Project Title: 2016 Intra-State Wheat Variety Performance

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Objectives:

Evaluate new and existing winter wheat lines and varieties in dryland systems under various growing environments in Montana and Western North Dakota

Results:

The 2016 Intrastate winter wheat evaluation nursery was grown at 9 locations including Bozeman, Havre, Sidney, Kalispell, Moccasin, Conrad, Ft. Benton, and Huntley, Montana and Williston, North Dakota. The growing season was good at all locations producing an overall trial average of 80 bu/a. The top yielding named variety was Avery which produced 122.5 bu/a at Huntley (Table 1). The top yielding experimental variety was MT1471 producing 148.9 bu/a at Kalispell. Test weight (Table 2) was good overall with a 60.1 trial average. Kalispell had very low test weight across all entries most likely related to a high incidence of stripe rust. For example varieties such as Bearpaw and Byrd had test weights below 40 lbs/bu where significant levels of stripe rust were seen even at the earliest evaluation date of June 5. These stripe rust susceptible varieties also yielded quite poorly at Kalispell(Table 1). Protein (Table 3) was medium to low at all locations except Bozeman where protein averaged 13.4%. The trial average overall was only 11.1, reflective of higher than expected yields at most locations.

Summary:

The development of improved winter wheat lines and cultivars continues with improvements in yield, disease resistance and tolerance advance, combined with improved stem solidness to combat sawfly.

Future Plans

The intra-state winter wheat trial is not specifically a component of the research center's "umbrella" project but results are included here for the convenience of the Montana Wheat and Barley Committee and the growers who provide check-off funds. Associate winter wheat breeder, Dr. Jim Berg assembled the tables for this report.

Table 1. 2016 Intrastate Winter Wheat Test (Exp. 35): Multi-Location Yield (bu/a)

		Cultivar/Line	Bozeman LAT	Havre LAT	Sidney LAT	Williston LAT	Kalispell RCB	Moccasin LAT	Huntley LAT	Conrad LAT	Ft. Benton RCB	9 Loc Avg.
		lattice efficiency	208%	124%	137%	102%		111%	113%	117%		
+		**MTW1491**	**108.1**	**110.3**	66.3	**62.5**	**138.8**	**65.1**	**114.8**	**101.4**	**71.8**	**93.2**
		MT1265	**105.7**	**107.0**	77.3	**60.4**	130.0	**65.9**	112.8	99.7	**70.6**	**92.2**
	d	**MT1138**	94.0	**102.3**	65.6	**61.8**	132.3	**71.0**	**119.6**	**111.2**	63.2	**91.2**
#		**SY Monument**	92.9	**103.3**	70.2	**55.7**	127.0	62.9	113.4	**111.2**	**78.7**	**90.6**
		MT1348	**97.3**	**110.2**	69.2	**57.5**	132.2	**65.8**	108.4	**101.3**	**67.2**	**89.9**
+		**MT1444**	89.4	**100.2**	72.9	**56.8**	136.1	**66.7**	113.9	**105.3**	**68.2**	**89.9**
	d	**MT1332**	**95.9**	**104.2**	68.0	**58.2**	127.8	**68.7**	**118.8**	97.0	**67.8**	**89.6**
+		**MT1471**	94.7	96.0	73.9	**56.1**	**148.9**	58.9	100.0	**103.3**	**67.1**	**88.8**
	d	**Colter**	89.3	94.7	65.6	**56.2**	**141.9**	**67.5**	**115.4**	98.1	65.0	**88.2**
#		**Keldin**	85.5	**107.8**	**78.9**	**54.9**	101.1	**68.5**	113.7	**109.4**	**72.8**	**88.1**
+		**MT1465**	88.3	**98.7**	60.0	49.3	135.0	**71.7**	112.0	**104.2**	**69.8**	**87.7**
		MTCL1131	90.9	97.3	61.1	**60.1**	121.6	63.4	113.1	**103.3**	**78.6**	**87.7**
		Northern	84.1	**103.8**	58.7	50.3	133.7	57.4	**117.5**	**103.5**	**70.4**	**86.6**
		SY Wolf	80.8	97.8	76.3	**58.7**	98.6	63.3	**117.9**	**109.5**	**69.8**	**85.9**
		SY Clearstone 2CL	90.1	98.4	62.1	**53.1**	117.2	**65.6**	112.5	97.7	**72.0**	**85.4**
+	d	**MT1460**	91.6	**99.9**	60.0	**53.3**	110.6	**68.1**	108.4	**108.6**	**66.8**	**85.3**
		Yellowstone	95.1	**103.6**	63.7	**58.6**	94.9	63.3	110.2	**102.3**	**73.8**	**85.1**
#		**SY Sunrise**	92.3	92.8	75.8	52.7	130.6	61.2	106.4	90.6	62.9	**85.0**
#	d	**T158**	**104.8**	92.0	75.0	48.7	115.6	59.7	111.4	95.5	61.0	**84.9**
	d	**WB3768**	82.8	**100.6**	55.9	**55.1**	126.7	59.5	111.7	98.8	**72.9**	**84.9**
+	d	**MT1446**	89.6	**108.7**	63.2	48.4	121.1	55.8	110.4	95.0	**69.7**	**84.7**
	d	**MT1354**	86.7	**99.2**	55.2	50.7	132.0	62.3	**115.2**	**104.4**	55.8	**84.6**
	d	**MT1257**	86.4	**103.0**	67.2	53.0	112.3	**64.1**	114.0	94.8	**65.8**	**84.5**
	d	**MT1356**	86.5	94.0	67.1	**58.1**	120.9	**64.1**	110.5	96.6	62.8	**84.5**
+	d	**MT1478**	90.6	**105.6**	70.3	**62.4**	96.6	62.5	107.4	99.9	62.9	**84.2**
+		**MT1488**	94.1	97.7	47.1	48.9	135.1	61.3	106.9	**100.1**	**67.0**	**84.2**
#		**WB4623CLP**	**98.4**	84.9	59.5	**55.5**	**145.1**	54.7	102.5	96.6	57.2	**83.8**
		Loma	92.0	80.8	46.9	47.8	128.0	58.2	110.5	96.1	**77.8**	**82.0**
+	d	**MT1443**	74.5	96.7	63.2	52.0	106.7	58.6	111.6	**102.0**	**65.6**	**81.2**
	d	**Freeman**	89.0	**110.5**	68.2	49.0	80.1	63.2	103.7	86.4	**74.1**	**80.5**
#+	d	**Avery**	69.5	**103.3**	**85.8**	**55.4**	38.0	61.6	**122.5**	**105.4**	**71.2**	79.2
		Warhorse	77.5	89.8	46.3	41.0	126.7	63.6	101.8	84.6	62.6	77.1
#		**Brawl CL Plus**	81.3	89.7	74.6	50.0	54.4	59.0	108.8	93.2	**74.3**	76.1
	d	**Cowboy**	68.2	**99.4**	66.7	51.2	45.5	**67.4**	**116.1**	**101.7**	**68.3**	76.1
#		**WB4614**	67.2	97.5	74.7	51.9	64.2	53.8	108.3	**107.4**	55.6	75.6
+	d	**MTS1407**	77.9	92.4	49.5	48.7	88.1	56.7	101.6	**101.7**	60.6	75.2
		WB-Quake	77.3	87.4	42.2	49.8	117.5	54.5	95.3	87.9	64.1	75.1
		Judee	68.3	85.2	53.7	46.7	118.8	48.7	101.7	89.5	62.7	75.0
#+		**BZ9W09-2212 (WB4483)**	51.5	87.6	57.3	50.9	88.9	54.3	107.4	**102.3**	**70.3**	74.5
#+	d	**PSB13NEDH-14-71**	82.3	76.6	68.3	47.1	77.9	60.7	107.6	92.0	58.3	74.5
#	d	**Byrd**	52.0	**101.8**	**78.5**	**58.7**	20.6	63.0	108.8	99.6	**77.9**	73.4
	d	**CDC Falcon**	54.5	87.3	65.2	45.4	43.5	53.2	102.6	88.3	63.3	67.0
	d	**Rampart**	64.9	81.1	47.8	**53.2**	70.4	48.6	87.7	91.3	57.6	67.0
#	d	**WB4059CLP**	52.8	74.4	70.5	**54.1**	34.6	61.9	96.6	88.7	64.4	66.4
#+		**BZ9W09-2075 (WB4575)**	43.0	75.8	64.8	51.5	21.8	61.5	97.7	97.0	**74.2**	65.3
		Decade	51.1	80.7	57.4	49.8	18.5	55.0	97.7	95.7	**72.7**	64.3
	d	**Broadview**	41.8	83.4	68.2	48.7	27.2	47.9	94.4	96.2	55.7	62.6
		Bearpaw	46.9	64.1	43.3	45.4	16.4	55.0	95.0	95.4	64.3	58.4
	d	**Jerry**	44.1	69.9	60.1	43.3	18.2	55.4	89.8	83.7	54.3	57.6
		Average	**79.9**	**94.5**	**64.1**	**51.8**	**97.3**	**60.8**	**107.9**	**98.5**	**67.0**	**80.3**
		LSD (0.05)	**12.9**	**11.9**	**8.5**	**9.4**	**10.2**	**7.8**	**7.8**	**11.9**	**13.8**	**13.5**
		C. V. (%)	**9.1**	**7.2**	**7.6**	**10.7**	**6.5**	**7.4**	**4.2**	**7.0**	**12.7**	**18.1**
		P-value (Varieties)	**<.0001**	**<.0001**	**<.0001**	**0.0005**	**<.0001**	**<.0001**		**<0001**	**0.0151**	**<.0001**

+ = new for 2016, # = paid entry d = cultivars/lines dropped for 2017 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 2. 2016 Intrastate Winter Wheat Test (Exp. 35): Multi-Location Test Weight (lb/bu)

		Cultivar/Line	Bozeman LAT	Havre LAT	Sidney LAT	Williston LAT	Kalispell LAT	Moccasin RCB	Huntley LAT	Conrad LAT	Ft. Benton RCB	9 Loc Avg.
		lattice efficiency	229%	105%	104%	104%	112%		100%	125%		
#		**WB4623CLP**	**63.0**	**61.7**	62.1	58.7	**59.2**	**63.8**	**63.0**	62.3	59.8	**61.5**
		Judee	59.7	**61.3**	62.1	59.4	**58.3**	**63.8**	62.6	**63.5**	**61.7**	**61.4**
#	d	**T158**	**63.1**	**61.4**	**62.9**	57.8	56.1	63.0	62.4	**64.0**	**61.2**	**61.3**
#		**SY Sunrise**	60.8	**61.0**	**63.0**	58.5	57.7	63.2	62.4	**63.5**	**61.1**	**61.2**
		SY Wolf	60.7	**61.4**	**63.5**	**59.6**	52.2	63.2	**62.9**	**64.5**	**62.2**	**61.1**
	d	**WB3768**	60.9	60.8	61.6	59.0	57.7	63.4	62.2	62.1	**61.3**	**61.0**
+	d	**MT1446**	61.3	60.6	60.9	59.3	57.0	62.8	61.6	**63.3**	**61.3**	**60.9**
+		**MT1471**	60.0	60.4	61.4	58.9	**59.5**	63.0	62.0	**62.9**	59.9	**60.9**
		MT1348	60.1	60.7	61.5	59.2	57.7	62.8	61.1	**63.3**	**60.9**	**60.8**
	d	**MT1354**	60.7	60.7	61.1	59.1	57.9	62.7	62.4	62.2	60.5	**60.8**
+		**MT1488**	**61.8**	60.0	59.9	**59.8**	**60.0**	62.6	62.3	60.9	60.2	**60.8**
+		**MTW1491**	**62.1**	60.0	60.3	58.3	**59.6**	61.8	62.3	**63.1**	59.7	**60.8**
+		**MT1465**	60.3	59.9	60.1	58.6	**58.5**	62.3	62.3	62.6	**61.3**	**60.7**
		Warhorse	59.5	60.4	60.9	58.9	**59.7**	61.8	61.9	62.1	60.7	**60.7**
		WB-Quake	61.3	60.0	59.7	58.3	**58.7**	63.5	62.0	**63.2**	60.0	**60.7**
#		**Keldin**	59.4	**61.2**	62.3	**59.5**	55.6	62.5	61.6	**63.3**	60.1	**60.6**
		MT1265	61.1	60.1	62.1	58.9	57.3	61.5	61.3	62.7	60.1	**60.6**
#+	d	**PSB13NEDH-14-71**	60.1	**61.1**	62.5	**59.6**	50.9	**64.4**	62.2	62.7	**62.1**	**60.6**
	d	**MT1332**	60.7	59.8	60.7	59.1	57.4	62.1	61.8	62.3	60.4	**60.5**
+	d	**MT1443**	60.9	59.7	59.2	**59.5**	56.2	62.5	61.8	**63.7**	60.8	**60.5**
#+		**BZ9W09-2075 (WB4575)**	61.0	59.3	**63.3**	**59.9**	46.1	**64.1**	62.6	**64.4**	**62.6**	**60.4**
	d	**Colter**	59.3	59.4	60.9	59.2	**58.6**	61.8	61.7	62.2	60.2	**60.4**
+		**MT1444**	59.4	59.8	60.6	58.8	57.9	61.8	61.6	**63.0**	60.3	**60.4**
+	d	**MT1460**	60.7	60.3	60.3	57.9	57.1	62.1	61.7	**63.2**	60.5	**60.4**
		MTCL1131	60.7	59.8	60.2	58.7	55.8	61.9	61.7	62.4	**61.4**	**60.3**
#		**WB4614**	60.4	**61.1**	62.1	58.6	51.2	62.6	62.1	**63.6**	60.6	**60.3**
#		**Brawl CL Plus**	61.1	**61.0**	62.3	**59.8**	43.3	**64.5**	**63.6**	**63.9**	**62.3**	**60.2**
	d	**Rampart**	**62.3**	60.8	60.9	58.1	52.3	62.4	61.9	62.4	60.5	**60.2**
		Northern	59.5	59.2	59.7	59.2	56.8	62.4	61.8	61.6	60.3	**60.1**
	d	**MT1138**	59.9	59.7	60.4	59.0	57.0	61.8	61.7	60.8	60.1	**60.0**
	d	**MT1356**	60.4	60.3	59.9	58.3	56.7	62.0	61.8	62.1	58.9	**60.0**
+	d	**MTS1407**	60.1	60.4	60.1	58.1	53.0	62.9	62.3	**63.1**	60.4	**60.0**
		Yellowstone	60.4	59.4	60.2	58.4	55.9	61.8	61.5	61.9	60.8	**60.0**
#+		**BZ9W09-2212 (WB4483)**	59.6	59.1	59.6	58.5	56.8	61.6	61.8	61.3	60.7	**59.9**
		Loma	60.9	58.6	58.7	58.6	57.4	62.2	62.2	60.2	60.4	**59.9**
	d	**MT1257**	59.7	59.3	60.0	58.3	56.5	61.7	61.2	62.1	60.3	**59.9**
+	d	**MT1478**	59.6	59.3	59.8	57.7	53.9	61.5	61.3	**63.0**	60.3	59.6
		SY Clearstone 2CL	58.8	59.5	60.1	59.0	54.9	61.4	61.3	62.7	58.9	59.6
	d	**CDC Falcon**	59.3	59.8	61.8	57.3	50.8	62.1	60.9	61.8	**61.1**	59.4
#		**SY Monument**	57.3	59.6	60.7	57.4	54.9	60.7	61.1	61.9	60.8	59.4
	d	**Broadview**	60.0	59.4	60.8	57.4	50.1	62.4	61.3	62.6	59.6	59.3
#+	d	**Avery**	59.6	59.2	61.8	58.4	42.9	61.3	62.0	**63.5**	**61.0**	58.9
	d	**Cowboy**	61.2	59.0	60.9	57.9	47.3	61.0	62.0	60.2	60.7	58.9
#	d	**WB4059CLP**	60.8	59.4	62.2	57.5	43.4	62.1	61.4	62.7	59.8	58.8
		Decade	59.3	57.8	60.0	58.3	42.9	62.3	61.5	62.4	60.3	58.3
	d	**Freeman**	58.8	59.5	60.6	56.2	48.5	59.9	59.3	60.8	60.5	58.2
#	d	**Byrd**	58.6	58.8	62.2	58.3	38.6	61.1	62.0	62.4	60.8	58.1
	d	**Jerry**	60.1	57.7	60.3	56.8	44.1	61.4	60.7	61.6	59.5	58.0
		Bearpaw	60.9	57.3	59.0	57.3	39.4	62.3	61.6	62.5	59.5	57.8
		Average	**60.3**	**59.9**	**61.0**	**57.4**	**53.7**	**62.3**	**61.8**	**62.5**	**60.6**	**60.1**
		LSD (0.05)	**1.4**	**0.7**	**0.8**	**0.5**	**1.9**	**0.9**	**0.7**	**1.7**	**1.8**	**1.9**
		C. V. (%)	**1.3**	**0.7**	**0.8**	**0.5**	**2.0**	**0.7**	**0.7**	**1.5**	**1.8**	**3.4**
		P-value (Varieties)	**<.0001**	**<.0001**	**<.0001**	**<.0001**	**<.0001**	**<.0001**		**<0001**	**0.0230**	**0.0007**

+ = new for 2016, # = paid entry d = cultivars/lines dropped for 2017 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 3. 2015 Intrastate Winter Wheat Test (Exp. 35): Multi-Location Grain Protein (%)

		Cultivar/Line	Bozeman bulk	Havre LAT	Sidney LAT	Williston[1/] LAT	Kalispell LAT	Moccasin bulk	Huntley LAT	Conrad LAT	Ft. Benton bulk	8 Loc Avg.
		lattice efficiency		108%	184%	101%	104%		114%	123%		
+		**MT1471**	16.3	11.2	12.2	10.9	12.6	7.9	**11.9**	12.2	11.2	**11.9**
#		**Brawl CL Plus**	13.7	11.1	11.5	10.7	13.9	7.7	11.4	**13.3**	11.9	**11.8**
		Bearpaw	14.5	10.4	9.6	11.6	**15.4**	8.0	11.5	12.1	11.8	**11.7**
	d	**Jerry**	13.6	10.2	12.3	13.7	14.5	7.8	**12.3**	11.2	11.3	**11.7**
	d	**Rampart**	13.3	10.7	11.0	11.2	12.9	8.7	**12.9**	**13.0**	11.4	**11.7**
#	d	**WB4059CLP**	14.8	9.9	10.7	12.5	14.3	8.0	11.6	**12.9**	11.3	**11.7**
#		**WB4623CLP**	13.0	10.2	11.6	11.6	13.8	8.2	**12.2**	**12.6**	11.6	**11.7**
+	d	**MTS1407**	14.3	10.5	11.5	11.5	12.6	7.9	**12.0**	12.5	11.5	**11.6**
#+		**BZ9W09-2075 (WB4575)**	13.3	10.1	11.0	11.3	13.9	8.0	11.7	12.1	12.0	**11.5**
		Warhorse	14.2	10.7	11.3	13.9	13.0	8.3	11.6	12.1	11.0	**11.5**
		WB-Quake	14.2	10.8	11.9	11.6	11.5	7.8	11.4	12.3	11.7	**11.5**
	d	**Broadview**	11.9	11.0	11.3	12.3	14.4	7.8	11.2	11.3	11.8	**11.3**
		Decade	13.5	10.0	11.2	11.2	14.2	8.1	11.1	11.5	10.8	**11.3**
		Judee	14.6	9.8	10.3	12.5	12.2	7.6	11.3	**12.6**	12.1	**11.3**
		Northern	14.5	10.8	10.8	12.7	11.7	8.0	11.7	11.7	11.0	**11.3**
#+		**BZ9W09-2212 (WB4483)**	13.7	10.2	12.1	11.4	12.3	8.4	10.7	11.7	10.7	11.2
	d	**Colter**	15.0	10.2	10.5	12.5	11.9	7.5	11.5	11.7	11.4	11.2
#+	d	**PSB13NEDH-14-71**	13.5	10.9	9.9	10.7	12.5	7.8	11.3	12.0	11.8	11.2
		SY Wolf	14.4	10.4	10.7	11.1	12.6	7.6	11.7	11.4	10.7	11.2
+		**MT1465**	14.0	11.2	9.5	12.7	11.8	8.1	11.0	11.8	11.4	11.1
+	d	**MT1478**	13.7	10.9	10.6	12.1	11.3	7.8	11.6	11.5	11.3	11.1
#		**SY Sunrise**	13.5	10.5	10.7	11.8	12.0	8.0	11.1	11.8	11.5	11.1
	d	**Freeman**	12.6	10.1	9.5	10.7	12.1	8.0	**12.2**	11.8	11.3	11.0
		Loma	11.4	10.2	**14.0**	11.9	11.8	7.7	10.9	11.9	10.4	11.0
+	d	**MT1443**	12.8	10.4	11.0	10.7	11.1	7.9	11.3	11.8	11.4	11.0
+	d	**MT1460**	12.3	10.4	10.3	12.1	11.5	8.1	**11.9**	11.5	11.7	11.0
+		**MT1488**	12.9	10.7	10.9	12.3	12.3	8.0	11.0	11.2	10.9	11.0
	d	**MT1257**	15.2	10.1	9.2	13.1	11.6	7.4	10.7	**12.6**	10.6	10.9
+		**MT1444**	14.5	10.5	10.2	9.3	11.1	7.4	10.5	11.3	11.4	10.9
		MTCL1131	13.5	10.7	10.5	10.8	11.0	7.4	11.6	11.8	10.7	10.9
	d	**CDC Falcon**	12.8	10.1	10.3	13.6	12.6	8.0	11.3	10.9	10.3	10.8
#		**Keldin**	13.0	10.6	10.7	11.3	11.3	7.2	11.5	10.8	11.5	10.8
		MT1348	12.5	11.6	8.3	12.1	11.6	7.3	**12.4**	11.4	11.6	10.8
+	d	**MT1446**	12.6	10.3	9.4	13.0	11.2	7.7	11.8	11.6	11.5	10.8
#		**SY Monument**	13.6	10.3	10.3	10.2	12.3	7.1	11.1	10.9	10.7	10.8
#	d	**T158**	13.0	10.1	8.8	12.7	12.7	7.6	10.6	11.8	11.6	10.8
	d	**WB3768**	13.1	10.6	10.0	12.0	11.0	7.7	11.7	11.7	10.9	10.8
		Yellowstone	13.1	10.6	9.2	10.6	11.1	7.6	**12.1**	11.7	10.8	10.8
	d	**MT1138**	13.7	10.3	9.5	10.9	11.2	7.7	11.7	11.7	10.0	10.7
	d	**MT1332**	12.8	10.0	9.4	10.8	11.5	7.8	11.5	11.6	10.7	10.7
	d	**MT1354**	12.9	10.1	10.6	11.9	11.3	7.7	10.7	11.8	10.8	10.7
	d	**MT1356**	12.8	10.2	9.7	10.0	11.1	8.0	10.9	12.2	11.0	10.7
#		**WB4614**	13.4	9.6	8.7	12.0	13.6	7.4	10.5	11.6	10.7	10.7
#	d	**Byrd**	13.2	10.1	8.3	9.7	13.9	7.3	10.7	10.8	10.5	10.6
		MT1265	12.5	10.2	8.8	11.1	10.9	7.8	11.6	11.6	11.4	10.6
		SY Clearstone 2CL	12.9	10.4	9.2	10.9	11.4	7.8	11.1	11.8	10.5	10.6
+		**MTW1491**	12.7	10.1	9.5	9.7	10.9	7.1	11.0	11.7	11.0	10.5
	d	**Cowboy**	12.8	10.1	8.7	11.3	11.7	7.4	10.4	10.1	10.3	10.2
#+	d	**Avery**	11.2	9.3	8.1	11.9	13.1	6.7	10.6	10.3	10.4	10.0
		Average	**13.4**	**10.4**	**10.3**	**11.6**	**12.3**	**7.8**	**11.4**	**11.7**	**11.1**	**11.1**
		LSD (0.05)		**ns**	**1.1**	**ns**	**0.6**		**1.0**	**0.8**		**0.7**
		C. V. (%)		**5.7**	**6.0**	**13.4**	**2.7**		**4.9**	**3.8**		**6.4**
		P-value (Varieties)		**0.0834**	**<.0001**	**0.1499**	**<.0001**			**<0001**		**<.0001**

+ = new for 2016, # = paid entry d = cultivars/lines dropped for 2017 test 1/ = data not used, in average, for this location

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. 2016 Intrastate Winter Wheat Test (Exp. 35): Multi-Location Heading Date (days from Jan. 1)

		Cultivar/Line	Bozeman LAT	Havre LAT	Sidney no	Williston RCB	Kalispell LAT	Moccasin LAT	Huntley LAT	Conrad RCB	Ft. Benton no	7 Loc Avg.
		lattice efficiency	104%	126%	data		107%	133%	107%		data	
#	d	**T158**	156.2	148.5		146.3	151.2	157.2	149.9	153.0		150.3
	d	**Freeman**	155.1	149.5		145.7	150.6	157.0	152.1	154.7		150.5
#		**Brawl CL Plus**	157.0	149.1		145.7	149.8	157.1	150.4	153.0		150.8
#	d	**WB4059CLP**	157.5	150.3		146.7	150.2	158.5	151.2	153.3		151.6
#	d	**Byrd**	159.3	150.1		146.3	148.5	158.8	152.5	154.0		152.3
#+	d	**PSB13NEDH-14-71**	159.0	153.8		146.7	149.1	158.0	153.1	155.7		152.8
#		**SY Sunrise**	158.3	153.9		147.3	151.1	159.2	154.0	155.7		153.2
#+	d	**Avery**	159.7	153.8		147.0	150.4	160.0	154.0	156.0		154.0
		SY Wolf	160.1	154.7		146.7	151.6	160.7	154.3	157.3		154.2
	d	**Cowboy**	159.1	155.2		147.0	150.9	160.5	154.3	157.3		154.6
+	d	**MT1478**	161.1	155.5		147.0	150.9	160.8	154.0	158.0		155.0
#		**SY Monument**	160.8	155.3		147.7	150.2	160.4	154.5	158.0		155.0
		MT1348	161.1	155.1		147.0	139.3	160.0	156.1	158.3		155.2
#		**WB4614**	158.4	157.2		147.0	151.7	160.7	155.7	157.3		155.2
	d	**CDC Falcon**	161.3	155.5		147.7	150.8	160.7	154.6	158.0		155.4
		Decade	161.4	155.9		147.7	151.0	160.4	155.0	157.7		155.4
#		**Keldin**	160.9	156.0		147.3	151.5	161.1	156.0	157.7		155.5
		Bearpaw	161.3	156.1		147.3	148.9	160.9	156.0	159.0		155.6
#+		**BZ9W09-2075 (WB4575)**	161.9	155.5		147.7	150.7	159.2	155.9	157.3		155.6
+		**MT1465**	162.1	156.2		147.0	140.9	161.5	155.9	158.3		155.9
		Judee	161.1	156.7		148.0	151.7	161.4	157.0	159.0		156.0
		Yellowstone	163.0	156.2		147.7	151.2	161.1	157.1	156.7		156.0
	d	**Rampart**	161.7	156.1		147.3	152.0	161.5	156.0	159.7		156.1
		SY Clearstone 2CL	162.3	157.3		147.3	151.7	161.1	156.3	157.7		156.1
#		**WB4623CLP**	160.9	156.7		147.7	148.5	161.8	156.5	159.0		156.1
+	d	**MT1446**	162.7	157.1		147.7	153.3	161.5	157.2	160.0		156.3
+	d	**MTS1407**	162.3	156.3		147.7	147.6	160.3	158.1	158.3		156.3
+		**MT1444**	161.9	157.1		148.3	150.3	161.4	156.1	158.7		156.4
+		**MT1471**	162.9	156.3		148.7	143.5	161.6	154.6	159.3		156.4
	d	**MT1257**	162.3	156.1		150.3	145.6	161.0	156.3	159.0		156.5
	d	**Jerry**	163.0	156.0		149.7	152.6	160.7	156.1	159.7		156.6
	d	**MT1356**	162.8	157.0		148.3	149.2	161.3	156.1	159.3		156.6
+	d	**MT1460**	162.7	156.5		147.7	151.7	161.4	156.7	160.0		156.6
	d	**Broadview**	163.1	156.5		148.7	143.2	161.3	156.1	159.7		156.7
	d	**MT1138**	163.4	156.3		148.3	151.2	161.4	156.7	159.0		156.7
	d	**MT1332**	163.0	156.9		147.3	144.1	161.7	157.5	159.0		156.7
+		**MTW1491**	163.3	157.3		150.3	144.8	159.7	157.1	159.7		156.9
		Warhorse	162.0	158.0		150.7	147.9	161.4	156.2	159.3		156.9
+	d	**MT1443**	163.6	157.0		147.7	144.0	161.6	157.2	160.3		157.0
		MT1265	163.9	157.2		147.7	148.5	161.5	157.4	159.7		157.1
	d	**MT1354**	163.3	157.0		149.3	149.9	161.6	157.5	160.3		157.3
		MTCL1131	163.9	157.0		150.3	152.2	161.4	156.8	160.0		157.3
	d	**Colter**	164.1	158.1		150.7	153.3	161.5	157.8	160.3		157.6
+		**MT1488**	163.6	157.0		150.3	150.3	161.9	158.1	160.0		157.6
		Loma	163.9	158.2		150.7	148.5	162.3	156.9	161.7		157.8
	d	**WB3768**	164.8	158.5		148.3	151.0	162.0	159.2	161.0		157.8
		WB-Quake	162.8	157.3		150.3	152.4	162.1	158.1	160.7		157.8
		Northern	163.8	157.8		149.7	151.6	161.6	158.9	161.0		157.9
#+		**BZ9W09-2212 (WB4483)**	165.1	158.2		150.7	150.6	162.3	158.1	159.7		158.2
		Average	**161.6**	**155.7**		**148.1**	**149.4**	**160.7**	**155.8**	**158.3**		**155.7**
		LSD (0.05)	**1.7**	**0.9**		**0.9**	**2.3**	**1.1**	**1.6**	**1.8**		**1.1**
		C. V. (%)	**0.6**	**0.3**		**0.4**	**0.9**	**0.4**	**0.6**	**0.7**		**0.7**
		P-value (Varieties)	**<.0001**	**<.0001**		**<.0001**	**<.0001**	**<.0001**		**<0001**		**<.0001**

+ = new for 2016, # = paid entry d = cultivars/lines dropped for 2017 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 5. 2016 Intrastate Winter Wheat Test (Exp. 35): Multi-Location Plant Height (in)

		Cultivar/Line	Bozeman LAT	Havre RCB	Sidney LAT	Williston LAT	Kalispell LAT	Moccasin LAT	Huntley LAT	Conrad LAT	Ft. Benton RCB	9 Loc Avg.
		lattice efficiency	139%		111%	101%	108%	104%	109%	145%		
+	d	**MTS1407**	31.3	35.2	32.5	21.0	41.2	28.1	34.9	29.4	31.5	31.2
#	d	**WB4059CLP**	32.8	37.4	32.9	19.5	39.5	30.0	35.7	31.4	33.0	31.7
#		**SY Sunrise**	33.5	37.0	35.7	19.4	36.8	28.3	33.7	30.5	32.5	32.0
	d	**CDC Falcon**	34.2	37.6	35.1	19.2	42.7	31.3	37.9	29.8	34.0	32.9
#+		**BZ9W09-2075 (WB4575)**	32.2	38.0	35.0	23.6	44.7	30.8	37.1	32.3	33.5	33.1
#		**WB4614**	35.4	38.5	34.3	21.8	43.5	30.1	38.9	33.3	33.0	33.6
#	d	**T158**	34.2	40.4	34.6	18.3	43.8	30.2	38.5	32.0	35.5	33.7
		Bearpaw	33.4	36.1	34.1	21.8	41.2	30.9	39.6	34.5	36.0	33.8
		Loma	33.3	36.7	35.2	23.9	39.3	29.8	38.2	34.0	33.5	33.9
+		**MT1465**	33.8	38.2	36.9	23.3	39.3	30.3	37.2	32.7	33.5	33.9
#+		**BZ9W09-2212 (WB4483)**	34.5	37.8	35.0	23.4	43.6	32.8	39.2	33.1	33.0	34.0
#+	d	**PSB13NEDH-14-71**	35.5	38.1	36.0	20.3	43.1	31.6	39.1	32.1	35.5	34.1
		Warhorse	35.5	39.7	33.9	18.8	42.6	32.1	38.5	31.6	35.0	34.1
		Decade	33.4	38.6	34.3	21.7	43.1	31.1	39.8	34.8	36.5	34.3
		Judee	35.9	38.3	33.4	21.5	43.8	32.3	38.5	33.2	34.5	34.3
#		**WB4623CLP**	35.4	37.9	34.5	22.9	43.4	30.2	37.8	33.1	35.0	34.3
#		**Keldin**	34.5	38.3	36.0	21.3	45.4	34.0	37.0	34.2	35.5	34.4
	d	**Broadview**	32.8	40.2	36.8	22.6	41.0	32.3	40.3	34.6	36.5	34.6
		WB-Quake	34.2	38.7	35.1	24.3	40.8	31.8	38.5	33.0	35.0	34.7
#	d	**Byrd**	33.4	40.3	35.8	23.8	37.5	32.2	40.5	32.8	36.0	34.8
	d	**Cowboy**	33.9	39.4	34.9	21.2	41.8	32.6	41.3	33.9	36.5	34.8
+		**MT1488**	35.7	38.9	34.6	21.5	43.6	31.3	39.2	35.7	35.5	34.8
		SY Wolf	35.3	39.2	36.7	23.6	40.8	32.7	37.5	32.8	34.5	34.8
#		**SY Monument**	36.3	39.0	35.6	22.1	37.1	32.0	39.7	33.8	35.5	35.0
		Northern	35.8	39.0	35.6	20.5	44.5	32.6	39.9	34.9	35.5	35.2
	d	**Freeman**	36.7	41.1	37.2	22.7	46.4	31.3	39.0	31.8	35.5	35.3
#		**Brawl CL Plus**	34.4	41.1	36.7	24.0	38.1	31.7	39.7	35.3	35.5	35.5
+	d	**MT1443**	36.8	38.6	36.6	24.1	32.5	31.8	39.4	35.8	36.0	35.5
#+	d	**Avery**	35.5	41.6	35.4	21.7	42.6	32.0	41.3	35.5	37.5	35.7
+	d	**MT1446**	37.6	39.5	36.7	24.7	37.3	31.6	38.5	34.0	36.0	35.7
+		**MT1471**	36.9	38.7	36.8	25.3	38.7	32.2	39.3	34.3	35.5	35.8
		MT1348	37.9	40.8	36.8	24.2	42.0	32.1	40.5	33.8	36.5	36.2
	d	**Colter**	36.9	38.7	37.1	26.5	41.3	33.3	41.3	35.0	35.0	36.3
+	d	**MT1460**	36.0	41.6	38.2	24.6	35.0	33.9	40.6	35.7	35.0	36.5
+		**MTW1491**	38.9	40.4	37.1	26.6	38.6	33.4	40.5	34.1	34.0	36.5
	d	**MT1354**	38.1	39.6	39.1	23.8	37.5	34.3	41.4	34.7	36.5	36.8
+	d	**MT1478**	36.2	42.6	39.2	25.5	40.1	33.4	41.5	34.2	35.0	36.8
	d	**MT1356**	37.6	40.6	38.4	26.6	39.2	33.0	41.9	35.0	36.0	36.9
+		**MT1444**	37.7	42.4	38.0	25.5	41.9	33.9	41.0	34.7	35.0	36.9
	d	**MT1257**	37.9	40.8	38.5	25.6	41.0	33.3	42.9	35.7	35.5	37.1
		Yellowstone	39.9	41.5	37.1	26.8	43.7	32.9	40.3	36.2	37.0	37.1
	d	**MT1332**	39.4	40.6	38.0	25.8	37.3	34.2	41.1	36.1	38.5	37.6
		SY Clearstone 2CL	38.8	41.7	37.9	25.6	43.2	34.2	42.4	35.6	39.0	37.6
	d	**MT1138**	39.8	42.3	38.5	27.0	35.6	34.1	41.8	35.8	36.5	37.7
		MT1265	39.2	40.7	38.7	27.2	40.9	33.7	42.0	35.9	37.0	37.7
	d	**Jerry**	38.0	43.5	39.9	22.4	43.0	34.4	46.3	37.4	39.0	38.2
	d	**Rampart**	38.9	43.3	37.5	24.2	43.8	33.5	43.7	38.1	40.5	38.3
	d	**WB3768**	39.4	41.0	38.6	25.6	42.7	34.8	41.9	37.8	39.5	38.3
		MTCL1131	39.1	42.9	38.6	28.3	44.7	35.3	41.7	37.1	39.5	38.7
		Average	**36.0**	**39.7**	**36.4**	**23.4**	**41.0**	**32.2**	**39.8**	**34.1**	**35.7**	**35.4**
		LSD (0.05)	**2.1**	**2.6**	**2.0**	**3.3**	**2.2**	**2.3**	**1.7**	**2.0**	**2.0**	**1.2**
		C. V. (%)	**3.3**	**4.1**	**3.2**	**8.6**	**3.0**	**4.2**	**2.5**	**3.3**	**2.8**	**3.5**
		P-value (Varieties)	**<.0001**	**<.0001**	**<.0001**	**<.0001**	**<.0001**	**<.0001**		**<0001**	**<.0001**	**<.0001**

+ = new for 2016, # = paid entry d = cultivars/lines dropped for 2017 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 6. 2016 Intrastate Winter Wheat Test (Exp. 35): Multi-Location Stem Solidness (5-25)

	Cultivar/Line		Bozeman	Conrad	Havre	Moccasin	Northern Seeds - Carter[1/]	5 Loc Average
		stems clipping date	5-Jul	9-Jul	8-Jul	10-Jul	10-Jul	
	Warhorse	Montana, 2013	**19.8**	**21.6**	**22.6**	21.1	**22.1**	**21.3**
	Rampart	Montana, 1996	17.5	**22.2**	**21.5**	**22.1**	**21.1**	**21.1**
+	**MTS1407**	MT0097//MTS0527//MTS0532	**20.5**	**21.3**	**22.3**	20.8	20.8	**20.8**
	Bearpaw	Montana, 2011	17.2	20.3	**22.2**	**21.5**	**21.5**	20.3
	WB-Quake	WestBred, 2011	18.8	20.2	20.0	20.9	20.5	20.3
#+	**BZ9W09-2212 (WB4483)**	WestBred, 2016 (solid stem)	18.9	19.9	19.7	19.4	20.1	19.9
	Judee	Montana, 2011	16.5	20.5	19.8	20.5	20.7	18.6
	Loma	Montana, 2016	15.7	16.8	18.1	18.3	17.7	17.5
	CDC Falcon	Sask/WestBred, 1999	5.0	5.4	5.9	6.4	6.3	6.7
	Average		**16.7**	**18.7**	**19.1**	**19.0**	**19.0**	**18.5**
	LSD (0.05)		**1.5**	**1.7**	**1.7**	**0.9**	**1.1**	**0.6**
	C. V. (%)		**5.3**	**5.1**	**5.2**	**2.8**	**3.4**	**4.7**
	P-value (Varieties)		**<.0001**	**<.0001**	**<.0001**	**<.0001**	**<.0001**	**<.0001**

Locations were significant (P= <.0001), there was a significant Entry x Location Interaction (P = <.0001)

+ = new for 2016, # = paid entry

1/ = 56% sawfly infestation rate in clipped stems

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. 2016 Intrastate Winter Wheat Test (Exp. 35): Multi-Location Stripe Rust Evaluation, including data fom Pullman and Mt. Vernon, WA

Cultivar/Line	Stripe Rust											
	Montana (%)							Pullman, WA		MT. Vernon, WA		
d = cultivars/lines dropped for	Kalispell			Bozeman			2 loc	Milk		Stem elong.		Heading/flowering
+ = new for 2016, # = paid entry	5-Jun	10-Jun	30-Jun	2-Jun	8-Jun	16-Jun	'late'	IT[1/]	%	IT[1/]	%	IT[1/]	%
								13-Jun		18-Apr		18-May	
+ MT1488	**8**	**17**	**22**	5	**12**	**10**	**16**	2	15	3	30	5	80
# WB4623CLP	**4**	**7**	**29**	tr	**5**	**4**	**17**	5	15	2	20	3	20
# SY Monument	**3**	**10**	**33**	tr	**1**	**2**	**18**	5	10	2	10	2	10
+ MT1471	**3**	**9**	**35**	0	**1**	**4**	**20**	3	10	2	10	3	20
Judee	17	21	**27**	8	**9**	15	**21**	5	30	3	20	3	30
Warhorse	12	**16**	**37**	0	**4**	**5**	**21**	5	10	2	20	2	20
+ MT1465	**10**	27	**37**	tr	**3**	**7**	**22**	3	5	2	20	3	20
Loma	22	30	**35**	12	14	**10**	**23**	5	15	3	30	2	20
d Colter	15	23	38	tr	**5**	12	**25**	2	20	2	20	2	20
# SY Sunrise	**5**	**7**	38	8	**5**	12	**25**	5	15	5	30	4	60
# d T158	**6**	**13**	49	7	**5**	**2**	**26**	5	30	3	30	8	80
+ MTW1491	17	51	51	tr	**7**	**10**	**31**	5	10	2	20	4	30
MT1348	**7**	**12**	56	tr	**5**	**8**	**32**	5	15	2	15	2	20
Northern	20	28	52	3	15	14	**33**	5	30	3	30	2	20
SY Wolf	17	34	50	0	**9**	16	**33**	8	100	3	30	4	60
MT1265	**10**	22	67	0	**5**	**6**	**37**	3	15	2	20	2	20
+ d MT1446	**8**	25	61	0	**4**	12	**37**	5	20	2	20	3	20
d Freeman	**10**	28	68	2	**5**	**6**	**37**	5	15	5	30	7	80
+ MT1444	12	29	70	0	**4**	**7**	**39**	3	15	2	20	3	20
d MT1356	18	38	71	tr	**6**	**8**	**40**	5	25	2	15	2	20
d MT1332	12	21	76	tr	**2**	**6**	**41**	5	20	2	20	2	10
d MT1138	17	26	73	tr	**5**	**10**	**42**	3	10	2	20	2	30
+ d MTS1407	21	65	70	2	**6**	13	**42**	5	40	2	20	3	20
WB-Quake	20	27	67	23	21	17	**42**	5	20	8	40	2	20
d MT1354	20	43	80	tr	**3**	**8**	**44**	5	25	2	15	2	20
d WB3768	12	40	82	0	**2**	**6**	**44**	5	20	2	20	2	30
+ d MT1460	18	39	76	tr	**8**	13	**45**	5	20	2	20	3	20
d MT1257	25	57	84	tr	**6**	**9**	**47**	3	15	3	30	2	20
SY Clearstone 2CL	23	48	86	0	**4**	**8**	**47**	5	20	3	20	3	20
+ d MT1443	25	49	82	2	**9**	14	48	5	35	5	30	2	20
# Keldin	27	56	82	tr	**11**	17	50	5	20	2	20	2	20
MTCL1131	17	37	87	tr	**6**	12	50	3	15	2	20	3	30
Yellowstone	15	51	86	0	**6**	15	51	5	20	3	20	3	50
+ d MT1478	23	71	91	tr	**11**	13	52	5	25	3	30	4	20
# WB4614	62	89	82	tr	14	23	53	5	25	2	20	2	20
#+ BZ9W09-2212 (WB4483)	53	69	68	20	30	40	54	8	90	3	30	2	20
d Rampart	30	89	83	0	13	28	56	5	40	3	30	3	30
#+ d PSB13NEDH-14-71	52	77	93	5	25	30	62	5	40	3	30	2	20
d CDC Falcon	87	96	96	5	32	42	69	8	100	8	60	5	80
Decade	85	94	93	12	36	57	75	8	100	8	40	4	50
# Brawl CL Plus	70	87	84	12	65	76	80	8	100	5	30	8	80
d Jerry	89	98	97	18	41	66	82	8	100	8	60	8	80
# d Byrd	85	94	95	15	49	70	83	8	100	8	80	8	80
Bearpaw	92	98	96	22	61	72	84	8	100	8	40	5	60
d Broadview	90	95	88	40	57	83	86	8	100	8	80	8	80
#+ BZ9W09-2075 (WB4575)	91	96	96	18	55	75	86	8	100	8	60	4	30
#+ d Avery	73	97	95	7	51	77	86	8	100	2	20	8	80
d Cowboy	85	94	94	32	49	80	87	8	100	5	30	8	80
# d WB4059CLP	95	97	99	27	70	87	93	8	100	8	80	8	80
Average	**33.4**	**49.9**	**69.5**	**9.2**	**17.7**	**25.2**	**47.4**		**41**		**30**		**38**
LSD (0.05)	**7.9**	**12.9**	**15.6**	**8.2**	**11.8**	**8.3**	**31.1**						

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.

** = indicates highest value within a column

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