.40	M	2	4.0	67.7	6.5	77.4	1160	5
10	MTS1802	HRW	0.166		14.4	72.2	13.1	89.6	-1.40	9.8	1.33	0.40	M	2	3.6	69.4	6.1	79.1	1145	5
11	MTS1804	HRW	0.151		14.6	70.0	13.0	89.3	-1.32	10.0	1.34	0.41	M	2	4.8	71.5	7.2	81.2	1235	6
12	MTS1809	HRW	0.115		15.0	68.8	13.2	90.2	-1.30	8.7	1.48	0.39	M	1	3.8	71.9	5.6	82.1	1115	5
13	x MTS1810	HRW	0.125		14.3	71.0	13.2	89.9	-1.59	10.4	1.40	0.39	M	2	3.1	67.7	4.7	77.4	1080	6
14	MTS1830	HRW	0.135		13.7	72.7	13.1	89.7	-1.66	10.4	1.34	0.40	M	1	5.3	68.1	12.5	77.8	1215	7
15	x MTS1831	HRW	0.159		13.4	73.2	13.1	89.9	-1.63	10.0	1.39	0.40	M	3	8.3	67.7	17.9	77.4	1140	5
	MIN		0.079		13.4	68.8	12.9	89.2	-2.12	7.9	1.33	0.37		1	3.1	65.9	4.7	75.6	1080	4
	MAX		0.210		15.1	74.1	13.3	90.2	-0.93	13.1	1.48	0.41		4	8.3	71.9	17.9	82.6	1260	7
	AVE		0.144		14.2	71.9	13.1	89.6	-1.49	10.2	1.38	0.39		2.3	5.2	69.0	9.8	78.8	1152	5.3

Table 24. 2018 Sawfly Winter Wheat Nursery Mill & Bake (Exp. 5853)
Location: Big Sandy, MT

Sample No.	Variety	Class	PPD	Single kernel hardness	Wheat Protein, % (12% m.b.)	Flour Yield, %	Flour Protein, % (14% m.b.)	L* Brightness	a* Green - Red	b* Blue - Yellow	Wheat Ash, %	Flour Ash, %	Mixograph Type	Mixing Tolerance	Mixing Time, min	Mixing Water Absorption, %	Bake Mixing Time, min	Bake Water Absorption, %	Loaf Volume	Crumb Grain Score
1	x Yellowstone	HRW	0.214		13.6	70.7	12.5	89.1	-1.35	10.7	1.54	0.43	M	3	8.7	68.8	13.8	78.5	1110	6
2	x Judee	HRW	0.205		14.3	70.2	13.3	89.3	-1.35	10.4	1.56	0.41	M	3	5.7	66.7	7.2	76.4	1215	7
3	Decade	HRW	0.323		14.8	71.2	13.4	89.5	-1.16	9.3	1.58	0.36	M	3	8.0	74.1	19.5	84.8	1165	6
4	x Warhorse	HRW	0.226		14.2	70.2	13.2	89.2	-1.40	10.6	1.54	0.43	M	2	6.0	67.7	8.2	78.4	1150	7
5	x Loma	HRW	0.147		14.2	72.4	12.9	88.7	-1.90	13.1	1.74	0.40	M	2	7.6	72.1	14.4	81.8	1225	6
6	x Bobcat	HRW	0.296		14.1	72.6	12.9	89.6	-2.01	12.5	1.55	0.41	M	3	6.7	69.8	12.8	79.5	1200	6
7	x MTS1601	HRW	0.282		13.6	72.5	12.5	89.4	-1.67	11.6	1.55	0.40	M	3	6.2	68.0	11.3	77.7	1125	5
8	MTS1731	HWW	0.233		13.7	74.1	12.7	89.9	-0.93	8.2	1.50	0.41	M	3	6.8	67.1	14.1	76.8	1160	4
9	MTS1801	HRW	0.187		14.3	70.7	12.8	89.0	-1.35	10.8	1.48	0.38	M	3	6.3	67.6	8.4	77.3	1180	6
10	MTS1802	HRW	0.237		14.7	72.2	13.8	89.3	-1.31	10.1	1.49	0.42	MH	3	4.6	68.7	7.5	78.4	1205	6
11	MTS1804	HRW	0.239		14.3	71.0	13.4	89.2	-1.35	10.4	1.52	0.42	M	3	5.0	68.9	8.8	79.1	1190	5
12	MTS1809	HRW	0.193		14.2	69.2	13.1	89.8	-1.40	9.5	1.48	0.41	M	2	4.6	68.1	6.0	77.8	1130	5
13	x MTS1810	HRW	0.175		14.8	70.1	13.7	89.5	-1.62	11.0	1.42	0.41	M	2	3.7	66.1	4.7	75.8	1105	6
14	MTS1830	HRW	0.185		13.9	71.2	13.0	89.2	-1.58	10.6	1.64	0.42	M	2	6.8	70.0	15.8	80.2	1190	5
15	x MTS1831	HRW	0.181		13.7	71.5	12.6	89.5	-1.53	10.2	1.64	0.43	M	4	9.8	70	19.9	80.7	1165	6
	MIN		0.147		13.6	69.2	12.5	88.7	-2.01	8.2	1.42	0.36		2	3.7	66.1	4.7	75.8	1105	4
	MAX		0.323		14.8	74.1	13.8	89.9	-0.93	13.1	1.74	0.43		4	9.8	74.1	19.9	84.8	1225	7
	AVE		0.222		14.2	71.3	13.1	89.3	-1.46	10.6	1.55	0.41		2.7	6.4	68.9	11.5	78.9	1168	5.7

Table 25. 2018 Sawfly Winter Wheat Nursery Mill & Bake (Exp. 58)

Location: Means Across Locations

Sample No.	Variety		Class	PO	Single kernel hardness	Wheat Protein, % (12% m.b.)	Flour Yield, %	Flour Protein, % (14% m.b.)	L* Brightness			a* Green - Red			b* Blue - Yellow			Wheat Ash, %	Flour Ash, %	Mixing Tolerance	Mixo Mixing Time, min	Mixo Water Absorption, %	Bake Mixing Time, min	Bake Water Absorption, %	Loaf Volume	Crumb Grain Score
1	x	Yellowstone	HRW	0.183		13.2	71.6	12.3	89.5	-1.39	10.2	1.46	0.41	3.3	7.4	66.1	11.6	76.2	1102	5.3						
2	x	Judee	HRW	0.198		13.7	71.1	12.3	89.7	-1.46	10.1	1.51	0.40	4.0	4.8	66.0	6.5	75.7	1208	6.3						
3		Decade	HRW	0.252		13.9	72.0	12.4	90.0	-1.24	8.7	1.50	0.38	2.7	5.9	70.1	14.3	80.8	1113	5.3						
4	x	Warhorse	HRW	0.226		14.0	70.4	12.5	89.5	-1.42	10.0	1.47	0.41	2.0	4.9	67.8	6.6	78.1	1160	6.3						
5	x	Loma	HRW	0.117		13.3	73.4	12.2	89.1	-2.03	12.7	1.53	0.40	2.3	6.7	69.9	14.2	80.2	1145	5.3						
6	x	Bobcat	HRW	0.262		13.3	73.6	12.2	89.9	-2.07	12.3	1.50	0.39	3.0	5.7	67.8	11.7	78.1	1130	5.7						
7	x	MTCS1601	HRW	0.241		13.3	73.2	12.4	89.7	-1.76	11.3	1.46	0.39	3.7	4.5	66.9	9.3	78.2	1080	4.7						
8		MTS1731	HWW	0.231		13.4	74.3	12.3	90.1	-0.98	7.9	1.48	0.39	3.0	5.8	67.0	13.4	77.4	1133	4.0						
9		MTS1801	HRW	0.178		13.5	71.6	12.0	89.4	-1.52	10.6	1.42	0.39	2.7	4.6	65.4	6.7	75.1	1147	5.3						
10		MTS1802	HRW	0.226		14.1	72.2	12.8	89.8	-1.40	9.6	1.42	0.40	2.7	3.7	66.5	5.9	76.6	1160	5.3						
11		MTS1804	HRW	0.209		14.1	71.0	12.7	89.5	-1.41	10.0	1.43	0.41	2.3	4.8	68.6	7.0	78.4	1202	6.0						
12		MTS1809	HRW	0.186		14.0	69.4	12.4	90.2	-1.39	8.9	1.47	0.39	2.0	3.8	67.1	4.9	77.0	1090	5.7						
13	x	MTS1810	HRW	0.164		13.8	71.1	12.6	90.0	-1.69	10.5	1.42	0.40	2.0	3.1	64.5	4.2	74.2	1082	5.7						
14		MTS1830	HRW	0.176		13.0	72.1	11.9	89.8	-1.68	10.1	1.48	0.41	1.7	5.6	66.0	11.5	75.8	1160	6.0						
15	x	MTS1831	HRW	0.181		12.8	72.8	11.8	90.1	-1.62	9.8	1.51	0.41	3.7	8.5	66.4	19.6	77.4	1118	5.3						
Average				0.202		13.6	72.0	12.3	89.8	-1.54	10.2	1.47	0.40	2.7	5.3	67.1	9.8	77.3	1135	5.5						
LSD (0.05)				0.043		0.6	0.9	ns	0.2	0.11	0.4	ns	0.02	0.8	1.0	3.1	2.8	ns	56	ns						
C.V.				12.8		2.9	0.8	3.1	0.1	4.3	2.3	3.9	2.8	18.6	11.7	2.8	17.3	3.0	2.9	17.1						

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 26. 2018 Preliminary A Winter Wheat Nursery Mill & Bake (Exp. 3601)
Location: Bozeman, MT

Sample No. x = lines in 2020 tests	Variety	Class	PPD	Single kernel hardness	Wheat Protein, % (12% m.b.)	Flour Yield, %	Flour Protein, % (14% m.b.)	L* Brightness	a* Green - Red	b* Blue - Yellow	Wheat Ash, %	Flour Ash, %	Mixograph Type	Mixing Tolerance	Mixing Time, min	Mixing Water Absorption, %	Bake Mixing Time, min	Bake Water Absorption, %	Loaf Volume	Crum Grain
1	x Yellowstone	HRW	0.167		11.7	72.5	10.5	89.9	-1.40	9.3	1.45	0.40	M	4	5.2	61.1	9.2	71.8	1070	6
2	x Decade	HRW	0.223		12.8	72.3	11.4	90.1	-1.24	8.2	1.46	0.38	M	2	4.8	69.8	18.2	79.5	1040	4
3	x Judee	HRW	0.219		12.1	72.4	10.7	89.8	-1.50	9.8	1.50	0.39	LM	1	3.5	61.1	7.8	70.8	1125	5
4	x SY Wolf	HRW	0.251		12.5	70.8	10.9	89.9	-1.85	10.6	1.47	0.37	M	4	5.7	64.7	5.6	74.9	990	5
5	x MT1845	HRW	0.128		12.6	72.2	11.2	89.9	-1.48	9.7	1.50	0.42	M	3	6.8	67.1	13.6	78.8	1045	5
6	x MT1848	HRW	0.092		12.5	73.7	11.1	89.3	-1.47	10.2	1.42	0.47	M	2	3.5	66.2	6.8	75.9	1125	6
7	MT1854	HRW	0.231		11.1	73.7	9.9	89.7	-1.44	9.8	1.38	0.43	M	5	7.7	65.1	16.6	75.8	1030	6
8	x MT1855	HRW	0.216		11.9	74.5	10.6	89.4	-1.85	11.1	1.51	0.40	M	2	2.6	62.0	4.0	71.7	990	5
9	x MT1866	HRW	0.183		11.8	73.1	10.3	89.9	-1.79	10.2	1.49	0.38	LM	2	3.5	62.6	5.7	72.3	965	5
10	x MT1867	HRW	0.289		12.0	73.1	10.4	89.9	-1.68	10.0	1.47	0.38	LM	3	4.9	64.3	9.4	75.0	990	4
11	x MT1872	HRW	0.235		11.9	71.9	10.5	90.1	-1.94	10.5	1.39	0.39	M	2	3.1	60.3	3.8	70.0	1000	4
12	MT1882	HRW	0.125		12.4	72.6	11.1	89.7	-1.79	11.3	1.49	0.41	M	4	9.4	71.3	30.9	81.0	960	4
13	MT1889	HRW	0.207		13.2	73.1	11.8	89.8	-1.35	9.0	1.40	0.37	M	2	4.1	66.8	9.9	76.5	1055	4
	MIN		0.092		11.1	70.8	9.9	89.3	-1.94	8.2	1.38	0.37		1	2.6	60.3	3.8	70.0	960	4
	MAX		0.289		13.2	74.5	11.8	90.1	-1.24	11.3	1.51	0.47		5	9.4	71.3	30.9	81.0	1125	6
	AVE		0.198		12.2	72.8	10.8	89.8	-1.60	10.0	1.46	0.40		2.8	5.0	64.8	10.9	74.9	1030	4.8

Table 27. 2018 Preliminary A Winter Wheat Nursery Mill & Bake (Exp. 3607)
Location: Moccasin, MT

Sample No. x = lines in 2020 tests	Variety	Class	PP0	Single kernel hardness	Wheat Protein, % (12% m.b.)	Flour Yield, %	Flour Protein, % (14% m.b.)	L* Brightness	a* Green - Red	b* Blue - Yellow	Wheat Ash, %	Flour Ash, %	Mixograph Type	Mixing Tolerance	Mixing Time, min	Mixing Water Absorption, %	Bake Mixing Time, min	Bake Water Absorption, %	Loaf Volume	Crum Grain
1	x Yellowstone	HRW	0.139		12.1	70.5	11	89.6	-1.39	9.3	1.57	0.44	LM	4	11.4	62.8	16.7	72.5	1020	5
2	x Decade	HRW	0.211		12.2	70.4	11.1	90.2	-1.31	8.0	1.62	0.40	M	5	7.7	67.0	21.5	77.7	1030	5
3	x Judee	HRW	0.226		12.4	70.2	11.2	90.1	-1.60	9.4	1.51	0.43	M	3	6.9	63.8	10.8	73.5	1110	5
4	x SY Wolf	HRW	0.250		12.0	69.8	10.8	90.1	-2.00	10.5	1.53	0.41	M	2	4.7	60.7	7.1	71.9	975	4
5	x MT1845	HRW	0.121		12.5	71	11.3	89.8	-1.56	9.7	1.47	0.45	M	4	9.6	64.7	14.6	74.4	1040	5
6	x MT1848	HRW	0.071		12.2	71.8	11.0	89.5	-1.64	10.4	1.59	0.47	M	3	6.3	65.0	14.0	74.7	1090	6
7	MT1854	HRW	0.210		12.4	72.2	11.0	89.5	-1.38	9.5	1.51	0.45	LM	3	19.0	66.0	25.8	77.7	1045	6
8	x MT1855	HRW	0.185		12.1	70.8	10.8	89.6	-1.86	10.7	1.62	0.43	LM	2	5.8	64.1	9.4	73.8	950	5
9	x MT1866	HRW	0.176		12.2	70.6	10.9	90.0	-1.76	9.9	1.56	0.41	M	4	8.5	61.8	15.4	75.5	1000	5
10	x MT1867	HRW	0.255		11.2	71.3	9.7	89.9	-1.81	9.8	1.60	0.40	LM	4	8.0	62.2	16.2	74.9	935	5
11	x MT1872	HRW	0.199		12.3	69.8	11.2	90.2	-1.99	10.2	1.57	0.43	M	2	5.1	63.8	6.6	72.3	990	6
12	MT1882	HRW	0.122		12.0	70.2	10.8	90.1	-1.97	10.9	1.69	0.44	M	5	10.5	65.8	13.6	75.5	1025	4
13	MT1889	HRW	0.249		12.4	70	11	89.9	-1.51	9.0	1.57	0.41	LM	3	8.7	67.0	10.6	76.7	970	5
	MIN		0.071		11.2	69.8	9.7	89.5	-2.00	8.0	1.47	0.40		2	4.7	60.7	6.6	71.9	935	4
	MAX		0.255		12.5	72.2	11.3	90.2	-1.31	10.9	1.69	0.47		5	19.0	67.0	25.8	77.7	1110	6
	AVE		0.185		12.2	70.7	10.9	89.9	-1.68	9.8	1.57	0.43		3.4	8.6	64.2	14.0	74.7	1014	5.1

Table 28. 2018 Preliminary A Winter Wheat Nursery Mill & Bake (Exp. 3608)
Location: Huntley, MT

Sample No. x = lines in 2020 tests	Variety	Class	PP0	Single kernel hardness	Wheat Protein, % (12% m.b.)	Flour Yield, %	Flour Protein, % (14% m.b.)	L* Brightness	a* Green - Red	b* Blue - Yellow	Wheat Ash, %	Flour Ash, %	Mixograph Type	Mixing Tolerance	Mixing Time, min	Mixing Water Absorption, %	Bake Mixing Time, min	Bake Water Absorption, %	Loaf Volume	Crum Grain
1	x Yellowstone	HRW	0.202		16.9	71.5	11.3	90.1	-1.77	9.9	1.45	0.41	LM	1	3.1	62.5	5.6	71.2	1060	5
2	Decade	HRW	0.245		13.7	73.0	12.0	89.5	-1.30	9.0	1.38	0.40	M	2	6.9	68.7	28.6	78.4	1025	4
3	x Judee	HRW	0.224		13.1	71.0	11.7	90.0	-1.98	10.5	1.31	0.42	LM	0	3.6	65.0	4.3	74.7	980	4
4	SY Wolf	HRW	0.231		12.5	72.1	10.8	89.8	-2.18	12.0	1.38	0.40	LM	2	5.0	65.2	9.6	74.9	1055	5
5	x MT1845	HRW	0.158		13.0	72.4	11.1	90.0	-2.10	11.4	1.43	0.41	M	1	3.7	63.7	9.0	72.4	1125	5
6	x MT1848	HRW	0.229		12.9	72.1	11.1	89.7	-1.60	9.8	1.41	0.39	M	3	3.9	66.2	8.2	75.9	1050	5
7	MT1854	HRW	0.207		13.4	71.1	11.3	89.6	-1.37	9.6	1.38	0.39	M	4	5.4	66.2	10.2	75.9	1210	6
8	x MT1855	HRW	0.246		13.1	72.8	11.6	89.4	-1.48	10.3	1.41	0.42	M	3	5.5	66.8	10.0	76.5	1030	5
9	x MT1866	HRW	0.240		13.2	73.3	11.6	89.7	-1.39	9.5	1.33	0.42	M	3	5.6	68.8	19.2	78.5	1055	5
10	x MT1867	HRW	0.118		13.5	73.1	11.8	88.8	-1.43	10.3	1.32	0.43	M	4	6.3	67.8	14.4	78.5	1150	7
11	x MT1872	HRW	0.107		13.7	70.9	11.9	89.5	-1.49	9.8	1.46	0.45	M	4	5.9	64.7	11.6	75.4	1150	6
12	MT1882	HRW	0.238		12.7	71.9	11.0	90.1	-1.48	8.4	1.34	0.40	M	3	5.1	65.1	14.1	75.8	1040	4
13	MT1889	HRW	0.245		12.7	71.5	11.2	89.8	-1.87	10.3	1.46	0.41	M	3	3.8	62.8	7.5	72.5	1055	6
	MIN		0.107		12.5	70.9	10.8	88.8	-2.18	8.4	1.31	0.39		0	3.1	62.5	4.3	71.2	980	4
	MAX		0.246		16.9	73.3	12.0	90.1	-1.30	12.0	1.46	0.45		4	6.9	68.8	28.6	78.5	1210	7
	AVE		0.207		13.4	72.1	11.4	89.7	-1.65	10.1	1.39	0.41		2.5	4.9	65.7	11.7	75.4	1076	5.2

Table 29. 2018 Preliminary A Winter Wheat Nursery Mill & Bake (Exp. 3618)
Location: Conrad, MT

Sample No.	Variety	Class	PPD	Single kernel hardness	Wheat Protein, % (12% m.b.)	Flour Yield, %	Flour Protein, % (14% m.b.)	L* Brightness	a* Green - Red	b* Blue - Yellow	Wheat Ash, %	Flour Ash, %	Mixograph Type	Mixing Tolerance	Mixing Time, min	Mixing Water Absorption, %	Bake Mixing Time, min	Bake Water Absorption, %	Loaf Volume	Crum Grain
1	x Yellowstone	HRW	0.170		14.3	71.5	13	89.4	-1.40	9.9	1.30	0.38	M	3	11.4	73.1	26.8	82.8	1145	6
2	x Decade	HRW	0.242		14.1	72.4	12.9	90.0	-1.35	8.5	1.21	0.38	M	2	9.5	76.0	33.5	85.7	1050	4
3	x Judee	HRW	0.242		14.6	71.6	13.5	89.6	-1.46	9.8	1.28	0.37	M	3	5.8	68.8	11.5	78.5	1225	7
4	x SY Wolf	HRW	0.219		14.2	69.7	13.5	89.4	-1.99	11.4	1.36	0.36	M	1	4.1	64.7	6.6	74.4	1145	5
5	x MT1845	HRW	0.114		13.7	71.0	12.4	89.6	-1.64	10.7	1.30	0.42	M	4	8.6	68.0	16.4	78.7	1155	6
6	x MT1848	HRW	0.065		14.6	71.7	13.2	89.2	-1.64	11.2	1.31	0.44	M	2	6.8	73.3	15.3	83.0	1160	5
7	MT1854	HRW	0.214		13.6	72.4	12.2	89.3	-1.40	10.3	1.32	0.41	M	3	16.4	73.1	21.3	82.8	1155	5
8	x MT1855	HRW	0.188		14.6	71.7	13.3	89.3	-2.01	12.0	1.22	0.39	M	2	3.8	69.2	7.9	78.9	1115	5
9	x MT1866	HRW	0.166		13.4	71.6	12.0	89.8	-1.73	10.5	1.27	0.37	M	4	6.7	69.0	16.3	78.7	1075	6
10	x MT1867	HRW	0.233		12.9	71.2	11.4	90.0	-1.78	10.2	1.21	0.36	M	4	5.7	68.4	8.4	79.7	1080	4
11	x MT1872	HRW	0.221		13.6	69.4	12.3	90.3	-2.02	10.7	1.75	0.38	M	2	3.3	64.1	4.7	73.8	1075	5
12	MT1882	HRW	0.107		13.6	71.8	12.4	89.6	-1.86	11.9	1.33	0.42	M	5	10.3	72.1	24.1	82.8	1060	5
13	MT1889	HRW	0.274		13.8	71.0	12.5	89.8	-1.47	9.6	1.24	0.40	M	2	5.5	68.1	12.7	77.8	1150	5
MIN			0.065		12.9	69.4	11.4	89.2	-2.02	8.5	1.21	0.36		1	3.3	64.1	4.7	73.8	1050	4
MAX			0.274		14.6	72.4	13.5	90.3	-1.35	12.0	1.75	0.44		5	16.4	76.0	33.5	85.7	1225	7
AVE			0.189		13.9	71.3	12.7	89.6	-1.67	10.5	1.32	0.39		2.8	7.5	69.8	15.8	79.8	1122	5.2

Table 30. 2018 Preliminary A Winter Wheat Nursery Mill & Bake (Exp. 36)

Location: Means Across 4 Locations

Sample No.	Variety	Class	PO	Single kernel hardness	Wheat Protein, % (12% m.b.)	Flour Yield, %	Flour Protein, % (14% m.b.)	L* Brightness	a* Green - Red	b* Blue - Yellow	Wheat Ash, %	Flour Ash, %	Mixing Tolerance	Mixing Time, min	Mixing Water Absorption, %	Bake Mixing Time, min	Bake Water Absorption, %	Loaf Volume	Crumb Grain
1	x Yellowstone	HRW	0.169		13.8	71.5	11.5	89.8	-1.49	9.6	1.44	0.41	3.0	7.8	64.9	14.6	74.6	1074	5.5
2	x Decade	HRW	0.230		13.2	72.0	11.9	89.9	-1.30	8.4	1.42	0.39	2.8	7.2	70.4	25.5	80.3	1036	4.3
3	x Judée	HRW	0.228		13.1	71.3	11.8	89.9	-1.64	9.9	1.40	0.40	1.8	5.0	64.7	8.6	74.4	1110	5.3
4	x SY Wolf	HRW	0.238		12.8	70.6	11.5	89.8	-2.01	11.1	1.44	0.39	2.3	4.9	63.8	7.2	74.0	1041	4.8
5	x MT1845	HRW	0.130		13.0	71.7	11.5	89.8	-1.70	10.4	1.43	0.43	3.0	7.2	65.9	13.4	76.1	1091	5.3
6	x MT1848	HRW	0.114		13.1	72.3	11.6	89.4	-1.59	10.4	1.43	0.44	2.5	5.1	67.7	11.1	77.4	1106	5.5
7	MT1854	HRW	0.215		12.6	72.4	11.1	89.5	-1.40	9.8	1.40	0.42	3.8	12.1	67.6	18.5	78.1	1110	5.8
8	x MT1855	HRW	0.209		12.9	72.5	11.6	89.4	-1.80	11.0	1.44	0.41	2.3	4.4	65.5	7.8	75.2	1021	5.0
9	x MT1866	HRW	0.191		12.7	72.2	11.2	89.9	-1.67	10.0	1.41	0.40	3.3	6.1	65.6	14.2	76.3	1024	5.3
10	x MT1867	HRW	0.224		12.4	72.2	10.8	89.6	-1.68	10.1	1.40	0.39	3.8	6.2	65.7	12.1	77.0	1039	5.0
11	x MT1872	HRW	0.190		12.9	70.5	11.5	90.0	-1.86	10.3	1.54	0.41	2.5	4.4	63.2	6.7	72.9	1054	5.3
12	MT1882	HRW	0.148		12.7	71.6	11.3	89.9	-1.78	10.6	1.46	0.42	4.3	8.8	68.6	20.7	78.8	1021	4.3
13	MT1889	HRW	0.244		13.0	71.4	11.6	89.8	-1.55	9.5	1.42	0.40	2.5	5.5	66.2	10.2	75.9	1058	5.0
Average			0.195		12.9	71.7	11.4	89.8	-1.65	10.1	1.43	0.41	2.9	6.5	66.1	13.1	76.2	1060	5.1
LSD (0.05)			0.061		ns	0.9	ns	0.4	0.28	0.9	ns	0.03	ns	3.1	3.3	7.2	3.3	ns	ns
C.V.			21.9		5.4	0.9	4.1	0.3	11.8	6.1	5.9	4.8	36.5	32.8	3.5	38.1	3.0	4.7	15.0

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 31. 2018 Preliminary A Winter Wheat Nursery Mill & Bake (Exp. 36)
Location: Means Across 3 Locations (no Huntley data)

Sample No.	Variety	Class	PO	Single kernel hardness	Wheat Protein, % (12% m.b.)	Flour Yield, %	Flour Protein, % (14% m.b.)	L* Brightness	a* Green - Red	b* Blue - Yellow	Wheat Ash, %	Flour Ash, %	Mixing Tolerance	Mixing Time, min	Mixing Water Absorption, %	Bake Mixing Time, min	Bake Water Absorption, %	Loaf Volume	Crumb Grain
1	x Yellowstone	HRW	0.159		12.7	71.5	11.5	89.6	-1.40	9.5	1.44	0.41	3.7	9.3	65.7	17.6	75.7	1078	5.7
2	x Decade	HRW	0.225		13.0	71.7	11.8	90.1	-1.30	8.2	1.43	0.39	3.0	7.3	70.9	24.4	81.0	1040	4.3
3	x Judée	HRW	0.229		13.0	71.4	11.8	89.8	-1.52	9.7	1.43	0.40	2.3	5.4	64.6	10.0	74.3	1153	5.7
4	x SY Wolf	HRW	0.240		12.9	70.1	11.7	89.8	-1.95	10.8	1.45	0.38	2.3	4.8	63.4	6.4	73.7	1037	4.7
5	x MT1845	HRW	0.121		12.9	71.4	11.6	89.8	-1.56	10.0	1.42	0.43	3.7	8.3	66.6	14.9	77.3	1080	5.3
6	x MT1848	HRW	0.076		13.1	72.4	11.8	89.3	-1.58	10.6	1.44	0.46	2.3	5.5	68.2	12.0	77.9	1125	5.7
7	MT1854	HRW	0.218		12.4	72.8	11.0	89.5	-1.41	9.9	1.40	0.43	3.7	14.4	68.1	21.2	78.8	1077	5.7
8	x MT1855	HRW	0.196		12.9	72.3	11.6	89.4	-1.91	11.3	1.45	0.41	2.0	4.1	65.1	7.1	74.8	1018	5.0
9	x MT1866	HRW	0.175		12.5	71.8	11.1	89.9	-1.76	10.2	1.44	0.39	3.3	6.2	64.5	12.5	75.5	1013	5.3
10	x MT1867	HRW	0.259		12.0	71.9	10.5	89.9	-1.76	10.0	1.43	0.38	3.7	6.2	65.0	11.3	76.5	1002	4.3
11	x MT1872	HRW	0.218		12.6	70.4	11.3	90.2	-1.98	10.5	1.57	0.40	2.0	3.8	62.7	5.0	72.0	1022	5.0
12	MT1882	HRW	0.118		12.7	71.5	11.4	89.8	-1.87	11.4	1.50	0.42	4.7	10.1	69.7	22.9	79.8	1015	4.3
13	MT1889	HRW	0.243		13.1	71.4	11.8	89.8	-1.44	9.2	1.40	0.39	2.3	6.1	67.3	11.1	77.0	1058	4.7
Average			0.191		12.8	71.6	11.5	89.8	-1.65	10.1	1.45	0.41	3.0	7.0	66.3	13.6	76.5	1055	5.1
LSD (0.05)			0.029		ns	0.9	0.7	0.3	0.09	0.3	ns	0.02	1.5	2.9	3.7	7.7	3.6	51	ns
C.V.			9.1		3.4	0.8	3.7	0.2	3.4	1.9	6.7	2.5	30.2	24.4	3.3	33.7	2.8	2.9	13.0

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 32. 2018 Preliminary B Winter Wheat Nursery Mill & Bake (Exp. 3701)
Location: Bozeman, MT

Sample No.	Variety	Class	PPO	Single kernel hardness	Wheat Protein, % (12% m.b.)	Flour Yield, %	Flour Protein, % (14% m.b.)	L* Brightness			a* Green - Red	b* Blue - Yellow	Wheat Ash, %	Flour Ash, %	Mixograph Type	Mixing Tolerance	Mixo Mixing Time, min	Mixo Water Absorption, %	Bake Mixing Time, min	Bake Water Absorption, %	Loaf Volume	Crum Grain
1	x	Yellowstone	HRW	0.126		12.1	73.4	10.2	89.8	-1.43	9.2	1.37	0.45	M	3	5.9	65.4	10.2	76.1	1100	6	
2		Decade	HRW	0.226		12.6	72.7	11.2	90.2	-1.31	7.9	1.36	0.39	M	3	4.7	69.7	18.4	79.4	1025	4	
3	x	Judee	HRW	0.182		12.5	72.4	10.9	89.9	-1.54	9.4	1.40	0.40	M	4	5.2	67.8	11.5	76.5	1195	6	
4		SY Wolf	HRW	0.184		12.6	71.7	10.8	89.8	-1.89	10.5	1.36	0.39	LM	0	4.1	61.7	5.1	72.4	1025	6	
5		MT1895	HRW	0.191		12.2	73.6	10.5	89.6	-1.32	8.8	1.43	0.43	M	3	4.5	67.1	10.9	76.8	1005	5	
6		MT1897	HRW	0.214		12.1	73.5	10.9	89.7	-1.29	8.8	1.42	0.43	M	3	5.3	69.5	13.8	79.2	985	5	
7		MT18109	HWW	0.283		12.7	73.3	11.2	90.0	-1.93	11.0	1.34	0.41	LM	2	5.4	69.1	15.4	79.8	1035	5	
AVE			0.201		12.4	72.9	10.8	89.9	-1.53	9.37	1.38	0.41		2.6	5.0	67.2	12.2	77.2	1053	5.3		

Table 33. 2018 Preliminary C Winter Wheat Nursery Mill & Bake (Exp. 3901)
Location: Bozeman, MT

Sample No.	Variety	Class	PO	Single kernel hardness	Wheat Protein, % (12% m.b.)	Flour Yield, %	Flour Protein, % (14% m.b.)	L* Brightness	a* Green - Red	b* Blue - Yellow	Wheat Ash, %	Flour Ash, %	Mixograph Type	Mixing Tolerance	Mixing Time, min	Mixing Water Absorption, %	Bake Mixing Time, min	Bake Water Absorption, %	Loaf Volume	Crumb Grain
1	x Yellowstone	HRW	0.166		11.6	72.6	10.2	90.1	-1.47	9.1	1.37	0.41	M	4	6.3	67.1	14.2	77.8	1010	3.0
2	x Judee	HRW	0.216		11.7	72.3	10.3	90.1	-1.62	9.6	1.38	0.40	M	3	5.3	67.2	11.8	76.9	1095	5.0
3	x Warhorse	HRW	0.194		12.8	71.2	11.1	89.7	-1.56	9.7	1.28	0.40	M	1	4.4	68.6	6.6	78.3	1180	3.0
4	x Loma	HRW	0.114		11.9	74.1	10.7	89.6	-2.09	11.9	1.40	0.40	LM	3	8.0	70.8	24.6	81.5	1070	4.0
5	x MTS18149	HRW	0.129		12.2	74.2	10.6	89.8	-1.85	11.0	1.28	0.42	LM	3	9.0	66.8	20.5	77.5	1075	4.0
6	MTS18167	HRW	0.148		11.6	74.4	10.0	89.7	-2.11	12.1	1.38	0.40	M	3	7.1	67.5	28.1	79.2	1000	4.0
7	MTS18169	HRW	0.122		12.0	73.4	10.7	89.6	-1.92	11.3	1.40	0.40	M	2	8.2	67.7	20.8	77.4	1060	4.0
AVE			0.156		12.0	73.2	10.5	89.8	-1.80	10.7	1.36	0.40		2.7	6.9	68.0	18.1	78.4	1070	3.9

Table 34. 2018 Preliminary C Winter Wheat Nursery Mill & Bake (Exp. 3952)
Location: Big Sandy, MT

Sample No.	Variety	Class	PO	Single kernel hardness	Wheat Protein, % (12% m.b.)	Flour Yield, %	Flour Protein, % (14% m.b.)	L* Brightness	a* Green - Red	b* Blue - Yellow	Wheat Ash, %	Flour Ash, %	Mixograph Type	Mixing Tolerance	Mixing Time, min	Mixing Water Absorption, %	Bake Mixing Time, min	Bake Water Absorption, %	Loaf Volume	Crum Grain
1	x Yellowstone	HRW	0.155		14.2	70.6	13	89.1	-1.28	10.3	1.49	0.43	M	3	9.6	80.5	17	81.2	1170	6.0
2	x Judee	HRW	0.175		14.3	70.8	13	89.4	-1.28	9.9	1.35	0.40	M	3	6.9	71.6	12.2	81.3	1235	6.0
3	x Warhorse	HRW	0.222		14.3	69.7	13.2	89.1	-1.48	10.8	1.49	0.43	MH	3	5.8	81.0	10.5	81.7	1265	5.0
4	x Loma	HRW	0.115		14.1	71.8	13	88.8	-1.98	13.2	1.59	0.41	MH	3	7.3	71.7	16.3	81.4	1285	6.0
5	x MTS18149	HRW	0.132		14.1	72.4	12.8	88.9	-1.80	12.3	1.60	0.42	MH	3	8.0	71.7	18.6	82.4	1155	4.0
6	MTS18167	HRW	0.100		14.3	72.1	13.1	88.9	-2.00	13.3	1.64	0.43	M	2	8.3	71.8	19.8	81.5	1260	6.0
7	MTS18169	HRW	0.136		14.0	71.7	12.9	88.9	-1.80	12.4	1.67	0.43	M	3	9.7	73.8	17.2	83.5	1205	6.0
AVE			0.148		14.2	71.3	13.0	89.0	-1.66	11.7	1.55	0.42		2.9	7.9	74.6	15.9	81.9	1225	5.6

Table 35. 2018 Preliminary C Winter Wheat Nursery Mill & Bake (Exp. 36)
Location: Means Across Locations

Sample No.	Variety	Class	PPO	Single kernel hardness	Wheat Protein, % (12% m.b.)	Flour Yield, %	Flour Protein, % (14% m.b.)	L* Brightness	a* Green - Red	b* Blue - Yellow	Wheat Ash, %	Flour Ash, %	Mixing Tolerance	Mixing Time, min	Mixing Water Absorption, %	Bake Mixing Time, min	Bake Water Absorption, %	Loaf Volume	Crumb Grain
1	x Yellowstone	HRW	0.161		12.9	71.6	11.6	89.6	-1.38	9.7	1.43	0.42	3.5	8.0	73.8	15.6	79.5	1090	4.5
2	x Judee	HRW	0.196		13.0	71.6	11.7	89.8	-1.45	9.8	1.37	0.40	3.0	6.1	69.4	12.0	79.1	1165	5.5
3	x Warhorse	HRW	0.208		13.6	70.5	12.2	89.4	-1.52	10.2	1.39	0.42	2.0	5.1	74.8	8.6	80.0	1223	4.0
4	x Loma	HRW	0.115		13.0	73.0	11.9	89.2	-2.04	12.5	1.50	0.41	3.0	7.7	71.3	20.5	81.5	1178	5.0
5	x MTS18149	HRW	0.131		13.2	73.3	11.7	89.3	-1.83	11.7	1.44	0.42	3.0	8.5	69.3	19.6	80.0	1115	4.0
6	MTS18167	HRW	0.124		13.0	73.3	11.6	89.3	-2.06	12.7	1.51	0.42	2.5	7.7	69.7	24.0	80.4	1130	5.0
7	MTS18169	HRW	0.129		13.0	72.6	11.8	89.3	-1.86	11.9	1.54	0.42	2.5	9.0	70.8	19.0	80.5	1133	5.0
Average			0.152		13.1	72.2	11.8	89.4	-1.73	11.2	1.45	0.41	2.8	7.4	71.3	17.0	80.1	1148	4.7
LSD (0.05)			0.048		ns	0.6	ns	0.3	0.17	0.6	ns	ns	ns	ns	ns	8.50	ns	ns	ns
C.V.			13.0		2.4	0.3	2.3	0.1	4.0	2.1	5.7	2.4	27.1	14.0	4.5	20.5	1.8	4.0	14.3

bold = indicates highest value within a column

bold = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 36. 2018 Preliminary D Winter Wheat Nursery Mill & Bake (Exp. 4001)
Location: Bozeman, MT

Sample No.	Variety	Class	PO	Single kernel hardness	Wheat Protein, % (12% m.b.)	Flour Yield, %	Flour Protein, % (14% m.b.)	L* Brightness	a* Green - Red	b* Blue - Yellow	Wheat Ash, %	Flour Ash, %	Mixograph Type	Mixing Tolerance	Mixing Time, min	Mixing Water Absorption, %	Bake Mixing Time, min	Bake Water Absorption, %	Loaf Volume	Crum Grain
1	x Yellowstone	HRW	0.154		11.9	72.3	10.5	89.6	-1.56	9.5	1.44	0.41	M	3	5.2	64.7	12.1	75.4	1090	6.0
2	x Judee	HRW	0.169		11.8	72	10.4	89.8	-1.68	9.7	1.46	0.39	M	2	4.8	66.8	10.8	77.5	1095	4.0
3	x Warhorse	HRW	0.196		13.3	71.4	11.9	89.6	-1.55	9.6	1.34	0.41	M	2	3.6	67.8	5.8	77.5	1080	6.0
4	x Loma	HRW	0.102		12	74.2	10.8	89.4	-2.16	12.1	1.43	0.39	M	4	6.8	69.8	21.1	81.5	1105	5.0
5	x MTS18116	HRW	0.128		12.1	73.8	10.6	89.2	-2.35	13.3	1.41	0.42	M	2	5.0	66.5	13.4	77.2	1070	5.0
6	MTS18117	HRW	0.100		12.3	71.9	10.9	89.1	-1.57	10.3	1.44	0.41	M	3	5.3	67.0	9.4	77.7	1125	6.0
7	MTS18143	HRW	0.126		11.4	73.1	10.2	89.4	-1.65	10.1	1.43	0.41	M	3	6.7	66.6	16.6	78.3	1040	4.0
AVE			0.139		12.1	72.7	10.8	89.5	-1.79	10.6	1.42	0.41		2.7	5.3	67.0	12.7	77.9	1086	5.1

Table 37. 2018 Preliminary E Winter Wheat Nursery Mill & Bake (Exp. 4101)
Location: Bozeman, MT

Sample No.	Variety	Class	PPO	Single kernel hardness	Wheat Protein, % (12% m.b.)	Flour Yield, %	Flour Protein, % (14% m.b.)	L* Brightness	a* Green - Red	b* Blue - Yellow	Wheat Ash, %	Flour Ash, %	Mixograph Type	Mixing Tolerance	Mixing Time, min	Mixing Water Absorption, %	Bake Mixing Time, min	Bake Water Absorption, %	Loaf Volume	Crum Grain
1	x Clearstone	HRW	0.186		12.2	71.0	9.7	89.7	-1.58	9.6	1.45	0.39	M	4	3.8	61.5	5.8	71.2	1090	6.0
2	x Warhorse	HRW	0.261		13.2	71.9	11.8	89.5	-1.55	9.6	1.36	0.43	M	1	3.6	61.6	4.2	71.3	1125	7.0
3	MTCS18195	HRW	0.165		11.8	72.6	10.6	89.8	-2.01	10.3	1.36	0.39	M	4	3.4	61.9	7.2	73.1	1025	5.0
4	MTCS18211	HRW	0.197		12.6	69.3	9.9	89.7	-1.80	10.0	1.55	0.40	M	1	2.8	62.1	3.0	70.8	1055	5.0
5	MTCS18222	HRW	0.179		13.7	71.3	12.5	89.9	-1.87	10.6	1.54	0.43	MH	2	4.3	67.0	8.9	77.7	1230	6.0
AVE			0.198		12.7	71.2	10.9	89.7	-1.76	10.0	1.45	0.41		2.4	3.6	62.8	5.8	72.8	1105	5.8

Table 38. 2018 Sawfly Observation Nursery (SFO)
Location: Bozeman, MT

Sample No. x = in 2020 tests	Variety	Pedigree	Class	PPO	Single Kernel Hardness	Wheat Protein, % (12% m.b.)	Flour					Mixograph			Test Bake					
							Flour Yield, %	Flour Protein, % (14% m.b.)	L* Brightness	a* Green - Red	b* Blue - Yellow	Wheat Ash, %	Flour Ash, %	Type	Tolerance	Mixing Time, min	Water Absorption, %	Mixing Time, min	Water Absorption, %	Loaf Volume
1	Warhorse	check	HRW	0.269		13.6	71.3	12.4	89.9	-1.54	9.9	1.35	0.40	M	2	3.9	64.8	5.5	74.5	1100
2	MTCS1901	Judee*2/MTCS1301	HRW	0.205		12.8	72.4	11.6	90.0	-2.44	13.5	1.36	0.38	M	3	4.2	62.8	6.4	72.5	1075
3	MTS1902	(Judee sib, MTS0819)/08X350-A6/	HRW	0.153		11.9	73.2	10.8	90.5	-1.61	9.7	1.26	0.38	M	4	6.0	65.9	10.9	76.6	1060
4	x MTS1903	(Judee sib, MTS0819)/08X350-A6/	HRW	0.140		12.1	72.7	10.7	90.3	-2.09	11.7	1.36	0.36	M	5	6.7	65.3	16.5	77.0	1025
5	MTS1904	MTS1054/Warhorse/MTS1008	HRW	0.376		12.3	72.0	10.9	90.0	-1.50	10.2	1.37	0.39	M	5	4.9	65.5	9.7	75.7	1010
6	MTS1905	MT10105/Warhorse/MTS1011	HRW	0.323		12.5	71.1	10.9	89.4	-1.85	11.1	1.38	0.40	M	3	3.8	61.8	5.3	71.5	995
7	MTS1906	MT10105/Warhorse/MTS1011	HRW	0.242		12.6	72.4	11.5	90.2	-1.50	9.4	1.48	0.39	M	2	3.2	62.0	6.1	71.7	1100
8	MTS1907	Judee/16FAVW/ON-Irr-87/(MT097)	HWW	0.153		12.0	73.4	10.8	89.9	-1.79	11.7	1.40	0.38	M	2	2.7	56.9	3.1	66.6	905
9	x MTS1908	(Judee sib, MTS0819)/08X350-A6/	HRW	0.104		11.6	74.0	10.5	90.1	-2.01	11.8	1.29	0.38	M	4	5.7	64.0	12.0	75.7	1080
10	MTS1909	(Judee sib, MTS0819)/08X350-A6/	HRW	0.129		11.5	71.8	10.2	90.1	-1.82	11.1	1.26	0.40	M	4	4.5	63.0	7.0	72.7	1025
11	Warhorse	check	HRW	0.238		13.0	71.4	11.7	89.9	-1.52	10.2	1.35	0.41	M	3	3.9	62.0	4.1	71.7	1080
12	MTS1910	MTS1054/Warhorse/MTS1008	HRW	0.188		11.4	72.5	10.2	89.9	-1.65	10.9	1.24	0.39	M	3	4.8	64.0	8.1	74.7	965
13	MTS1911	(Colter sib, MT08177)/MTS0916/MT	HRW	0.152		11.9	71.1	10.6	90.4	-1.83	10.4	1.38	0.39	M	4	5.3	66.6	15.6	77.8	965
14	MTS1912	MT10105/Warhorse/MTS1011	HRW	0.289		12.4	71.9	11.5	89.7	-1.54	10.4	1.39	0.40	M	2	2.5	61.9	3.6	71.6	1055
15	MTS1913	Loma*2/AAC Gateway	HRW	0.144		12.9	74.4	11.8	89.7	-1.78	11.7	1.55	0.39	M	3	5.0	67.9	10.7	77.6	1275
16	x MTS1914	MTS1585/Loma/AAC Gateway	HRW	0.068		11.4	74.9	10.4	89.6	-1.74	11.4	1.53	0.37	M	1	3.1	60.0	3.8	68.7	985
17	x MTS1915	MTS1596/Emerson/Spur	HRW	0.215		11.1	74.2	10.0	89.4	-2.17	13.0	1.44	0.41	M	3	6.0	63.4	11.9	74.6	955
18	x MTS1916	MTS1596/Emerson/Spur	HRW	0.208		12.0	72.6	11.0	90.2	-1.81	10.9	1.42	0.39	M	3	7.3	68.1	24.3	77.8	1010
19	Warhorse	check	HRW	0.209		13.3	71.1	11.9	90.1	-1.59	10.4	1.33	0.39	M	2	3.8	62.5	5.2	72.7	1065
20	MTS1917	Judee/MTS0907/MTS0827	HRW	0.209		11.6	72.4	10.3	89.7	-1.59	10.5	1.38	0.38	M	4	4.8	63.5	10.1	73.7	985
21	x MTS1918	Judee/MTS0907/MTS0827	HRW	0.236		11.7	73.1	10.4	90.2	-1.68	10.5	1.45	0.36	LM	3	3.0	63.4	7.2	73.6	1030
22	x MTS1919	Warhorse*2/Accipiter	HRW	0.162		13.4	73.4	12.2	90.4	-1.58	9.8	1.38	0.37	M	2	3.0	65.9	6.6	75.6	1120
23	x MTS1920	Warhorse*2/Accipiter	HRW	0.169		13.3	73.4	12.1	90.5	-1.40	9.1	1.42	0.37	M	1	2.5	65.2	4.7	75.4	1095
24	MTS1921	Warhorse/MTS0910/DH01-29-125	HRW	0.318		12.6	74.4	11.6	90.2	-1.89	11.4	1.45	0.36	LM	1	3.9	63.9	7.6	73.6	1055
25	x MTS1922	08X350-A6/Warhorse	HRW	0.219		12.4	71.7	11.0	90.5	-1.78	10.5	1.38	0.38	M	1	3.2	62.8	4.2	72.5	975
26	MTS1923	08X350-A6/Warhorse	HRW	0.198		12.1	72.7	10.8	90.3	-1.74	10.6	1.33	0.38	LM	1	2.8	60.4	2.0	69.6	965
27	Warhorse	check	HRW	0.178		12.9	72.6	11.8	90.1	-1.51	10.1	1.46	0.40	M	2	3.9	67.9	5.8	77.6	1120
28	MTS1924	03X273cE8/MTS0826	HRW	0.157		11.9	72.4	11.0	90.2	-1.91	11.0	1.59	0.43	M	3	4.9	64.8	12.8	74.5	965
29	MTS1925	03X139cE98/MT0866	HRW	0.225		11.2	75.6	10.1	89.8	-2.11	12.1	1.46	0.41	M	4	4.3	63.5	10.6	73.7	965
						71.1	10.0	89.4	-2.44	9.1	1.24	0.36			1.0	2.5	56.9	2.0	66.6	905
MIN					0.068	11.1	71.1	12.4	90.5	-1.40	13.5	1.59	0.43		5.0	7.3	68.1	24.3	77.8	1275
MAX					0.376	75.6	12.4	90.5	-1.76	10.9	1.39	0.39		3.0	4.3	63.8	8.3	73.8	1035	
AVE					0.203	72.8	11.1	90.0	-1.76	10.9	1.39	0.39		3.0	4.3	63.8	8.3	73.8	1035	

Table 39. 2018 Single Rep Observation 'A' Nursery (SROA)

Location: Bozeman, MT

Sample No. x = in 2020 tests	Variety	Pedigree	Class	PPO	Single Kernel Hardness	Wheat Protein, % (12% m.b.)	Flour					Mixograph			Test Bake					
							Flour Yield, %	Flour Protein, % (14% m.b.)	L* Brightness	a* Green - Red	b* Blue - Yellow	Wheat Ash, %	Flour Ash, %	Type	Tolerance	Mixing Time, min	Water Absorption, %			
1	Yellowstone	check	HRW	0.174		12.7	73.8	10.2	90.0	-1.30	9.5	1.41	0.35	M	3	6.0	65.5	12.1	76.7	1080
2	MTW19146	Bearpaw/16FAWWON-lrr-61/MT08	HWW	0.115		12.3	73.5	11.2	90.0	-1.56	10.8	1.46	0.41	MH	4	2.8	66.6	6.4	76.8	1055
3	MTW19147	MT10121*2/16FAWWON-lrr-67	HWW	0.150		12.4	74.1	11.4	90.2	-1.46	10.2	1.36	0.41	M	1	1.8	64.1	1.2	69.8	975
4	MTCL19148	MTCL1125/Northern	HRW	0.297		12.6	72.5	11.5	89.9	-1.31	9.5	1.40	0.41	M	2	2.9	65.9	2.8	72.6	980
5	x MTCL19149	MTCL1125/MT1091	HRW	0.315		12.1	72.3	9.3	89.4	-1.51	10.7	1.37	0.39	M	3	1.8	60.7	1.5	67.4	925
6	MTCL19150	MTCL1125/MT10128	HRW	0.243		12.5	73.8	11.4	90.3	-1.49	9.8	1.50	0.38	M	2	2.3	63.0	2.5	69.7	1005
7	x MTCL19151	MT0871/(06X445B1-2, SY Clearst	HRW	0.158		12.5	74.5	11.5	90.3	-1.32	9.8	1.36	0.41	M	3	4.4	65.8	9.5	75.5	1110
8	x MTCL19152	MT0871/(06X445B1-2, SY Clearst	HRW	0.131		12.3	73.4	9.9	90.3	-1.37	9.8	1.39	0.36	M	4	4.7	65.9	9.4	76.6	1055
9	x MTCL19153	MT0871/(06X445B1-2, SY Clearst	HRW	0.135		12.6	74.2	10.7	90.0	-1.42	10.3	1.47	0.38	M	3	3.7	65.8	7.1	75.5	1070
10	MT19154	08X349-A5/MT0954/MT1078	HRW	0.155		11.6	73.9	10.5	90.2	-1.56	10.7	1.34	0.39	LM	3	5.3	65.0	10.3	74.7	1075
11	MT19155	08X349-A5/MT0954/MT1078	HRW	0.184		11.4	73.4	8.6	90.4	-1.14	9.2	1.43	0.36	M	4	4.1	62.5	8.6	73.7	1000
12	MT19156	Yellowstone/(493-22, Reeder/6*Pa	HRW	0.344		12.7	74.2	11.7	90.0	-1.30	9.9	1.41	0.42	M	2	3.6	66.0	6.3	75.7	1035
13	MT19157	Northern/02X22cE38/MT10121	HRW	0.104		12.0	74.0	10.9	90.6	-1.19	9.1	1.35	0.40	M	4	3.9	65.5	7.1	75.7	1000
14	MT19158	Northern/02X22cE38/MT10121	HRW	0.191		11.3	75.7	10.8	90.5	-1.51	10.2	1.37	0.40	M	4	4.5	65.1	9.9	74.8	975
15	x MT19159	Northern/02X22cE38/MT10121	HRW	0.094		11.9	75.3	10.9	89.8	-1.36	10.4	1.35	0.42	LM	3	4.3	65.3	10.4	76.5	950
16	MT19160	Northern/02X22cE38/MT10121	HRW	0.129		11.9	75.1	9.0	90.1	-1.36	10.3	1.41	0.37	M	4	3.4	60.3	5.8	70.5	970
17	MT19161	Accipiter/MT0871/02X159E41	HRW	0.174		11.9	74.4	11.3	90.4	-1.48	10.3	1.33	0.40	MH	4	3.8	65.5	6.9	75.7	1105
18	MT19162	Accipiter/MT0871/02X159E41	HRW	0.253		11.9	74.5	11.0	90.2	-1.51	10.5	1.35	0.40	MH	5	3.5	65.5	6.5	75.7	1115
19	Yellowstone	check	HRW	0.242		11.8	73.0	10.5	90.1	-1.50	9.8	1.35	0.39	MH	3	5.5	65.6	10.4	75.8	1015
20	MT19163	Colter/03X273cEx/MT10105	HRW	0.287		12.8	73.1	10.4	90.4	-1.29	9.1	1.47	0.37	MH	4	5.5	67.5	10.8	78.7	1075
21	MT19164	Colter/03X273cEx/MT10105	HRW	0.286		13.0	74.0	10.2	90.1	-1.25	9.3	1.55	0.36	MH	4	4.8	67.4	12.2	77.6	1125
22	MT19165	MT10121/Yellowstone/SD08W015	HRW	0.256		12.2	73.8	10.8	90.6	-1.82	10.8	1.51	0.38	M	4	5.8	67.5	14.4	78.7	1020
23	MT19166	MT1141/Yellowstone/HV9W06-979	HRW	0.332		11.8	74.3	11.1	90.0	-1.44	10.4	1.30	0.40	M	3	6.6	67.1	17.2	77.8	1030
24	MT19167	06X424B20/Yellowstone/Garrison	HRW	0.137		11.8	73.2	10.6	90.0	-2.10	12.8	1.46	0.41	M	4	2.8	64.3	3.8	74.5	985
25	MT19168	06X424B20/Yellowstone/Garrison	HRW	0.128		11.6	72.8	9.7	89.8	-1.83	12.0	1.53	0.37	M	4	4.8	65.5	10.9	76.7	990
26	MT19169	06X424B20/Yellowstone/Garrison	HRW	0.119		11.9	72.6	10.7	90.4	-1.77	11.5	1.37	0.41	MH	4	4.4	64.5	7.5	74.7	1045
27	Yellowstone	check	HRW	0.264		11.9	73.6	8.5	90.1	-1.37	9.5	1.45	0.34	M	4	5.2	65.3	11.6	76.5	1005
28	MT19170	MT1091/Accipiter	HRW	0.128		12.1	73.9	11.0	90.6	-1.40	9.1	1.42	0.42	M	5	5.8	67.3	13.4	79.5	1005
29	MT19171	MT1145/MT0866	HRW	0.269		12.4	72.5	9.4	90.6	-1.39	8.9	1.51	0.34	M	3	2.8	62.5	3.5	72.7	975
30	MT19172	MT0871/MT1151	HRW	0.090		12.4	74.3	10.9	89.9	-1.41	9.8	1.38	0.38	M	2	2.9	66.0	4.2	75.7	1015
31	x MT19173	HV9W04-1594R/Accipiter	HRW	0.275		12.1	73.7	10.9	90.9	-1.59	9.3	1.38	0.38	M	2	2.9	65.4	6.0	75.6	980
32	MT19174	MT0871/SD06156-1, Redfield sib)	HRW	0.099		12.2	74.3	9.9	90.3	-1.15	8.7	1.38	0.36	M	2	3.9	66.0	6.8	75.7	1000
33	x MT19175	SD08198/Northern	HRW	0.129		11.4	74.2	10.3	90.5	-1.10	8.5	1.33	0.39	LM	3	3.9	62.9	7.2	72.6	990
34	x MT19176	MTW1098/Yellowstone-Lr41/Deca	HRW	0.250		13.6	71.7	12.3	90.8	-1.91	10.4	1.52	0.37	M	1	4.1	65.8	6.8	75.5	1115
35	MT19177	(Northern sib, MT0977)/MT0859/M	HRW	0.105		12.7	74.3	10.6	90.3	-1.57	9.9	1.39	0.36	LM	2	3.2	63.0	3.5	71.7	930
36	MT19178	Northern/MT0861/CDC Falcon	HRW	0.278		10.5	72.2	9.3	90.6	-1.19	8.5	1.37	0.40	LM	3	6.5	62.3	11.1	72.5	975
37	Yellowstone	check	HRW	0.155		11.6	72.8	8.9	90.7	-1.46	9.5	1.34	0.35	M	4	5.7	65.4	11.9	76.6	1010
38	MT19179	MT0951/MT0861/MT0754	HRW	0.300		11.4	75.3	9.3	90.5	-1.84	11.0	1.41	0.34	M	3	3.9	62.8	10.5	72.5	975
39	MT19180	MT1090/MT0861/MT0887	HRW	0.200		11.7	73.1	10.4	90.7	-1.93	10.6	1.49	0.38	M	3	3.3	62.3	4.8	71.5	950
40	MT19181	MT10104/MT0861/MT0890	HRW	0.201		13.4	73.3	12.1	90.6	-1.54	9.6	1.50	0.37	M	2	3.4	67.9	6.9	77.6	1025
41	MT19182	MT1078/AAC Gateway/MT1265	HRW	0.283		11.6	73.1	10.5	90.4	-1.37	9.0	1.43	0.38	MH	5	5.0	63.9	13.7	73.6	1060
42	x MT19183	MT1078//AAC Gateway/MT1265	HRW	0.177		12.4	75.2	9.7	90.1	-1.34	9.8	1.30	0.36	M	3	3.9	65.0	8.5	77.2	1030

Table 39. 2018 Single Rep Observation 'A' Nursery (SROA)
Location: Bozeman, MT

Sample No. x = in 2020 tests	Variety	Pedigree	Class	PPO	Single Kernel Hardness	Wheat Protein, % (12% m.b.)	Flour					Mixograph			Test Bake							
							Flour Yield, %	Flour Protein, % (14% m.b.)	L* Brightness	a* Green - Red	b* Blue - Yellow	Wheat Ash, %	Flour Ash, %	Type	Tolerance	Mixing Time, min	Water Absorption, %	Mixing Time, min	Water Absorption, %	Loaf Volume		
43	MT19184	MT1078/AAC Gateway/MT1265	HRW	0.286		13.4	71.9	12.0	89.8	-1.51	9.4	1.48	0.41	M	2	3.4	65.3	4.9	75.5	1105		
44	MT19185	MT1078/Colter/Emerson	HRW	0.319		12.3	71.7	8.9	90.7	-1.23	8.5	1.44	0.34	M	4	6.5	65.4	12.2	75.6	1085		
45	x MT19186	MT1090/MT08185/MT0742	HRW	0.224		11.8	72.1	9.3	90.6	-1.54	9.4	1.39	0.36	M	4	5.0	64.8	10.0	74.5	995		
46	MT19187	MT1084/MT0859/SD06069	HRW	0.316		11.9	75.8	10.9	90.0	-1.92	11.1	1.20	0.40	M	3	3.8	64.7	6.7	74.4	975		
47	MT19188	MT0866/MT08184/NE06549	HRW	0.231		12.7	73.5	10.0	90.6	-1.71	9.7	1.20	0.35	M	3	4.5	65.3	12.0	75.5	1015		
48	x MT19189	MT1084/MT08184/CO04575(c1)	HRW	0.279		11.7	74.3	10.6	90.2	-1.67	10.6	1.27	0.41	M	3	3.0	62.9	5.0	72.6	970		
49	MT19190	MT0871/02X159E41	HRW	0.329		12.5	72.8	10.4	90.0	-1.70	11.1	1.45	0.36	M	3	3.0	64.9	5.3	74.6	1050		
50	MT19191	MT0871/02X159E41	HRW	0.288		12.3	74.1	11.2	90.5	-1.85	10.8	1.41	0.42	M	1	3.5	65.9	6.2	75.6	1070		
51	MT19192	Yellowstone/SD08W015	HRW	0.247		13.5	71.9	12.0	90.3	-1.65	10.4	1.50	0.40	LM	0?	3.8	64.9	6.2	74.6	1075		
52	x MT19193	Yellowstone/SD08W015	HRW	0.254		13.1	71.8	11.3	90.4	-1.57	10.2	1.59	0.39	M	2	4.0	60.8	6.3	70.5	1000		
53	MT19194	Yellowstone/493-22(Reeder/6*Paul)	HRW	0.124		12.4	72.8	11.1	90.3	-1.40	9.6	1.35	0.40	LM	2	5.3	68.0	8.5	77.7	1060		
54	MT19195	MT10116/MTW0880/MT0950	HRW	0.244		11.6	71.7	8.6	90.8	-1.86	10.4	1.45	0.32	M	2	3.1	61.9	3.4	71.6	960		
55	x MT19196	Northern//Yellowstone/MTW0880	HRW	0.088		11.5	71.8	8.8	90.0	-1.35	9.6	1.45	0.36	MH	4	3.9	64.0	5.9	74.7	1075		
56	MT19197	Northern//Yellowstone/MTW0880	HRW	0.105		11.5	72.8	10.4	89.9	-1.63	10.8	1.36	0.43	M	2	3.3	62.1	4.6	71.8	980		
57	MT19198	Northern//Yellowstone/MTW0880	HRW	0.099		11.6	72.6	10.4	89.9	-1.53	10.6	1.38	0.39	M	2	2.8	60.0	3.7	69.7	965		
58	MT19199	08X349-A3/Yellowstone	HRW	0.195		11.6	72.1	10.3	90.4	-1.60	9.9	1.44	0.40	MH	4	3.9	60.1	5.8	69.8	985		
59	MT19200	08X349-A3/Yellowstone	HRW	0.142		11.2	71.7	8.1	90.3	-1.36	9.4	1.48	0.34	MH	3	4.4	61.5	6.6	71.7	990		
60	MT19201	08X350-A2/MT0890	HRW	0.106		11.6	74.4	10.5	90.0	-1.45	10.2	1.58	0.39	M	4	5.4	64.2	13.1	75.9	980		
61	MT19202	08X350-A2/MT0890	HRW	0.084		11.4	74.0	8.5	90.6	-1.52	10.2	1.54	0.35	MH	5	5.4	62.4	12.4	72.6	975		
62	MT19203	Yellowstone/KS07HW25	HRW	0.282		12.6	73.2	9.9	90.8	-1.18	8.6	1.57	0.33	M	5	5.9	65.0	11.1	74.7	1040		
63	MT19204	Yellowstone/KS07HW25	HRW	0.271		13.6	73.5	12.2	90.0	-1.45	10.1	1.59	0.38	M	4	8.5	65.0	19.2	74.7	1115		
64	MT19205	Yellowstone/HV9306-975	HRW	0.324		12.7	70.8	10.2	89.9	-1.49	10.6	1.50	0.36	M	4	4.8	67.0	7.2	76.7	1075		
							10.5	70.8	8.1	89.4	-2.10	8.5	1.20	0.32	0.0			1.8	60.0	1.2	67.4	925
MIN							13.6	75.8	12.3	90.9	-1.10	12.8	1.59	0.43	5.0			8.5	68.0	19.2	79.5	1125
MAX							12.1	73.4	10.4	90.3	-1.50	10.0	1.42	0.38	3.1			4.2	64.6	8.1	74.5	1021
AVE																						