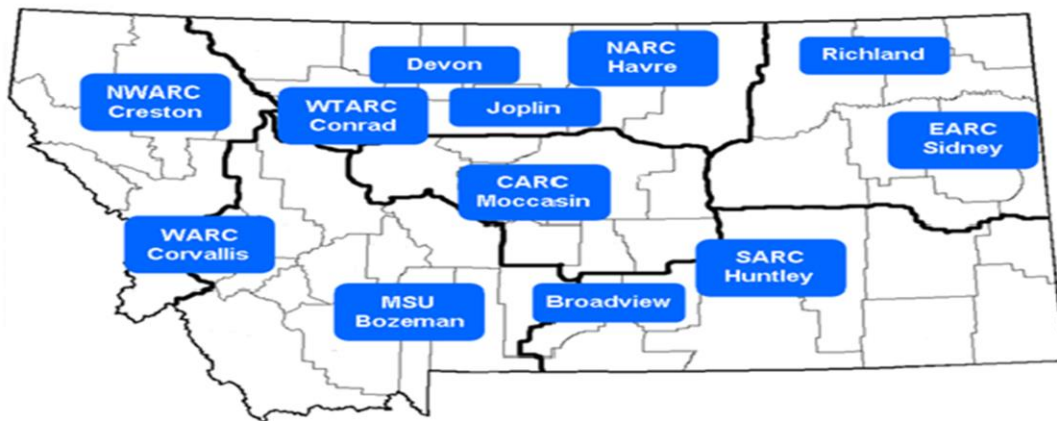


2015 Montana Cool-Season Spring Pulse Variety Evaluation Annual Report

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Montana State University
Montana Agricultural Experiment Stations

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DISCLAIMER:

The information given herein is supplied with the understanding that no discrimination is intended and no endorsement by the Montana Agricultural Experiment Station is implied. The results of individual trials and studies are considered to be of a **PRELIMINARY** nature and should **NOT** be considered as a product endorsement or recommendation for commercial use.

List of Seed Suppliers

The list of seed companies who provide seeds for the 2015 variety evaluation are shown in Table 1. This table may give information for producers to contact seed companies if interested in grown the respective varieties. This table is not showing the complete list of all varieties evaluated in 2015 since most of the varieties received from breeders are not released yet (example Western Regional variety evaluation trials) and lack of information for some varieties.

Table 1. Some of the dry pea, lentil and chickpea varieties included in 2015 variety evaluation trials and seed suppliers

Crop	Variety	Seed supplier	Seed cotyledon type
Dry pea	AAC Carver	Meridian Seeds	Yellow
	AAC Lacombe	Seed Net	Yellow
	Abarth	Pulse USA	Yellow
	AC Agassiz	Meridian Seeds	Yellow
	Bridger	Great Northern Ag	Yellow
	CDC Amarillo	University of Saskatchewan	Yellow
	CDC Meadow	University of Saskatchewan	Yellow
	CDC Saffron	University of Saskatchewan	Yellow
	CDC Treasure	Chahill Seeds	Yellow
	DS Admiral	Pulse USA	Yellow
	Durwood	Pulse USA	Yellow
	AC Earlstar	Meridian Seeds	Yellow
	Gunner	Great Northern Ag	Yellow
	Hyline	ProGene, Legume Logic and Great Northern Ag	Yellow
	Jetset	Meridian Seeds	Yellow
	Korando	Pulse USA	Yellow
	Mystique	Pulse USA	Yellow
	Navarro	Great Northern Ag	Yellow
	Nette 2010	Pulse USA	Yellow
	Salamanca	Great Northern Ag	Yellow
	Spider	Great Northern Ag	Yellow
	SW Midas	Pulse USA	Yellow
	Trapez	Legume Logic	Yellow
	Vegas	Legume logic and JB Farm	Yellow
	Yellowstone (Pro 793)	ProGene	Yellow
	Aragorn	Pulse USA	Green
	Arcadia	Pulse USA	Green
	Banner	ProGene	Green
	Bluemoon	Legume logic and JB Farm	Green
	CDC Striker	Pulse USA	Green
	Daytona	Meridian Seeds	Green
	Ginny	Pulse USA	Green
Greenwood	Pulse USA	Green	
Hampton	Chahill Seeds	Green	
K-2	Pulse USA	Green	
LN1123	Pulse USA	Green	
Majoret	Pulse USA	Green	
Viper	Pulse USA	Green	
Lentil	CDC Maxim	Pulse USA	Small red
	CDC Invincible	Pulse USA	Small green
	CDC Imi-Green	Pulse USA	Medium green
Chickpea	CDC Orion	Meridian Seeds	Kabuli type

PROJECT DESCRIPTION AND OBJECTIVE

Project Description

Cool season spring pulse crops (pea, lentil, and chickpea) production is increasing rapidly in Montana largely due to the replacement of summer fallow. It is expected that this trend will continue to increase since there is still lot of land being summer fallowed, growing pulse crops require low energy input thus low carbon foot print, these pulse crops are compatible in dryland farming system of Montana (require less moisture) and availability of international marketing opportunity as world demand for healthy protein source is increasing and these crops satisfy these demand. There is no doubt that the addition of these crops in the existing cropping systems will have substantial contribution to achieve social, economic and environmental sustainability. In addition to the direct economic benefit of pulse crops, the various rotational benefits to the succeeding crop are tremendous. Therefore, in order to sustain these pulse crops production in the state, information on varietal testing, development and improved agronomic management practices are needed to produce quality grain to satisfy national and international market standards.

In order to avail research information that will help with informed decision making, the Central Agricultural Research Center (CARC) of Montana State University is coordinating a serious of state wide and western regional dry pea, lentil and chickpea variety evaluations and research on pulse crop management practices within different cropping systems. Since 2008, CARC has been coordinating spring pulse variety evaluation project. Since May, 2015, this coordination office moved to Eastern Agricultural Research Center and continued the coordination work. This project is designed to work together with pulse breeders from Montana State University, North Dakota State University, USDA-ARS Pullman, WA, private seed companies and pulse growers. Every year, the project is implemented at nine different sites that are well scattered all over Montana to represent the state in terms of weather and soil variability under dryland and irrigation condition. The finding of the project is published every year as annual spring pulse variety evaluation report and distributed to stakeholders free of charge to promote pulse crop production in the state. In 2015, the trials were conducted at seven Montana State University (MSU) Agricultural Research Centers, Bozeman Post Farm (MSU), and three cooperating producers' fields near Devon, Broadview and Richland, Montana. This report contains the

summary of 2015 cropping season results from different locations, and summary from multiple years.

Objective

The objective of these trials were to evaluate spring dry pea, lentil and chickpea commercial varieties and experimental lines for adaptability and yield potential in the diverse Montana environments.

METHODS

Procedures and Experimental Design

The Central Agricultural Research Center of MSU (coordinating center) invited individual private seed companies and breeders to submit varieties and entries of dry pea, lentil and chickpea for 2015 evaluation. Available locations for evaluations were indicated in the invitation letter. All sites were dry land except three irrigated sites at Corvallis, Huntley and Sidney. The western regional variety evaluations were organized by the breeders at Pullman, WA and Fargo, NDSU. Once seeds were received by CARC, all seeds for the trials were pre-treated with fludioxinil and mephenoxam fungicides (Apron MAXX[®]RTU, Syngenta Crop Protection, Inc) to protect fungal diseases. Furthermore, the seed for Moccasin site were additionally treated with thiamethoxam insecticide (Cruiser MAXX[®], Syngenta Crop Protection, Inc) to control pea leaf weevil infestation. Seeds were then packaged per plot at CARC, Moccasin, and distributed to testing sites with appropriate rhizobium inoculant. The seed rates were 8, 12 and 5 live seeds per ft² for pea, lentil and chickpea, respectively. The experiments were carried out in randomized complete block design with four replications in most of the locations. Plot size varied from site to site depends on land availability and machinery used for seeding and harvesting. Best management practices were employed using available resources at each site. The coordinating center and cooperators recorded plant density, plant height, days to flowering, grain yield, test weight, grain moisture content and thousand kernel weights for most of the sites. Subsamples were requested from the collaborators for further quality analysis by the coordination office. Grain yield data was adjusted to 13%

moisture content before statistical analysis when possible. Analysis of variance were done using GLM of SAS statistical package (SAS 9.3). The protected LSD ($\alpha = 0.05$) procedure was used to differentiate treatment means.

Collaborators and Experimental Locations

Every year, all the agricultural research centers of MSU collaborate in this project and carried out the experiments. The type of pulse crops they evaluated and the number of varieties included vary from site to site depending on the interest of seed suppliers. The collaborating centers, location and type of crop they evaluated are shown in Table 2.

Table 2. Summary table showing collaborating centers and locations participated in 2015 spring pulse variety evaluations

Collaborators [†]	Location	Conditions	Pea	Lentil	Chickpea	Observations
CARC	Moccasin	Dry land	X	X	X	
CARC	Richland	Dry land	X	X	X	
EARC	Sidney	Irrigated	X	X		
EARC	Sidney	Dry land	X	X		Trials abandoned due to hail
LRES	Bozeman	Dry land	X	X		
NARC	Havre	Dry land	X	X		
NWARC	Creston	Dry land	X	X		
SARC	Broadview	Dry land	X	X		
SARC	Huntley	Dry land	X	X	X	
SARC	Huntley	Irrigated	X	X	X	
WARC	Corvallis	Irrigated	X	X	X	
WTARC	Conrad	Dry land	X	X	X	Pea and chickpea trials damaged by deer and antelope

[†]CARC = Central Agricultural Research Center, EARC = Eastern Agricultural Research Center, LRES = Land Resources and Environmental Sciences, NARC = Northern Agricultural Research Center, NWARC = Northwest Agricultural Research Center, SARC = Southern Agricultural Research Center, WARC = Western Agricultural Research Center, WTARC = Western Triangle Agricultural Research Center.

Site Information and Agronomic Management Practices

The experimental sites are scattered all over Montana and the respective precipitation, site information and agronomic management practices are shown in Tables 3 and 4.

Precipitation

The amount of precipitation received from April 1, 2015 to Aug 31, 2015 varied for the different testing sites. The summary is shown in Table 3. Among the different sites, Creston received very low precipitation during this growing period and yield was extremely low for this site compared to previous year. The highest precipitation was received at Moccasin.

Table 3. Growing season and long term average precipitation and irrigation amount applied by Location

	Bozeman (LRES)	Conrad (WARC)	Corvallis (WARC)	Creston (NWARC)	Havre (NARC)	Huntley (SARC)	Moccasin (CARC)	Sidney (EARC)
Season Precipitation (“ (April – Aug, 2015)	7.45	4.40	5.07	2.57	8.05	7.94	9.34	8.77
Site Average (“		8.52	2.57	9.33	8.03	7.99	10.73	9.53
Irrigation applied (“			6” total 2” each in May, June and July			4” total for pea 2” each in June 8 and 25; 6” total for lentil and chickpea 2” each in June 9, June 25 and July 13		3.23” total 1”May, 1.23”June and 1”July

Agronomic practices

The agronomic practices are very different for the different agricultural research centers. The summary of these practices and soil types by location are shown in Table 4.

Table 4. Major site information and agronomic management practices for 2015 by location

	Bozeman (LRES)	Broadview (SARC)	Conrad, Devon (WTARC)	Corvallis (WARC) Irri.	Creston (NWARC)	Sidney Irri (EARC)	Havre (NARC)	Huntleydry (SARC)	Moccasin (CARC)	Richland (CARC)
Tillage	No till	No till	Chemical fallow	Culti-roller	Conventional	Conventional	No till	No till	No till	No till
Soil Type	Amsterdam silt loam		Assiniboine fine sandy loam	Burnt Fork Loam	Creston silt loam	Williams clay loam	Hillon Clay Loam		Judith clay	
Elevation (ft)	4800		3706	3600	2890	2200	2732	2725	4250	2950
Pea Trials										
Dates:										
Seeding	4/11/2015	3/30/2015		4/28/2015	4/29/2015	4/23/2015	4/9/2015	4/2/2015	3/31/2015	4/21/2015
Harvest	7/21 and 26/2015	8/13/2015		8/14/2015	7/24/2015	8/4/2015	7/16/2015	7/27/2015	7/30/2015	8/4/2015
Previous crop		Wheat		Winter wheat	Barley	Sugar beet	Chemical fallow	Fallow	Winter wheat	Chemical fallow
Fertilizer					6-30-20	44-0-0	None	None	None	None
Herbicides and insecticide	Assure II 8 oz/ac; Warrior II 2 oz/a	RT3 24 oz/ac + 2pt Prowl H2O/ac		Pursuit 40 ml/ac and Prowl H2O 950 ml/ac	Prowl H2O 2 pt/A+ Pursuit 3 oz/A (pre-plant), Assure II 10-12 floz/A + NIS 1 qt/100 gal + AMS 2-4 lb/A, Basagran 1-2 pt/A + MSO 0.5-1 pt/A + 28% UAN 2-4 pt/A	Spartan Charge 3 oz/ac	Spartan Charge 3 oz/ac Mustang Max 4oz/ac	RT3 24 oz/ac + 2pt Prowl/ac	Prowl H2O 3pt/a	Roundup and ProwlH2O
Lentil Trials										
Dates:										
Seeding	4/11/2015		4/27/2015	4/28/2015	4/29/2015	4/23/2015	4/8/2015	5/5/2015	4/9/2015	4/22/2015
Harvest	7/29/2015		8/12/2015	8/14/2015	8/17/2015	8/21/2015	7/14/2015	8/4/2015	8/7/2015	8/19/2015
Previous crop			Chemical fallow	Winter wheat	Barley	Sugar beet	Chemical fallow	Barley	Winter wheat	Chemical fallow
Fertilizer			11- 23-20		6-30-20	44-0-0	None			
Herbicides	Assure II 8 oz/ac; Warrior II 2 oz/a		22 oz/a RT3	Same as pea	Prowl H2O 2 pt/A + Pursuit 3 oz/A (pre-plant) Assure II 10-12 floz/A + NIS 1 qt/100 gal + AMS 2-4 lb/A	Same as pea	Prowl H2O 2 pt/ac	RT3 24 oz/ac	Same as pea	Same as pea
Chickpea Trials										
Dates:										
Seeding				4/28/2015				4/21/2015	4/17/2015	4/22/2015
Harvest				8/24/2015				7/27/2015	8/29/2015	9/11/2015
Previous				Winter wheat				Fallow	Winter wheat	Winter wheat
Fertilizer										
Herbicides and insecticide				Same as pea				RT3 24 oz/ac	Same as pea	Same as pea

RESULTS

The results presented in this report include from Statewide and Western Regional dry pea, lentil and chickpea variety evaluation trials. First, results from dry pea (yellow and green) are presented followed by lentil and chickpea. The most common data collected and presented include grain yield, thousand kernel weight, test weight, plant height and number of days to flowering.

Unusual hail damage at Sidney resulted in total loss of dry pea and lentil variety trials from dryland site. So only results from irrigated trial are reported for this site. At Conrad (WTARC), we lost the dry pea and chickpea variety evaluation trials due to animal (antelope and deer) damage. This may need special attention for site selection to avoid data loss for next year. At Richland site, we harvested only one replication for statewide and western regional lentil variety evaluation trials due to the trials being seeded by the cooperator's seeder. So, there is no statistics for these trials at this location and we presented only the results from one replication.

Dry Pea

Statewide Dry Pea Variety Evaluation

A total of 52 dry pea entries (34 yellow and 18 green) (both commercial varieties and experimental lines) were evaluated in 2015 at 11 locations (Bozeman, Broadview, Conrad, Corvallis, Creston, Havre, Huntley dryland and Huntley irrigated, Moccasin, Richland and Sidney) across the state of Montana and three of these sites were irrigated. Some varieties were submitted by private companies on a fee basis and tested at select locations only and some varieties were included from pea line advancement trial. Grain yield, thousand kernel weight, test weight, plant height and flowering date are shown in Tables 6 to 16. The dry pea results are reported into two groups (yellow and green).

Yellow Pea Grain Yield

Yellow pea grain yield varied greatly from location to location due to probably differences in environmental conditions and management practices. Mean grain yield for yellow pea for the different locations ranged from 1144 lb/ac at Creston to 4158 lb/ac at Sidney (irrigated) (Table 6). Last year, Creston was the highest yielding site but this year due to drought at Creston, this site produced very low yield. Average yellow pea yields were 1577 lb/ac at Bozeman, 1298 lb/ac at Broadview, 2405 lb/ac with irrigation at Corvallis, 1144 lb/ac at Creston, 1760 lb/ac at Havre, 1644 lb/ac Huntley (dryland), 3666 lb/ac Huntley irrigated, 2654 lb/ac at Moccasin, 1908 lb/ac at Richland and 4158 lb/ac at Sidney irrigated. The performance of the different varieties in different

locations is shown in Table 6. The grain yields recorded at Huntley and Sidney both irrigated were significantly higher than other sites showing the potential to increase grain yield with supplementary irrigation.

Yellow Pea Thousand Kernel Weight (TKW)

Thousand kernel weights (TKW) data were received only from some research centers as shown in Table 7. The mean maximum TKW (246.1 g/1000seeds) was recorded from Moccasin followed by Richland site (243.2 gm /1000 seeds) and the lowest mean TKW (186.8 g/1000 seeds) was recorded from Havre.

Yellow Pea Test Weight

Test weight data were recorded in most of the sites as shown in Table 8. The mean test weight for most of the sites were very close and ranged from 65.22 lb/bu recorded at Huntley irrigated to 61.13 lb/bu recorded at Havre.

Yellow Pea Plant Height

Mean plant height ranged from 41 cm to 96 cm. The lowest mean plant height was recorded from Corvallis and the highest was recorded from Huntley irrigated (Table 9). Tall and the same time upright varieties are important for harvesting and produce more biomass that will be left in the field after harvest thus contributing more residue that will improve soil organic matter.

Yellow Pea Days to Flowering

Days to flowering data were recorded for most of the locations. From those locations, the mean number of days to flowering was longer at Moccasin (86 days) compared to other sites (Table 10). Moccasin also had longer time to flower in 2013 and 2014 compared with other sites.

Green Pea Grain Yield

The mean grain yield for green pea ranged from 1142 lb/ac to 4202 lb/ac. The average yields for green pea were 1370 lb/ac at Bozeman, 1241 lb/ac at Broadview, 2327 lb/ac at Corvallis with irrigation, 1142 lb/ac at Creston, 1806 lb/ac at Havre, 1581 lb/ac at Huntley (dryland), 3052 lb/ac at Huntley (irrigated), 2505 lb/ac at Moccasin, 1907 lb/ac at Richland and 4202 at Sidney with irrigation (Table 12). The mean grain yield both for green and yellow pea was higher at Sidney with irrigation than other locations.

Green Pea Thousand Kernel Weight (TKW)

TKW data for green pea was recorded only for few sites and ranged from 173.7 gm per 1000 seeds at Havre to 232.9 gm per 1000 seeds at Richland. Similarly, in 2014, the highest mean TKW for green pea was recorded from Richland and the lowest from mean TKW recorded from Havre compared to other locations (Table 13).

Green Pea Test Weight

The mean test weight for green pea ranged from 60.83 lb/bu at Havre sites to 64.92 lb/bu at Huntley irrigated. The details are shown in Table 14.

Green Pea Plant Height

Mean plant height ranged from 32 cm at Corvallis to 93 cm Huntley with irrigation (Table 15).

Green Pea Days to Flowering

The mean number of days to flower ranged from 52 days at Creston to 85 days at Moccasin (Table 16). Similarly, in 2014, the mean number of days to flowering was longer at Moccasin compared with other sites. The higher elevation in Moccasin might result in lower temperature and slow growth thus taking more time to flower.

Summary

In 2015, the mean grain yield both for yellow and green pea was higher for Sidney with irrigation than other locations. The maximum mean grain yield (5472 lb/ac) was recorded from variety Durwood compared with other yellow varieties at Sidney. Similarly, the green color variety Majoret resulted in maximum grain yield (5828 lb/ac) for the same location compared with other green color varieties and locations. The exceptionally high yield recorded at Sidney with irrigation may indicate the potential of this site for pea production under supplemental irrigation.

We found significant yield differences among varieties at several locations (Tables 6 and 12). On average, yellow pea varieties yielded 5% more grain yield than green pea in 2015. Several varieties have performed well in certain locations. However, none of the varieties consistently out yielded in all locations. In other words, the variety that resulted in maximum mean grain yield varied from location to location. This might suggest the importance of considering the release of location specific variety, due to the diverse ecologies of Montana, for better agronomic performances and economic returns.

Note: The following results and summary are for **informational purposes only**. Inclusion of any commercial variety in this summary does not constitute a recommendation by MSU-MAES or CARC.

Table 5. Yellow Dry Pea Variety Sources and Characteristics

Variety*	Size	Maturity	Height	Breeding Program	Release Date
AC Agassiz	M	Late	Mod	AC	2007
Bridger	M	Mod	Mod	LL	2011
CDC Treasure	M		Tall	CDC	2009
Delta	M	Mod	Short		1995
DS Admiral	L	Mod	Tall		2000
Gunner					
Jet Set	L	Late	Mod		
Korando	L	Late	Mod		
Montech 4152	ML	Mod	Tall	LIMG	2009
Montech 4193	M	Mod	Mod	LIMG	
Mystique	L	Late	Mod		
Navarro	VL	Early	Mod		
Nette 2010					
Pro 127-2	M	Mod	Mod	PG	
Pro 793	VL	Early	Short	PG	
Salamanca					
Spider	L	Mod	Tall	LL	2008
SW Midas	M	Mod	Mod	SW	2004
Torch					
Trapeze	VL	Late	Short	SW	2010

NDSU = North Dakota State University; CDC = Crop Development Centre, University of Saskatchewan; AC = Agriculture Canada; LL = Legume Logic; PG = ProGene Plant Research; LIMG = Limagrain, Nederland; SW = Svalöf-Weibull.

*Because some of the breeding entries have not been registered and released as varieties and lack of information for other varieties, this table does not contain complete list of all entries and information.

Table 6. 2015 Montana Statewide Dry Yellow Pea Variety Evaluation – Grain Yield (lb/ac)

Yellow pea variety/line	Bozeman	Broadview	Conrad	Corvallis (Irri)	Creston	Havre	Huntley (Dry)	Huntley (Irri)	Moccasin	Richland	Sidney (Irri)
AAC Carver	1670	1330		2243	1030	1617	1770	3774	2538	1920	4560
AAC Lacombe						1750			2441	1311	4358
Abarth	1621	1434			1029	1735	1855	4215	3000	1745	4289
AC Agassiz	1384	1207		2169	1172	1479	1616	3777	2287	1596	3515
Bridger						1561	1447	3647		1875	
CDC Amarillo	1566	1364		2629	966	1409	1558	3769	2631	1936	
CDC Meadow	1685	1363		2450	1158	1506	1685	3783	2674	2013	4211
CDC Saffron	1523	1291		2434	1392	1523	1784	3703	2546	1668	3786
CDC Treasure	1539	1247		2395	1327	1516	1409	3384	2256	1886	3755
DS Admiral	1569	1405		2396	1192	1897	1733	4027	2731	1735	3342
Delta	1564	1221		2410	889	1793	1635	3592	2644	1923	3426
Durwood									2517	1874	5472
AC Earlystar	1864	1318		2567	1248	1634	1838	3580	2945	2152	3725
Gunner						1598			2673	1901	
Hyline		1336			1165	1694	1593	3681	2617	1944	
Jetset	1594	1373		2364	1356	1802	1837	3631	2905	1938	3686
Korando		1383			893	1550	1718	3814	2418	1940	4256
LL 1139									2542		
LL 1404									3165		
LL 1406									2610		
LL 1408									2964		
Mystique	1451	1187			829	1454	1393	3762	2386	1937	4050
Navarro		1297			1165	1914	1888	3646		1991	
Nette 2010	1640	1264			1465	2072	1809	4133	2512	1930	4826
PSO826MT290	1346					2097	1462	2316	2766	2114	
PSO826MT460	1113					1981	1319	3487	2918	2083	
PSO877MT632	1254					2247	1475	3522	2572	2142	
Pro133-6243						2224		3825		2330	
Pro 822							1910	3679			
Salamanca	1357					1972	1544	3585	2542	1821	
Spider	1334					1526	1547		2702	1859	
SW Midas											5012
Trapez						1779			2433	1739	4341
Vegas										2127	
Yellowstone (Pro)						2199			3044		
Yellow pea means	1577	1298		2405	1144	1760	1644	3666	2654	1908	4158
P-Value	0.613	0.0214		0.9814	0.1616	<0.0001	0.2516	0.0004	0.0015	0.2076	0.4831
LSD (0.05)	NS	174		NS	NS	291	NS	582	424	NS	NS
CV (%)	16.15	9.47		22.07	26.82	11.76	16.54	11.26	11.36	18.35	28.28

Table 7. 2015 Montana Statewide Dry Yellow Pea Variety Evaluation –Thousand Kernel Weight (TKW) Summary (g/1000seed)

Yellow pea variety/line	Bozeman	Broadview	Conrad	Corvallis (Irri)	Creston	Havre	Huntley (Dry)	Huntley (Irri)	Moccasin	Richland	Sidney (Irri)
AAC Carver				244.3	189.0	165.6			231.7	230.1	218.0
AAC Lacombe						194.2			265.4	263.3	227.3
Abarth					208.3	205.8			275.1	253.8	221.3
AC Agassiz				235.5	194.3	169.8			235.4	236.3	210.0
Bridger						173.1				217.6	
CDC Amarillo				221.3	185.0	162.8			234.8	237.8	
CDC Meadow				202.7	160.3	145.3			208.0	208.3	176.5
CDC Saffron				242.1	190.4	176.8			245.0	240.3	203.3
CDC Treasure				227.0	176.5	155.8			215.1	215.3	188.8
DS Admiral				235.3	187.8	182.7			247.4	247.9	202.3
Delta				216.4	173.7	188.6			230.8	225.9	202.0
Durwood									238.1	235.4	228.5
AC Earlystar				215.0	178.5	155.6			228.4	219.3	193.5
Gunner						179.1			243.9	247.5	
Hyline					193.4	175.8			243.1	236.1	
Jetset				237.2	184.6	188.7			246.0	226.2	203.0
Korando					208.4	219.9			258.4	264.3	254.0
LL 1139									237.5		
LL 1404									267.1		
LL 1406									239.8		
LL 1408									228.7		
Mystique					215.0	193.4			265.7	259.6	235.0
Navarro					200.8	193.4			265.7	261.5	
Nette 2010					182.8	213.9				243.6	269.8
PSO826MT290						182.3			248.4	259.1	
PSO826MT460						220.9			267.3	256.7	
PSO877MT632						203.8			251.3	236.2	
Pro133-6243						177.5			223.1	288.1	
Pro133-6243						222.2				247.0	
Pro 822											
Salamanca						195.1			257.7		
Spider						189.4			253.8	256.4	
SW Midas											199.0
Trapez						182.6			264.8	247.2	206.3
Vegas										247.6	
Yellowstone (Pro)						224.3			285.7		
Yellow pea means				228.0	188.7	186.8			246.1	243.2	214.0
P-Value				0.1851	<0.0001	<0.0001			<0.0001	<0.0001	0.0006
LSD (0.05)				NS	2.9	3.14			11.1	11	36.8
CV (%)				9.64	5.42	2.39			3.21	3.22	12.11

Table 8. 2015 Montana Statewide Dry Yellow Pea Variety Evaluation – Test Weight (lb/bu)

Yellow pea variety/line	Bozeman	Broadview	Conrad	Corvallis (Irri)	Creston	Havre	Huntley (Dry)	Huntley (Irri)	Moccasin	Richland	Sidney (Irri)
AAC Carver	64.57	65.63		62.08	64.87	61.38	64.37	66.38	63.85	62.35	62.63
AAC Lacombe						62.00			63.90	64.13	63.78
Abarth	64.57	63.80			63.70	61.18	63.83	65.30	61.63	62.63	62.00
AC Agassiz	63.70	63.93		61.63	64.57	60.80	62.10	62.70	62.58	62.43	61.90
Bridger						61.15	63.90	66.13		63.10	
CDC Amarillo	64.40	65.40		61.48	64.50	62.10	63.77	64.95	63.23	63.00	
CDC Meadow	65.43	64.38		62.63	65.23	61.78	64.10	66.35	63.73	63.05	63.23
CDC Saffron	65.60	65.05		61.43	60.75	61.00	62.87	62.95	63.95	63.33	62.20
CDC Treasure	65.65	64.63		61.05	65.67	62.10	65.27	66.90	64.83	63.60	62.93
DS Admiral	63.68	64.30		61.30	64.75	60.55	63.70	65.23	63.20	62.83	62.00
Delta	65.00	65.05		61.73	64.63	61.28	64.93	65.70	64.65	63.38	62.13
Durwood									63.00	63.10	63.08
AC Earlystar	62.85	64.55		61.53	65.53	61.03	63.00	65.40	62.90	62.78	62.28
Gunner						60.60			63.60	63.43	
Hyline		64.73			65.55	61.70	62.80	64.33	63.00	62.38	
Jetset	64.63	64.43		62.10	65.38	60.75	63.17	64.83	63.45	63.45	63.05
Korando		64.75			64.93	60.45	64.00	64.80	62.43	63.00	61.58
LL 1139									63.98		
LL 1404									63.45		
LL 1406									63.20		
LL 1408									64.93		
Mystique	60.60	64.30			62.97	60.28	62.73	64.63	63.00	62.93	62.18
Navarro		64.35			64.50	60.80	64.10	64.63		63.70	63.10
Nette 2010	65.70	65.80			66.38	61.80	65.00	66.45	64.53	64.08	
PSO826MT290		65.40				61.18	63.43	63.60	62.88	64.00	
PSO826MT460		64.10				60.60	54.20	65.70	62.68	62.38	
PSO877MT632		64.18				60.93	63.17	64.55	62.70	63.18	
Pro133-6243						61.40				63.65	
Pro 822							65.33	66.68			
Salamanca		64.95				60.63	62.93	66.13	63.00	63.03	
Spider		64.95				61.13	63.10	65.85	63.13	63.40	
SW Midas											62.63
Trapez						60.60			61.65	63.03	62.48
Vegas										63.28	
Yellowstone (Pro)						61.48			63.55		
Yellow pea means	64.32	64.67		61.69	64.66	61.13	63.29	65.22	63.33	63.16	62.54
P-Value	0.3364	<0.0001		0.4935	0.3793	<0.0001	0.1976	0.0030	<0.0001	<0.0001	<0.0001
LSD (0.05)	NS	0.83		NS	NS	0.53	NS	2.05	0.66	0.68	0.76
CV (%)	3.63	0.91		1.52	3.67	0.62	5.11	2.23	0.74	0.76	0.86

Table 9. 2015 Montana Statewide Dry Yellow Pea Evaluation – Plant Height (cm)

Yellow pea variety/line	Bozeman	Broadview	Conrad	Corvallis (Irri)	Creston	Havre	Huntley (Dry)	Huntley (Irri)	Moccasin	Richland	Sidney (Irri)
AAC Carver		68		41	46	62	78	102	80	50	
AAC Lacombe						62			78	52	
Abarth		59			45	51	68	99	73	47	
AC Agassiz		58		43	46	54	69	93	72	52	
Bridger						53	61	94		47	
CDC Amarillo		71		49	43	65	69	96	72	54	
CDC Meadow		57		38	43	60	72	93	72	49	
CDC Saffron		62		39	40	54	60	85	67	49	
CDC Treasure		73		43	45	58	72	92	73	51	
DS Admiral		72		40	42	54	75	98	73	52	
Delta		59		32	34	53	60	95	67	43	
Durwood									80	58	
AC Earlystar		69		36	47	58	78	94	77	56	
Gunner						57			72	52	
Hyline		66			40	60	72	93	70	44	
Jetset		67		45	48	61	72	97	76	49	
Korando		61			38	53	69	95	77	47	
LL 1139									68		
LL 1404									83		
LL 1406									81		
LL 1408									73		
Mystique		64			41	62	74	112	81	55	
Navarro		62			40	60	68	94		49	
Nette 2010		58			40	52	64	99	78	46	
PSO826MT290		52				65	80	105	89	54	
PSO826MT460		57				51	62	83	80	45	
PSO877MT632		63				59	64	93	68	48	
Pro133-6243						51				51	
Pro 822							71	95			
Salamanca		68				65	68	102	77	53	
Spider		70				58	73	100	74	54	
SW Midas											
Trapez						55			75	49	
Vegas										48	
Yellowstone (Pro)						53			75		
Yellow pea means		63		41	42	57	69	96	75	50	
P-Value		0.0012		0.0036	0.0191	0.0348	0.0003	0.0671	0.2332	0.0107	
LSD (0.05)		9		7	1	10	9	NS	NS	7.3	
CV (%)		10.89		12.91	11.67	12.15	7.68	9.96	12.28	10.41	

Table 10. 2015 Montana Statewide Dry Yellow Pea Variety Evaluation – Number of Days to Flowering

Yellow pea variety/line	Bozeman	Broadview	Conrad	Corvallis (Irri)	Creston	Havre	Huntley (Dry)	Huntley (Irri)	Moccasin	Richland	Sidney (Irri)
AAC Carver	70			54	54	65	57	73	83		56
AAC Lacombe						66			90		57
Abarth	68				54	62	54	75	83		54
AC Agassiz	71			51	53	64	56	72	88		56
Bridger						62	57	73			
CDC Amarillo	71			55	55	66	56	74	89		
CDC Meadow	69			52	51	64	55	72	85		55
CDC Saffron	71			55	54	65	55	74	88		56
CDC Treasure	69			52	51	64	56	75	84		55
DS Admiral	69			52	52	64	56	73	86		56
Delta	69			50	50	62	57	74	83		55
Durwood									86		56
AC Earlystar	69			51	52	64	57	75	84		55
Gunner						65			87		
Hyline					51	65	57	74	84		
Jetset	70			54	52	65	56	72	87		55
Korando					52	60	55	74	82		53
LL 1139									84		
LL 1404									85		
LL 1406									87		
LL 1408									87		
Mystique	71				52	63	57		86		56
Navarro					49	58	58	73			
Nette 2010	69				49	62	56	74	85		55
PSO826MT290						61	58	74	82		
PSO826MT460						62	56	74	85		
PSO877MT632						63	57	73	86		
Pro133-6243						61					
Pro 822							57	73			
Salamanca						63	58	73	87		
Spider						64	55	72	89		
SW Midas											56
Trapez						63			86		56
Vegas											
Yellowstone (Pro 793)						61			85		
Yellow pea means	70			53	52	63	56	73	86		55
P-Value	<0.0001			<0.0001	<0.0001	<0.0001	0.0202	0.4717	<0.0001		<0.0001
LSD (0.05)	0.2			2	0.5	0.6	2	NS	2.3		0.1
CV (%)	0.96			2.46	3.32	0.71	2.02	2.19	1.94		0.77

Table 11. Green Pea Variety Sources and Characteristics

Variety*	Size	Maturity	Height	Breeding	Release
Aragorn	M	Mod	Mod	PG	2006
Arcadia	M	Mod	Short		2009
Banner	M	Early	Tall	PG	2007
Bluemoon	VL	Late	Short		
CDC Striker	L	Mod	Mod	CDC	2002
Cruiser	S	Mod	Tall	PG	2002
Daytona	VL	Late	Short		
Greenwood					
K2	M	Mod	Mod	LL	2005
Majoret	M	Mod	Short	SW	1994
PS07ND0190	M	Late	Tall	NDSU	
Shamrock					
Viper	L	Late	Mod		

PG = ProGene Plant Research; CDC = Crop Development Centre, University of Saskatchewan; LL = Legume Logic; NDSU = North Dakota State University; LIMG = LImagrain, Netherlands; SW = Svalöf-Weibull.

*Because some of the breeding entries have not been registered and released as varieties and lack of information for other varieties, this table does not contain complete list of all entries tested and information.

Table 12. 2015 Montana Statewide Dry Green Pea Variety Evaluation – Grain Yield (lb/ac)

Green pea variety/line	Bozeman	Broadview	Conrad	Corvallis (Irri)	Creston	Havre	Huntley (Dry)	Huntley (Irri)	Moccasin	Richland	Sidney (Irri)
Aragorn	1322	1163		2771	1241	1579	1699	2649	2142	1731	3459
Arcadia	1101	1247		2499	1155	1782	1617	3964	2333	2273	4749
Banner						2131			2771		
Bluemoon										1942	
CDC Striker	1385	1194		1960	1137	1528	1541	2831	2212	1652	4125
Daytona	1393	1340		2374	1041	1721	1663	3619	2675	1939	4434
Ginny						1921	1615		2204	1730	
Greenwood						1639	1618		2412	1914	
Hampton	1549			2225		1882	1729		2420	1857	4806
K-2											3834
LN1123					1073	1736			2781	1702	2196
Majoret	1110	1095		2136	1243	1822	1307	3876	2867	1873	5828
Pro131-6221						1729					
PS0877MT457						1914			2758	1744	
PSO826MT190		993				1813	1260	2920	2534	2075	
PSO877MT076		1264				2052	1615	2230	2646	2203	
PSO877MT499		1426				1729	1597	2053	2205	1997	
Viper	1675	1453			1113	1852	1719	3330	2624	1980	3752
Mean	1370	1241		2327	1142	1806	1581	3052	2505	1907	4202
P-value	0.0582	0.0003		0.8943	0.8654	0.0057	0.0106	0.0425	0.0023	0.1273	0.0136
LSD (0.05)	NS	183		NS	NS	283	249	352	401	NS	370
CV (%)	17.07	10.18		43.55	21.19	11.00	9.36	29.20	11.25	15.28	21.84

Table 13. 2015 Montana Statewide Dry Green Pea Variety Evaluation – Thousand Kernel Weight (TKW) (g/1000 seed)

Green pea variety/line	Bozeman	Broadview	Conrad	Corvallis (Irri)	Creston	Havre	Huntley (Dry)	Huntley (Irri)	Moccasin	Richland	Sidney (Irri)
Aragorn				218.2	155.5	166.0			225.3	218.0	175.3
Arcadia				215.2	170.8	146.7			200.8	205.0	195.5
Banner						169.4			210.3		
Bluemoon										249.6	
CDC Striker				215.9	192.8	182.7			238.4	235.6	218.5
Daytona				246.0	197.8	197.9			249.1	260.9	228.8
Ginny						163.8			227.9	221.1	
Greenwood						150.9			216.5	209.4	
Hampton				242.9		173.2			223.9	234.6	213.3
K-2											199.5
LN1123					172.6	182.4			235.0	222.4	164.0
Majoret				234.1	205.9	193.0			258.1	251.5	224.3
Pro131-6221						155.0					
PS0877MT457						177.9			236.7	237.2	
PSO826MT190						169.5			231.4	238.1	
PSO877MT076						192.6			217.1	223.4	
PSO877MT499						155.0			226.1	241.4	210.3
Viper					184.0	184.1			240.0	246.4	
Mean				229.0	183.2	173.7			229.1	232.9	204.0
P-value				0.3594	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001
LSD (0.05)				NS	3.5	3.28			9.9	9.6	4.2
CV (%)				11.34	4.09	2.66			3.05	2.89	5.63

Table 14. 2015 Montana Statewide Dry Green Pea Variety Evaluation – Test Weight (lb/bu)

Green pea variety/line	Bozeman	Broadview	Conrad	Corvallis (Irri)	Creston	Havre	Huntley (Dry)	Huntley (Irri)	Moccasin	Richland	Sidney (Irri)
Aragorn	62.80	62.40		62.03	63.08	60.58	63.57	64.28	62.08	61.60	62.10
Arcadia	64.15	63.75		62.83	64.30	60.73	63.70	65.23	63.83	62.88	62.80
Banner						61.25			63.75		
Bluemoon										63.08	
CDC Striker	65.33	65.08		61.20	65.17	61.28	64.10	65.93	64.03	63.23	63.05
Daytona	65.78	64.13		61.95	64.83	60.35	63.63	65.63	63.63	62.63	62.50
Ginny						61.00	63.17		62.48	63.25	
Greenwood						61.83	63.70		63.35	62.95	
Hampton	64.05			60.88		60.70	63.63		63.20	62.25	62.62
K-2											62.35
LN1123					62.55	60.23			65.33	63.50	63.11
Majoret	64.75	64.45		62.35	63.95	59.90	63.47	65.48	63.03	62.88	62.58
Pro131-6221						61.30					
PS0877MT457						60.85			63.03	62.23	
PSO826MT190		64.13				60.55	63.20	63.75	62.53	62.73	
PSO877MT076		63.73				61.68	62.67	64.80	63.08	62.43	
PSO877MT499		64.50				61.30	63.97	64.75	63.35	62.83	
Viper	64.03	63.80			64.18	60.23	62.97	64.50	63.45	63.03	62.25
Mean	64.45	63.99		61.87	63.94	60.83	63.48	64.92	63.34	62.76	62.59
P-value	0.0015	0.0457		0.0417	0.7235	<0.0001	0.5519	0.0186	<0.0001	0.0036	0.1156
LSD (0.05)	0.39	1.39		1.25	NS	0.52	NS	1.19	0.12	0.81	NS
CV (%)	1.24	1.51		1.36	3.56	0.60	1.18	1.27	0.64	0.91	0.82

Table 15. 2015 Montana Statewide Dry Green Pea Variety Evaluation – Plant Height (cm)

Green pea variety/line	Bozeman	Broadview	Conrad	Corvallis (Irri)	Creston	Havre	Huntley (Dry)	Huntley (Irri)	Moccasin	Richland	Sidney (Irri)
Aragorn		56		32	42	52	66	95	68	48	
Arcadia		52		24	36	46	61	83	65	44	
Banner						52			71		
Bluemoon											43
CDC Striker		63		42	40	55	71	95	66	51	
Daytona		64		33	45	52	70	93	73	52	
Ginny						52	66		68	45	
Greenwood						48	63		67	44	
Hampton				29		46	57		66	37	
K-2											
LN1123					37	54			73	47	
Majoret		65		35	41	56	71	90	76	45	
Pro131-6221						52					
PS0877MT457						53			77	51	
PSO826MT190		69				57	74	105	78	47	
PSO877MT076		66				57	60	91	67	52	
PSO877MT499		67				52	67	94	58	49	
Viper		73			46	56	73	96	75	55	
Mean		64		32	41	52	66	93	70	47.2	
P-value		0.0376		0.0053	0.0692	0.1729	0.009	0.2963	0.2724	0.0015	
LSD (0.05)		11		8	NS	NS	9	NS	NS	7.31	
CV (%)		12.82		16.29	11.59	11.21	8.11	10.83	13.94	10.86	

Table 16. 2015 Montana Statewide Dry Green Pea Variety Evaluation – Number of Days to Flowering

Green pea variety/line	Bozeman	Broadview	Conrad	Corvallis (Irri)	Creston	Havre	Huntley (Dry)	Huntley (Irri)	Moccasin	Richland	Sidney (Irri)
Aragorn	68			50	48	62	56	75	82		54
Arcadia	70			52	51	64	55	74	87		55
Banner						61			78		
Bluemoon											
CDC Striker	71			54	54	65	56	75	87		56
Daytona	70			52	53	65	55	73	87		56
Ginny						63	58		86		
Greenwood						64	57		84		
Hampton	71			54		66	57		88		56
K-2											55
LN1123					55	65			87		57
Majoret	71			55	51	61	57	75	87		56
Pro131-6221						63					
PS0877MT457						63			83		
PSO826MT190						64	57	73	86		
PSO877MT076						62	57	73	89		
PSO877MT499						63	56	74	84		
Viper	70				51	63	56	73	87		55
Mean	70			53	52	63	57	74	85		56
P-value	<0.0001			0.0020	<0.0001	<0.0001	0.2434	0.1422	0.0016		<0.0001
LSD (0.05)	0.8			2	0.5	0.9	NS	NS	4.5		0.2
CV (%)	0.8			2.82	2.03	1.04	2.41	1.86	3.69		0.87

Multi-Year and Multi-Location Statewide Dry Pea Variety Evaluation

Multi-year (2008-2015) Summary:

The multi-year grain yield data for different varieties and locations are shown in Table 17. One of the problem with this multiyear data is that every year variety changed and make it difficult for comparison purpose to calculate the mean for a variety across years. This is because the interest of seed companies to test their varieties change every year in terms of submitting varieties and choosing testing sites. However, this table may provide some information for those interested in the dynamic of yield change across years for a given variety that is repeated every year.

Table 17. Montana Statewide Dry Pea Variety Evaluation – 2008-2015 Multi-Year Grain Yield Summary (lb/ac)

Varieties	Bozeman								Conrad							
	2008	2009	2010	2011	2012	2013	2014	2015	2008	2009	2010	2011	2012	2013	2014	2015
Yellow Pea																
AC Agassiz					905	1857	2492	1384				2867	2746	1519	2876	
Bridger				2476	1085	1763	2464					3259	2793	1741	2212	
Delta	1882	2158	3118	2105	1011	1779		1564	2177	3996	869	2832	2526	1641		
DS Admiral	1846	2486	3439	2206	910	1910	2665	1569	1966	3607	1212	3070	2204	1638	2795	
Montech 4152				2378	1074	2019	2444					3066	3116	1862	3456	
Spider				2188	1037	1971					1100	2664	2426	1748	3492	
SW Midas		2018	3436	2382	1048	1780	2396			3620	1212	2774	2674	1846	3216	
Yellow Ave*	1777	2193	3277	2246	1008	1883	2452	1577	2091	3789	1181	2853	2745	1741	2723	
Green Pea																
Arcadia				2378	966	1978	2349	1101				3178	2281	1718	3346	
CDC Striker		2343	2585	2081	918	1502	2283	1385		3189	1147	2632	2254	1812	2017	
Cruiser	1438	2247	3041	2152	872	1731	2101		1592	3154	965	2746	2002	1488	2995	
K2				2018	962	1500					1304	2622	2246	1713	2619	
Majoret	1766	2218	3008	2039	961	1705	2255	1110	1884	3345	1623	2382	2407	1607	2469	
Stirling	1994	2031	3288	2184	1088				1887	3932	926	2651	2746			
Green Ave*	1724	2246	2934	2123	961	1709	2312	1370	1794	3307	1164	2581	2373	1704	1177	
Trial Means[§]	1747	2214	3145	2177	986	1811	2385	1504	1836	3585	1174	2702	2577	1734	2798	
LSD (0.05)[§]	227	310	639	NS	144	NS	NS	70	583	479	298	NS	NS	483	NS	
CV (%)[§]	9	10	14	7	10	11	14	16	19	8	18	14	29	20	32	

*Average values brought from Table 6 and 12 for yellow and green pea, respectively. [§]Indicate results from both green and yellow color dry peas analyzed together.

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Table 17. Statewide Dry Pea Variety Evaluations – 2008 – 2015 Multi-year Grain Yield Summary (lb/ac)...continued

Varieties	Corvallis								Havre							
	2008	2009	2010	2011	2012	2013	2014	2015	2008	2009	2010	2011	2012	2013	2014	2015
Yellow Pea																
AC Agassiz					2812	1902	1066	2169				2236	1965	2027	2215	1479
Bridger				1862	3170	2525	1593					2149	1837	2127	1920	1561
Delta	1725	3276	3671	1674	2987	2594		2410	3021	2446	3600	2139	2222	1700		1793
DS Admiral	1844	2882	2941	1770	2518	2385	1622	2396	2789	2331	3325	2102	1798	2008	2592	1897
Montech 4152				1946	2899	2096	1395				3505	2266	2146	1828	2056	
Spider				2155	2899	1503						2071	1903	1734	1953	1526
SW Midas		2828	4029	1998	3064	2333	1495		2849	2314	3348	2111	1729	2033	2100	
Yellow Ave*	1923	3057	3590	1865	2907	2306	1350	2405	3027	2340	3495	2173	2039	2032	2228	2199
Green Pea																
Arcadia				2272	3029	2704	1295	2499				2405	1930	2598	1817	1782
CDC Striker		3144	3068	1866	2375	2053	1354	1960	2682	2154	3222	2012	1953	1571	1833	1528
Cruiser	1332	3046	3144	1967	2562	1543	1384		2735	2254	3194	2286	1735	1669	1856	
K2				1894	2470	2000						1576	1463	1650	1773	
Majoret	2074	3278	3812	1641	2447	1439	1570	2136	2694	2352	3451	1612	1685	2193	2105	1822
Stirling	1654	3144	3525	1475					3103	2327	3274	1915	2122			
Green Ave*	1706	3173	3313	1750	2630		1380	2327	2758	2252	3241	1987	1874	2011	2080	1806
Trial Means[§]	1835	3101	3483	1801	2779	2203	1362	2376	2942	2306	3397	2069	1968	2022	2170	1776
LSD (0.05)[§]	NS	627	495	NS	1057	950	NS	NS	317	290	325	NS	309	447	294	285
CV (%)[§]	39	14	10	23	14	30	17	31	8	9	7	13	11	14	10	11

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Table 17. Statewide Dry Pea Variety Evaluations – 2008 – 2015 Multi-year Grain Yield Summary (lb/ac)...continued

Varieties	Huntley (Dry)								Joplin							
	2008	2009	2010	2011	2012	2013	2014	2015	2008	2009	2010	2011	2012	2013	2014	2015
Yellow Pea																
AC Agassiz																
Bridger																
Delta	1612	2542	2517	1904	1414	2648										
DS Admiral				2128	1261	2840	1223	1733								
Montech 4152																
Spider																
SW Midas	2329		2760	2106	1855	2745	1151									
Yellow Ave*	1457	2591	2773	2065	1630	2707	1126	1644								
Green Pea																
Arcadia																
CDC Striker	2417		2556	1568	1128			986	1541							
Cruiser	2520		2575	1998	1232	2566	991									
K2																
Majoret	1277	2501	2945	1660	1331			1128	1307							
Stirling	1841	2633	2874	1527	1942											
Green Ave*	1462	2471	2632	1729	1482	2442	1042	1581								
Trial Means^s	1486	2545	2719	1878	1556	2634	1096	1623								
LSD (0.05)^s	355	274	NS	NS	NS	300	295	NS								
CV (%)^s	17	8	12	20	29	8	19	15								

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Table 17. Statewide Dry Pea Variety Evaluations – 2008 – 2015 Multi-year Grain Yield Summary (lb/ac)...continued

Varieties	Moccasin								Richland							
	2008	2009	2010	2011	2012	2013	2014	2015	2008	2009	2010	2011	2012	2013	2014	2015
Yellow Pea																
AC Agassiz			2855	1123	1100	559	2220	2287				2224	3242	4107	1359	1596
Bridger			2981	1160	1064	1826	2176				3295	2494	3878	3323	1145	1875
Delta	991	1177	3139	963	1313	1899		2644	1633	2015	3226	1501	3706	3573		1923
DS Admiral	1060	1158	2642	999	1295	1835	2213	2731	1536	2018	3264	1664	3564	3645	1153	1735
Montech 4152			2533	1018	1084	1791	2176					1809	3409	3786	1216	
Spider			2572	1005	1252	1750	2069	2702			2731	1910	1252	3959	1296	1859
SW Midas	697	903	2603	1031	1165	1557	2019		2007	1435	2321	2166	2983	3873	1034	
Yellow Ave*	930	1058	2796	992	1241	1678	2165	2654	1761	1855	2999	1855	3566	3807	1200	1908
Green Pea																
Arcadia				978	1186	1655	2010	2333				1494	3143	3777	1182	2273
CDC Striker	809	1066	2427	774	1193	1753	2156	2212		1918	2976	1732	3270	2914	1125	1652
Cruiser	682	1001	2680	988	1123	1502	1860		1456	1797	2642	1684	3010	3289	998	
K2			2436	851	1457	1259	1780				2721	1772	3476	2803		
Majoret	722	1091	2608	848	1027	1584	2054	2867	1457	2221	2981	1653	3078	3022	1275	1873
Stirling	885	1136	2907	838	1392				1590	1565	2566	1493	3725			
Green Ave*	783	1091	2665	887	1200	1594	2029	2505	1513	1927	2798	1628	3410	3440	1127	1907
Trial Means[§]	875	1071	2754	934	1224	1640	2113	2603	1677	1882	2922	1729	3501	3622	1172	1908
LSD (0.05)[§]	172	208	203	120	NS	291	245	412	NS	577	NS	289	NS	777	NS	NS
CV (%)[§]	14	12	5	9	16	13	8	11	15	21	13	10	16	15	30	17

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Table 17. Statewide Dry Pea Variety Evaluations – 2008 – 2015 Multi-year Grain Yield Summary (lb/ac)...continued

Varieties	Sidney dryland						
	2008	2009	2010	2011	2012	2013	2014 2015
Yellow Pea							
AC Agassiz					1619		2436
Bridger				2998	1249		1983
Delta	1420	1887	3105	2662	1464		
DS Admiral	1078	1757	3016	2517	1158		2693
Montech 4152				2463	1586		2521
Spider				2504	1297		
SW Midas		1511	3639	2589	1571		2909
Yellow Ave*	1261	1884	3489	2502	1421		2604
Green Pea							
Arcadia				2772	1302		2575
CDC Striker		1988	3408	2212	1122		2594
Cruiser	1398	1806	2820	2223	1202		2440
K2			2751	2296	1435		
Majoret	1048	2080	3342	2233	1336		
Stirling	1159	1658	3052	2601	2041		
Green Ave*	1221	1898	3104	2341	1406		2515
Trial Means[§]	1794	1964	3341	1659	1414		2569
LSD (0.05)[§]	1005	301	792	NS	465		NS
CV (%)[§]	39	9	9	14	20		13

Table 18. Claims and/or Resistance of Commercial Pea Varieties:

(This table is claims made by the breeding programs and/or commercial dealers and is not based on research conducted by MAES or CARC).

Variety*	Powdery Mildew Resistant ¹	Lodging Resistant ²	Height	<i>Fusarium</i> Resistance ³	Bleach Resistant ⁴	Maturity
AC Agassiz	X	X				
Aragorn		X			X	Med
Arcadia	X	X				Early
Banner		X				Early
Bluemoon	X	X	Tall			Med
Bridger	X	X	Tall			Early
CDC Striker			Med			Med
CDC Treasure	X	X				
Cruiser		X		X		Med
Daytona	X	X	Tall			Med
Delta				X		
DS Admiral	X	X				Early
Jet Set	X	X				Med
K2	X	X			X	Early
Korando						Early
Majoret		X				Med
Montech 4152			Tall			
Navarro	X	X				Early
Spider	X	X				Med
SW Midas	X	X				Early
Trapeze	X	X	Med			Early

¹Varieties exhibit above average resistance to Powdery Mildew; ²Varieties have above average resistance to lodging;

³Varieties are resistant to *Fusarium*; ⁴Varieties are resistant to bleaching; *Because some of the breeding entries have not been registered and released as varieties and lack of information for others, this table is not complete and inclusive.

Western Regional Dry Pea Variety Evaluation

The Western Regional dry pea variety evaluation trial was conducted at three locations (Havre, Moccasin and Richland). The trial consisted of seven yellow and 11 green dry pea advanced breeding lines and varieties. Most of the advanced breeding lines and varieties were obtained from the USDA-ARS Grain Legume Genetics and Physiology Program in Pullman, Washington.

The yellow pea had average yields of 2021 lb/ac at Havre, 1291 lb/ac at Moccasin, and 1727 lb/ac at Richland (Tables 19 - 21). The average yields of green pea were 1928 lb/ac at Havre, 1339 lb/ac at Moccasin, and 1717 lb/ac at Richland (Tables 19 - 21). The mean for green pea varieties was higher than the mean for yellow dry pea at Moccasin which is uncommon usually.

Table 19. 2015 Western Regional Dry Pea Variety Evaluation – Havre, MT

Variety/lines	Adjusted grain yield (lb/ac)	No of days to flowering	Plant height (cm)	TKW (gm)	Test wt (lb/bu)
Yellow					
CDC Treasure	1877	63	184	163.7	62.38
DS Admiral	1962	64	184	187.9	61.13
Delta	1807	62	184	200.6	61.95
PS07100925	2086	63	185	207.1	61.33
PS08100950	1885	66	185	217.2	62.73
PS08101004	2232	64	185	201.1	61.50
PS0810122	2304	61	185	206.5	61.60
Mean	2021	63	185	197.7	61.80
P-value	0.0085	<0.0001	0.0048	<0.0001	<0.0001
LSD (0.05)	281	0.90	0.9	8.9	0.37
C.V (%)	9.48	0.96	0.32	1.52	0.41
Green					
Arcadia	2170	64	185	155.1	61.13
CDC Striker	1454	66	184	189.2	62.15
Hampton	1835	66	187	180.4	61.08
Majoret	1937	64	185	188.0	60.75
PS03101445	1820	62	185	164.0	61.33
PS05100840	1931	66	187	187.4	61.08
PS07100470	1955	65	186	162.3	60.25
PS08100133	2080	63	186	185.9	60.70
PS08100582	1887	64	186	179.0	61.03
PS10100158	2034	64	186	146.8	60.53
PS10100370	2108	64	187	187.1	61.58
Mean	1928	64	185	175.0	61.05
P-value	0.0021	<0.0001	<0.0001	<0.0001	<0.0001
LSD (0.05)	289	0.6	0.9	10	0.4
C.V (%)	10.41	0.69	0.36	1.99	0.51

Table 20. 2015 Western Regional Dry Pea Variety Evaluation – Moccasin, MT

Variety/lines	Adjusted grain yield (lb/ac)	No of days to flowering	Plant height (cm)	TKW (gm)	Test wt (lb/bu)
Yellow					
CDC Treasure	1246	77	52	230.5	63.30
DS Admiral	1363	78	55	223.7	64.13
Delta	1404	77	48	243.3	63.60
PS07100925	1344	79	53	238.3	64.25
PS08100950	1354	80	67	232.3	64.28
PS08101004	1232	79	48	226.7	64.05
PS0810122	1100	77	55	246.3	64.40
Mean	1291	78	54	234.0	64.00
Pvalue	0.4289	0.0435	0.0304	0.4875	0.3775
LSD (0.05)	NS	2.1	11	NS	NS
CV(%)	16.03	1.84	13.91	7.44	1.18
Green					
Arcadia	1321	77	48	211.4	64.28
CDC Striker	1410	79	50	236.9	63.40
Hampton	1131	80	51	226.6	63.83
Majoret	1339	77	60	219.9	64.43
PS03101445	1595	77	47	238.0	63.80
PS05100840	1602	79	57	231.4	64.23
PS07100470	1331	80	46	233.5	63.70
PS08100133	1509	80	57	219.5	63.80
PS08100582	1532	78	57	217.7	64.43
PS10100158	1302	79	52	226.8	64.28
PS10100370	1339	77	55	218.5	64.00
Mean	1400	78	53	225.0	64.01
P-value	0.1134	0.0040	0.0085	0.5872	0.6093
LSD (0.05)	NS	1.9	7.9	NS	NS
CV	15.64	1.69	10.45	8.41	1.15

Table 21. 2015 Western Regional Dry Pea Variety Evaluation – Richland, MT

Variety/lines	Adjusted grain yield (lb/ac)	Plant height (cm)	TKW (gm)	Test wt (lb/bu)
Yellow				
CDC Treasure	2011	46	219.1	64.13
DS Admiral	1812	53	246.3	63.43
Delta	1805	46	228.5	63.78
PS07100925	1735	38	237.8	63.53
PS08100950	1461	36	253.7	64.18
PS08101004	1802	46	237.0	63.70
OPS0810122	1467	38	241.6	64.15
<i>Mean</i>	<i>1727</i>	<i>43</i>	<i>237.7</i>	<i>63.84</i>
<i>P-value</i>	<i>0.2137</i>	<i>0.0026</i>	<i>0.0182</i>	<i>0.3300</i>
<i>LSD (0.05)</i>	<i>NS</i>	<i>8</i>	<i>18.3</i>	<i>NS</i>
<i>C.V (%)</i>	<i>18.57</i>	<i>12.78</i>	<i>5.24</i>	<i>0.88</i>
Green				
Arcadia	2035	46	209.8	63.38
CDC Striker	2033	50	239.8	62.68
Hampton	1653	47	231.4	62.53
Majoret	1960	53	258.2	63.10
PS03101445	1565	42	218.7	63.18
PS05100840	1509	35	240.5	62.43
PS07100470	1685	47	220.9	62.90
PS08100133	1728	47	238.2	63.63
PS08100582	1472	40	227.1	62.98
PS10100158	1606	44	193.7	63.00
PS10100370	1651	45	246.6	64.45
<i>Mean</i>	<i>1717</i>	<i>45</i>	<i>229.5</i>	<i>63.11</i>
<i>P-value</i>	<i>0.1027</i>	<i>0.0152</i>	<i><0.0001</i>	<i><0.0001</i>
<i>LSD (0.05)</i>	<i>NS</i>	<i>8.4</i>	<i>5.8</i>	<i>0.64</i>
<i>C.V (%)</i>	<i>17.61</i>	<i>12.99</i>	<i>1.74</i>	<i>0.71</i>

Lentil

Statewide Lentil Variety Evaluation

The 2015 Statewide Lentil Variety Evaluation trial was conducted at 10 locations. This variety evaluation trial consisted of 10 entries. The tested entries include four medium green, 3 small green and 3 small red lentils.

Lentil Grain Yield

Substantial yield differences were recorded from locations to locations. The mean grain yield for the different locations ranged from 716 lb/ac to 2624 lb/ac (Table 23). Average lentil yields were 974 lb/ac at Bozeman, 716 lb/ac at Conrad, 1366 lb/ac with irrigation at Corvallis, 911 lb/ac at Creston, 912 lb/ac at Havre, 1100 lb/ac at Huntley (dry), 1928 lb/ac at Huntley (irrigated), 754 lb/ac at Moccasin, 999 lb/ac at Richland and 2624 lb/ac at Sidney with irrigation. The differences in grain yield among varieties in a location were significant for Havre and Sidney sites only (Table 23).

Lentil TKW

Thousand kernel weight data were not measured for all locations and mean TKW ranged from 33.0 to 45.1 g/1000 seeds (Table 24). The TKW mean data showed significance differences among varieties for a location and consistently significant yield differences were recorded among varieties for all locations (Table 24).

Lentil Test Weight

Test weight varied from locations to locations. The mean test weight ranged from 61.58 lb/bu measured at Huntley irrigated to 63.90 lb/bu recorded at Moccasin (Table 25).

Lentil Plant Height

The mean plant height ranged from 31 cm to 46 cm (Table 26). Plant was relatively shorter this year compared with last year.

Lentil Number of Days to Flowering

The number of days to flowering ranged from 53 to 79 days (Table 27). Recording the number of days to flowering was reported to be difficult in some of the testing locations since lentil keeps on flowering depends on soil moisture availability even during harvesting. Like dry pea, the longest flowering date was recorded from Moccasin compared with other sites.

Table 22. Lentil Variety Sources and Characteristics

Variety*	Type	Maturity ¹	Breeding Program ²	Release Date
Large Green				
CDC Greenland	Green	Mod	CDC	2006
Merrit	Green			
Riveland	Green			
Medium Green				
Avondale	Green			
CDC Richlea	Green			
Imi-Green	Green			
Impress CL	Green			
Essex				
NDL080141				
Small Green				
Eston	Green			
LC07ND055E	Green			
NDLO90298E	Green			
Viceroy	Green			
Small Red				
Crimson	Red	Mod	USDA	1990
CDC Impact	Red			
CDC Impala CL	Red			
CDC Red Coats	Red			
CDC Redberry	Red	Mod	CDC	2004
NDL090413T	Red	Late	NDSU	
Spanish Brown				
Morena	brown			
Pardina	brown			

¹ Compared to trial means; ² Refers to developer: CDC = Crop Development Centre, University of Saskatchewan; NDSU = North Dakota State University; USDA = USDA-ARS Grain Legume Genetics and Physiology Research.

*Because some of the breeding entries have not been registered and released as varieties and companies did not provide detail variety information, the variety characteristics in this table is not complete and inclusive.

Table 23. 2015 Montana Statewide Lentil Variety Evaluations – Grain Yield (lb/ac)

Variety/lines	Bozeman	Conrad	Corvallis (Irri)	Creston	Havre	Huntley (Dry)	Huntley (Irri)	Moccasin	Richland*	Sidney (Irri)
Large Green										
Medium Green										
Avondale	1083	535	1421	925	1046	1274	2114	751	1075	2746
CDC Richlea	1113	665	1735	969	1081	987	1892	952	1138	2671
CDC Imi-Green					860			647	1082	1724
NDL08187L	835		1280	779	955				1155	
Small Green										
CDC Invincible CL					930			893	986	3301
LC07ND055E	964		1406	739	955			768	924	
Viceroy	989	1099	1351	981	907	1065	1854	591	928	3252
Small Brown										
Small Red										
CDC Impala CL	854	676	1300	1065	741	1152	2084	584	828	2848
CDC Maxim					800			731	1134	2345
CDC Redcoat	949	608	1060	847	922	1027	1701	685	746	2108
Trial means	974	716	1366	911	912	1100	1928	754	999	2624
P-Value	0.0958	0.4219	0.5504	0.5495	<0.0001	0.2921	0.1239	0.1137		0.0016
LSD (0.05)	NS	NS	NS	NS	27	NS	NS	NS		721
CV (%)	14.14	60.67	32.10	26.00	7.37	17.77	12.07	27.00		18.84

*Data for Richland site is only from one replication due to reseeding of other replications with other variety (variety mix).

Table 24. 2015 Montana Statewide Lentil Variety Evaluations – Thousand Kernel Weight (TKW) (g/1000 seeds)

Variety/lines	Bozeman	Conrad	Corvallis (Irri)	Creston	Havre	Huntley (Dry)	Huntley (Irri)	Moccasin	Richland*	Sidney (Irri)
Large Green										
Medium Green										
Avondale		53.8	52.6	50.7	39.1			51.1	61.2	49.1
CDC Richlea		54.5	53.6	53.3	38.8			54.6	57.2	53.2
CDC Imi-Green					51.6			60.9	62.4	55.1
NDL08187L			65.9	62.6	45.5				62.4	
Small Green										
CDC Invincible CL					23.0			32.7	34.4	37.5
LC07ND055E			40.5	41.9	29.2			42.6	41.2	
Viceroy		34.3	35.0	32.6	22.7			33.6	35.2	35.8
Small Brown										
Small Red										
CDC Impala CL		30.5	31.1	32.8	21.6			31.3	34.0	33.4
CDC Maxim					32.8			41.3	42.4	40.8
CDC Redcoat		38.3	41.0	42.8	31.1			38.9	40.0	40.3
Trial means		42.3	45.1	44.7	33.0			44.9	47.0	43.2
P-Value		<0.0001	<0.0001	<0.0004	<0.0001			<0.0001		<0.0001
LSD (0.05)		2.9	0.6	2.68	0.3			4.4		2.7
CV (%)		4.58	2.99	0.6	2.08			6.75		4.37

*Data for Richland site is only from one replication due to reseeded of other replications with other variety (variety mix).

Table 25. 2015 Montana Statewide Lentil Variety Evaluations – Test Weight (lb/bu)

Variety/lines	Bozeman	Conrad	Corvallis (Irri)	Creston	Havre	Huntley (Dry)	Huntley (Irri)	Moccasin	Richland*	Sidney (Irri)
Large Green										
Medium Green										
Avondale	63.17		62.18	58.57	61.40	61.63	60.63	63.13	62.30	60.78
CDC Richlea	62.00			59.50	60.40	60.48	58.80	62.38	61.40	59.10
CDC Imi-Green			63.68		61.70			62.73	61.60	59.15
NDL08187L	61.57		61.27	58.90	59.00				60.50	
Small Green										
CDC Invincible CL					64.10			65.08	63.50	62.60
LC07ND055E	64.67		63.47	62.20	63.20			63.93	64.20	
Viceroy	65.35		64.60	64.13	64.20	63.30	62.65	64.98	64.60	63.75
Small Brown										
Small Red										
CDC Impala CL	65.90		60.75	66.18	64.90	64.80	63.50	65.78	64.40	63.15
CDC Maxim					63.50			64.58	63.50	62.45
CDC Redcoat	64.77		62.73	61.50	63.30	63.93	62.30	65.03	64.50	62.33
Trial means	63.85		62.69	61.77	62.74		61.58	63.9	63.05	61.66
P-Value	<0.0001		0.2959	0.0547	<0.0001		<0.0001	<0.0001		<0.0001
LSD (0.05)	0.23		NS	NS	0.11		1.16	0.76		0.99
CV (%)	0.68		3.69	1.66	0.44		1.25	0.82		1.10

*Data for Richland site is only from one replication due to reseeded of other replications with other variety (variety mix).

Table 26. 2015 Montana Statewide Lentil Variety Evaluations – Plant Height (cm)

Variety/lines	Bozeman	Conrad	Corvallis (Irri)	Creston	Havre	Huntley (Dry)	Huntley (Irri)	Moccasin	Richland*	Sidney (Irri)
Large Green										
Medium Green										
Avondale		34	32	33	31	44	51	32	30	41
CDC Richlea		33	31	31	27	41	44	36	30	39
CDC Imi-Green					33			36	32	45
NDL08187L			32	31	32				27	
Small Green										
CDC Invincible CL					32			35	27	43
LC07ND055E			30	29	26			34	23	
Viceroy		30	32	33	27	44	45	36	22	44
Small Brown										
Small Red										
CDC Impala CL		30	30	28	25	41	47	31	26	43
CDC Maxim					28			33	26	39
CDC Redcoat		34	31	32	24	45	44	30	23	37
Trial means		32	31	31	28	43	46	34	27	41
P-Value		0.2613	0.8051	0.1752	0.0110	0.2013	0.1934	0.1884		0.5416
LSD (0.05)		NS	NS	NS	1	NS	NS	NS		NS
CV (%)		10.23	7.81	9.85	12.13	6.14	9.39	10.41		14.87

*Data for Richland site is only from one replication due to reseeded of other replications with other variety (variety mix).

Table 27. 2015 Montana Statewide Lentil Variety Evaluations – Number of Days to Flowering

Variety/lines	Bozeman	Conrad	Corvallis (Irri)	Creston	Havre	Huntley (Dry)	Huntley (Irri)	Moccasin	Richland*	Sidney (Irri)
Large Green										
Medium Green										
Avondale	67		51	53	63	81	76	79		62
CDC Richlea	68		51	54	64	70	76	79		62
CDC Imi-Green					66			79		63
NDL08187L	68		51	57	64					
Small Green										
CDC Invincible CL					66			79		63
LC07ND055E	67		51	50	64			80		
Viceroy	70		55	54	67	65	77	80		64
Small Brown										
Small Red										
CDC Impala CL	69		56	55	67	76	78	80		63
CDC Maxim					63			79		61
CDC Redcoat	69		56	58	67	75	78	78		64
Trial means	68		53	54	65	73	77	79		62
P-Value	<0.0001		<0.0001	0.0007	<0.0001	<0.0001	0.0011	0.2197		<0.0001
LSD (0.05)	0.2		0.4	3.12	1.11	2	1	NS		0.7
CV (%)	0.59		1.47	0.8	0.3	2.09	0.94	1.50		32.72

Multi-Year and Multi-Location Statewide Lentil Variety Evaluation Summary

Table 28. Statewide Lentil Variety Evaluations – 2008 – 2015 Multi-year Grain Yield Summary (lb/ac)

Variety	Bozeman								Conrad							
	2008	2009	2010	2011	2012	2013	2014	2015	2008	2009	2010	2011	2012	2013	2014	2015
Small Green																
Essex			2111	1538	462		1839		512	3248	436	2842	1823		1865	
Medium Green																
Brewer			1855	1340	528				357	2272	381	2034	1120			
CDC Richlea			2266	1534	569	1400	1911	1113		2831	623	2307	1800	1698	1752	665
Avondale			2224	1578	685	1745	1919	1083	559	3113	687	2284	1696	1501	1597	535
Large Green																
Merrit			2064	1360	607		1444		510	2183	385	2151	1243		1744	
Riveland			1825	1558	567		1736		433	2127	324	1821	1464		1616	
Small Red																
Crimson			1999	1281	588	1424	1725		403	1921	544	1762	1543	1039	1590	
CDC Redberry			982	1400		1348	1700			2234	833	2318	1338	1351	1869	
<i>Trial Means</i>			<i>1953</i>	<i>1476</i>	<i>560</i>	<i>1363</i>	<i>1723</i>	<i>974</i>	<i>450</i>	<i>2451</i>	<i>533</i>	<i>2227</i>	<i>1496</i>	<i>1460</i>	<i>1682</i>	<i>716</i>
<i>LSD (0.05)</i>			<i>382</i>	<i>138</i>	<i>98</i>	<i>167</i>	<i>NS</i>	<i>NS</i>	<i>142</i>	<i>559</i>	<i>214</i>	<i>NS</i>	<i>NS</i>	<i>236</i>	<i>NS</i>	<i>NS</i>
<i>CV (%)</i>			<i>14</i>	<i>7</i>	<i>12</i>	<i>8</i>	<i>19</i>	<i>14</i>	<i>22</i>	<i>14</i>	<i>28</i>	<i>21</i>	<i>25</i>	<i>11</i>	<i>24</i>	<i>60</i>
Variety	Corvallis								Creston							
	2008	2009	2010	2011	2012	2013	2014	2015	2008	2009	2010	2011	2012	2013	2014	2015
Small Green																
Essex	1688	2224	1087		536		450		2670	2395	2464	2091	1409		1299	
Medium Green																
Brewer	738	940	964		405				1844	2460	2164	1464	1250			
CDC Richlea		2552	973		893	1330	471	1735		2831	2150	1873	1625	1303	1753	969
Avondale	1338	2495	1052		837	1387	528	1421	2676	3016	2626	2024	1790	1244	1625	925
Large Green																
Merrit	1192	1411	690		394		536		2445	2829	1954	1730	1038		1094	
Riveland	798	1353	430		552		340		2046	2478	1898	1547	1310		710	
Small Red																
Crimson	1262	1629	1095		838	951	365		2309	2082	2259	2095	1245	1238	1021	
CDC Redberry		2411	1059		706	795	540			2326	2346	2090		1816	1851	
<i>Trial Means</i>	<i>1112</i>	<i>1802</i>	<i>860</i>		<i>700</i>	<i>1155</i>	<i>511</i>	<i>1366</i>	<i>2312</i>	<i>2522</i>	<i>2164</i>	<i>1822</i>	<i>1345</i>	<i>1347</i>	<i>1409</i>	<i>911</i>
<i>LSD (0.05)</i>	<i>386</i>	<i>395</i>	<i>348</i>		<i>354</i>	<i>222</i>	<i>NS</i>	<i>NS</i>	<i>270</i>	<i>448</i>	<i>456</i>	<i>NS</i>	<i>421</i>	<i>279</i>	<i>136</i>	<i>NS</i>
<i>CV (%)</i>	<i>24</i>	<i>15</i>	<i>28</i>		<i>36</i>	<i>13</i>	<i>35</i>	<i>32</i>	<i>8</i>	<i>12</i>	<i>15</i>	<i>22</i>	<i>22</i>	<i>14</i>	<i>28</i>	<i>26</i>

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Table 28. Statewide Lentil Variety Evaluations – 2008 – 2015 Multi-year Grain Yield Summary (lb/ac)...continued

Variety	Havre								Huntley (Dry)							
	2008	2009	2010	2011	2012	2013	2014	2015	2008	2009	2010	2011	2012	2013	2014	2015
Small Green																
Essex	1680	1654	3119	1838			2131		1586	2103	464	784	569		843	
Medium Green																
Brewer	1371	1173	2487	1024	1121				950	494	425	402	583			
CDC Richlea		1546	2853	1743	830	1530	1649	1081		1603	569	873	734	1585	699	987
Avondale	1844	1807	2790	1385	874	1483	1808	1046	1457	1916	926	877		1767	718	1274
Large Green																
Merrit	1892	1331	2868	1127	977		1306		1210	947	466	717	523		499	
Riveland	1686	1368	2463	968	1033		1282		957	1814	399	717	727		557	
Small Red																
Crimson	1277	1072	2343	1705	902	625	1685		1597	1629	738	458	607	1683	578	
CDC Redberry		1217	2592	904	846	760	1440			2411	684	819	620	1956	412	
<i>Trial Means</i>	<i>1598</i>	<i>1399</i>	<i>2736</i>	<i>1362</i>	<i>830</i>	<i>1123</i>	<i>1557</i>	<i>912</i>	<i>1336</i>	<i>1397</i>	<i>573</i>	<i>672</i>	<i>614</i>	<i>1690</i>	<i>650</i>	<i>1100</i>
<i>LSD (0.05)</i>	<i>325</i>	<i>302</i>	<i>340</i>	<i>299</i>	<i>179</i>	<i>173</i>	<i>352</i>	<i>27</i>	<i>244</i>	<i>NS</i>	<i>272</i>	<i>NS</i>	<i>167</i>	<i>NS</i>	<i>141</i>	<i>NS</i>
<i>CV (%)</i>	<i>14</i>	<i>15</i>	<i>9</i>	<i>10</i>	<i>15</i>	<i>11</i>	<i>15</i>	<i>7</i>	<i>9</i>	<i>43</i>	<i>33</i>	<i>54</i>	<i>19</i>	<i>16</i>	<i>15</i>	<i>17</i>
Variety	Joplin								Moccasin							
	2008	2009	2010	2011	2012	2013	2014	2015	2008	2009	2010	2011	2012	2013	2014	2015
Small Green																
Essex			2491	726	2521					1743		2036	918	809	1713	
Medium Green																
Brewer			2236	350	2027				1395		1768	730	756			
CDC Richlea			2371	616	1919						2062	1100	958	1904	1672	952
Avondale				581	2421				1800		1944	903	955	1859	1440	751
Large Green																
Merrit			2549	546	2127				1501		1890	771	838		1258	
Riveland				247	2303				1572		1805	926	827		1519	
Small Red																
Crimson			2162	774	1479				1655		1919	911	907	1403	1087	
CDC Redberry			1973	785	1717						1642	764		1491	1456	
<i>Trial Means</i>			<i>2324</i>	<i>624</i>	<i>2077</i>				<i>1636</i>		<i>1906</i>	<i>888</i>	<i>833</i>	<i>1538</i>	<i>1383</i>	<i>754</i>
<i>LSD (0.05)</i>			<i>562</i>	<i>NS</i>	<i>NS</i>				<i>176</i>		<i>NS</i>	<i>NS</i>	<i>144</i>	<i>320</i>	<i>248</i>	<i>NS</i>
<i>CV (%)</i>			<i>17</i>	<i>44</i>	<i>20</i>				<i>7</i>		<i>11</i>	<i>24</i>	<i>12</i>	<i>15</i>	<i>13</i>	<i>27</i>

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Table 28. Statewide Lentil Variety Evaluations – 2008 – 2015 Multi-year Grain Yield Summary (lb/ac)...continued

Variety	Richland								Sidney (Dry)							
	2008	2009	2010	2011	2012	2013	2014	2015	2008	2009	2010	2011	2012	2013	2014	2015
Small Green																
Essex		1181	1752	1097	1705		441		1768	2251	1737	458		1057		
Medium Green																
Brewer	992	939	1324	581	1882				1103	1423	1061	184				
CDC Richlea		1596	1562	1077	1874	1914	755	1138	1699	1959	1594	530		1170		
Avondale		1284	1850	1398	2041	2193	582	1075	1653	2169	1774	453		982		
Large Green																
Merrit	1105	1098	1435	880	1710		371		1407	1350	1418	222		704		
Riveland	910	1013	1571	836	1712		398		1387	1564	1413	401		821		
Small Red																
Crimson	1247	1308	1222	859	1734	1573	287		836	1924	981	261		947		
CDC Redberry		1296	1390	933	1743	1582	524		1332	2186	1604	448		867		
Trial Means	1108	1200	1537	945	1666	1896	479	999	1351	1835	1444	371		938		
LSD (0.05)	230	288	294	392	332	603	206		260	390	434	NS		165		
CV (%)	12	17	11	25	12	22	31			13	17	42		12		

Western Regional Lentil Variety Evaluation

The Western Regional lentil variety trial was conducted at three sites (Havre, Moccasin and Richland). The trial consisted of 13 entries, four commercially available and nine advanced breeding lines from the USDA-ARS Grain Legume Genetics and Physiology Program in Pullman, Washington.

The average yields of lentil were 929 lb/ac at Havre, 733 lb/ac at Moccasin, and 563 lb/ac at Richland (Tables 29-31). Interestingly, the same variety (CDC Richlea) was the highest yielding variety in all sites followed by Viceroy.

Table 29. 2015 Western Regional Lentil Variety Evaluation – Havre, MT

Variety/lines	Grain Yield (lb/ac) 13% Moisture	Number of days to flower	Height (cm)	TKW (g/1000 seeds)	Test wt (lb/bu)
Avondale	882	161	29	42.1	61.20
CDC Redcoat	976	164	28	29.2	63.13
CDC Richlea	1191	162	28	40.3	60.43
LC01602062T	776	161	30	35.7	63.67
LC06601734L	980	161	28	60.9	58.63
LC08600113P	953	161	26	35.3	63.25
LC08600116P	947	161	28	39.8	63.43
LC09600410L	945	160	29	61.2	58.53
LC10600231P	684	161	24	34.8	63.25
LC10600494P	956	162	28	34.7	64.23
LC106022273E	776	160	26	30.0	63.50
LC11600380L	983	161	33	58.2	57.88
CDC Viceroy	1000	164	30	24.6	64.03
Means	929	161	28	40.5	61.9
P-values	<0.0001	<0.0001	0.3029	<0.0001	<0.0001
LSD	34	0.7	NS	1.7	0.08
C.V. (%)	11.24	0.32	14.84	0.99	0.37

Table 30. 2015 Western Regional Lentil Variety Evaluation – Moccasin, MT

Variety/lines	Grain Yield (lb/ac) 13% Moisture	Number of days to flower	Height (cm)	TKW (g/1000 seeds)	Test wt (lb/bu)
Avondale	679	79	29	50.6	62.88
CDC Redcoat	870	79	30	39.1	64.83
CDC Richlea	1098	79	33	53.3	62.05
LC01602062T	759	80	34	45.6	64.50
LC06601734L	680	81	30	72.8	60.50
LC08600113P	683	79	33	47.1	64.80
LC08600116P	656	79	29	51.6	64.80
LC09600410L	603	80	32	76.2	60.30
LC10600231P	634	81	32	45.5	64.30
LC10600994P	777	81	29	42.3	64.73
LC106022273E	521	80	33	38.9	64.43
LC11600380L	604	81	30	73.7	60.50
CDC Viceroy	975	80	32	32.5	65.18
Mean	733	80	31	54.5	63.37
P-value	0.0216	0.4968	0.8742	<0.0001	<0.0001
LSD (0.05)	302	NS	NS	2	0.43
C.V.(%)	28.81	2.28	15.22	2.76	0.48

Table 31. 2015 Western Regional Lentil Variety Evaluation – Richland, MT

Variety/lines	Grain Yield (lb/ac)	Height (cm)	TKW (g/1000 seeds)
Avondale	588	45	53.6
CDC Redcoat	688	26	42.4
CDC Richlea	920	26	54.8
LC01602062T	383	22	50.4
LC06601734L	623	27	75.6
LC08600113P	288	27	55.2
LC08600116P	408	20	56.4
LC09600410L	671	23	81.2
LC10600231P	448	27	49.2
LC10600494P	696	25	46.4
LC106022273E	446	22	42.4
LC11600380L	437	26	78.4
CDC Viceroy	727	27	37.6
Means	563	26	55.7
<i>P-value</i>			
<i>LSD (0.05)</i>			
<i>C.V.(%)</i>			

*Data for Richland site is only from one replication due to reseeded of other replications with other variety (variety mix). There was no enough seed to measure test weight.

Chickpea

Statewide Chickpea Variety Evaluation

The statewide chickpea variety evaluation includes five commercial varieties and two advanced lines and carried out in five locations. The statewide chickpea variety evaluation was not planted at Bozeman site and was damaged by deer at Conrad site. The mean grain yields were 1276 lb/ac at Corvallis with irrigation, 1144 lb/ac Huntley dry, 2707 lb/ac Huntley irrigated, 1155 lb/ac at Moccasin and 1619 lb/ac at Richland (Table 33).

We evaluated the seed size for the different chickpea varieties collected from statewide chickpea variety trial of Moccasin site. The kernel size of chickpea varieties grain samples were evaluated for their grain sizes using 10, 9, 8, 7 and 6 millimeter round sieves. The results are shown in Table 34. The variety Myles has the highest percent for 6 mm seed size compared with the other varieties. Sierra and Sawyer, large Kabuli's type, have the highest percent in the 9mm seed size compared with the other varieties. The new lines BGC090017 and BGC090018 have substantial percent of seeds in the 9mm seed size following Sierra and Sawyer.

Table 32. Chickpea Variety Characteristics

Variety/lines	Type
CA0790BO043C	Large Café Kabul
CA0890BO429C	Large Café Kabul
CA0790BO547C	Large Café Kabul
CA0790BO549C	Large Café Kabul
CA0790BO733C	Large Café Kabuli
Dwellely	Large Café Kabul
Sawyer	Large Café Kabul
CDC Alma	Med/Large Kabuli
CDC Frontier	Large Kabuli
CDC Orion	Large Kabuli
Myles	Desi

Table 33. 2015 Statewide Chickpea Variety Evaluation – Yield (lb/ac)

Variety/lines	Bozeman*	Conrad ⁺	Corvallis (Irrigated)	Huntley (Dryland)	Huntley (Irrigated)	Moccasin	Richland
BGC090017						946	1676
BGC090018						927	1797
CDC Frontier			1404	1284	2970	1337	2020
CDC Orion			1451	1521	3191	1477	1958
Myles			1300	1659	2474	1164	1027
Sawyer			1111	588	2431	1113	1520
Sierra			1116	668	2473	1126	1353
<i>Trial</i>			<i>1276</i>	<i>1144</i>	<i>2707</i>	<i>1155</i>	<i>1619</i>
<i>P-Value</i>			<i>0.2198</i>	<i><0.0001</i>	<i>0.0075</i>	<i>0.0512</i>	<i><0.0001</i>
<i>LSD (0.05)</i>			<i>NS</i>	<i>329</i>	<i>459</i>	<i>NS</i>	<i>85</i>
<i>CV (%)</i>			<i>19.051</i>	<i>19.08</i>	<i>11.26</i>	<i>21.43</i>	<i>11.28</i>

*Not planted and ⁺harvested because of deer and antelope problem.

Table 34. Percent of seed size of chickpea varieties from statewide chickpea variety evaluation trial at Moccasin in 2015.

Variety	Seed size and percent of grain in each sieve size					
	10 mm	9mm	8mm	7mm	6mm	<6 mm
BGC090017	0.6	28.6	61.3	8.5	0.8	0.3
BGC090018	1.1	31.8	54.0	12.4	0.6	0.1
CDC Frontier	0.0	4.3	67.6	26.6	1.3	0.3
CDC Orion	0.3	16.3	71.7	10.8	0.7	0.2
Myles	0.0	0.0	0.0	17.3	80.4	2.4
Sawyer	2.3	48.1	44.7	4.4	0.6	0.0
Sierra	1.5	50.5	43.1	4.4	0.5	0.0
Means	0.8	25.6	48.9	12.0	12.1	0.5
P-values	0.0003	<0.0001	<0.0001	0.0003	<0.0001	<0.0001
LSD(0.05)	0.9	5.7	7.0	8.5	2.2	0.3
CV	76.4	15.2	9.8	48.2	12.6	49.3

Multi-Year and Multi-Location Statewide Chickpea Variety Evaluation

Table 35. Multi-Year and Multi-Location Statewide Chickpea Variety Evaluations –
2011– 2015 - Grain Yield Summary (lb/ac)

Variety	Bozeman					Conrad				
	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015
BGC08008M										
BGC08009M										
BGC090016										
BGC090023										
CA0790B0042C										
CA0790B0547C										
CA0790B0549C										
CAO890B0427C										
CDC Alma		828	1396	1458			1946	3250	214	
CDC Frontier		875	1594			3422	2103	2488		
CDC Orion		852	1574	1923			2090	3008	118	
Myles		994	1233	1821		2748	1626	1294	476	
<i>Trial Means*</i>		796	1449	1734		2860	1750	2510	269	
<i>LSD (0.05)</i>		136	145	<i>NS</i>		<i>NS</i>	575	412	189	
<i>CV (%)</i>		10	6	24		19	18	10	43	
Variety	Huntley (Irrig)					Moccasin				
	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015
BGC08008M								1810		
BGC08009M								2084		
BGC090016								1719		
BGC090023								1812		
CA0790B0042C							981	1600		
CA0790B0547C								1551		
CA0790B0549C								1700		
CAO890B0427C								1807		
CDC Alma		3056	1467	3082			919	1533	1036	
CDC Frontier		2745	1874		2970	823	605	1420	1020	1337
CDC Orion		3167	1521	3598	3191		1619	1806	999	1477
Myles		2668	2411	2979	2474	995	964	1392	1566	1164
<i>Trial Means*</i>		2595	1818	3219	2707		830	1623	871	1155
<i>LSD (0.05)</i>		526	<i>NS</i>	510	459		304	425	307	<i>NS</i>
<i>CV (%)</i>		12	35	9	11		19	18	24	21

*Trial means include other varieties as indicated in the previous table (Table 33).

-----Continued -----

Table 35. Multi-Year and Multi-Location Statewide Chickpea Variety Evaluations –
 2011– 2015 - Grain Yield Summary (lb/ac) -----Continued -----

Variety	Corvallis (irrig)				
	2011	2012	2013	2014	2015
BGC08008M					
BGC08009M					
BGC090016					
BGC090023					
CA0790B0042C		1801			
CA0790B0547C					
CA0790B0549C					
CAO890B0427		1746			
CDC Alma		1771		734	
CDC Frontier		1971			
CDC Orion				934	
Myles		1693		1155	
<i>Trial Means*</i>		1678		1087	
<i>LSD (0.05)</i>		<i>NS</i>		<i>NS</i>	
<i>CV (%)</i>		22		43	
Variety	Richland				
	2011	2012	2013	2014	2015
BGC08008M			2339		
BGC08009M			3902		
BGC090016			2019		
BGC090023			2619		
CA0790B0042C		201	506		
CA0790B0547C			1617		
CA0790B0549C			1227		
CAO890B0427			867		
CDC Alma		1467	2763	599	
CDC Frontier	1605	2488	3529	838	2020
CDC Orion		1907	2930	416	1958
Myles	1096	1588	2641	922	1027
<i>Trial Means*</i>	1010	1175	2363	459	1619
<i>LSD (0.05)</i>	557	577	784	245	85
<i>CV (%)</i>	32	29	23	37	11

Western Regional Chickpea Variety Evaluation

The Western Regional chickpea variety evaluation trial consisted of ten advanced lines and three commercial varieties and the trial was planted at three locations. But the trial was totally damaged at Conrad site and results from Moccasin and Richland are reported here. Mean grain yield was 1222 lb/ac at Moccasin and 1178 lb/ac at Richland (Table 36). Some of the advanced lines particularly at Moccasin produced higher yield compared with the commercial varieties (Table 36).

Table 36. 2015 Western Regional Chickpea Variety Evaluation at Moccasin and Richland

Variety/lines	Moccasin				Richland			
	Grain Yield (lb/ac) @ 13% moisture	TKW (g/1000 seeds)	Test wt (lb/bu)	Height (cm)	Grain Yield (lb/ac) @ 13% moisture	TKW (g/1000 seeds)	Test wt (lb/bu)	Height (cm)
CA0790BO042C	1089	474.3	60.15	43	1157	483.1	60.10	34
CA0790BO043C	1265	507.5	58.88	46	1414	527.8	59.90	39
CA0790BO054C	1041	507.7	61.03	45	1109	562.6	60.00	37
CA0790BO547C	1250	486.8	60.73	38	1249	515.3	58.58	33
CA0790BO549C	1329	453.8	60.33	40	1239	474.4	59.33	32
CA0790BO642C	1057	491.7	59.43	40	1087	551.2	58.73	36
CA0790BO733C	1209	468.0	60.95	39	1473	515.5	60.28	35
CA0890BO429C	1096	506.9	59.85	43	1057	577.9	59.60	38
CA0890BO531C	1192	480.1	58.63	40	1085	570.9	195.00	35
CA0890BO551C	1028	496.6	57.88	37	1133	549.3	57.43	32
CDC Frontier	1195	358.8	61.70	37	1583	409.9	61.18	36
Myles	847	173.6	60.40	35	543	182.1	57.83	30
Sierra	993	481.9	60.45	41	1028	525.7	59.10	34
Mean	1122	452.9	60.03	40	1178	501	59.36	34
P-value	0.0003	<0.0001	<0.0001	<0.0001	0.0009	<0.0001	<0.0001	<0.0001
LSD (0.05)	11.44	1.93	1.05	6.11	81	11.62	0.25	3
C.V.(%)	183	12.5	0.90	3	20.81	7.05	1.27	6.18

FUTURE PLANS

The future plan is to continue statewide and western regional spring dry pea, lentil and chickpea variety evaluations, as well as evaluating advanced lines of these crops. We are also evaluating winter pea and winter lentil varieties as additional options for growers. Agronomic management practices need further attention since they are a major bottleneck for increasing quality pulse production in Montana. These include nutrient management, weed control both for conventional and organic farming. This research project will continue as far as funding and resources are available to carry out the experiments.

Note: The results and summary mentioned in this annual report are for **informational purposes only**. Inclusion of any commercial variety in this summary does not constitute a recommendation by MSU-MAES or CARC.

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