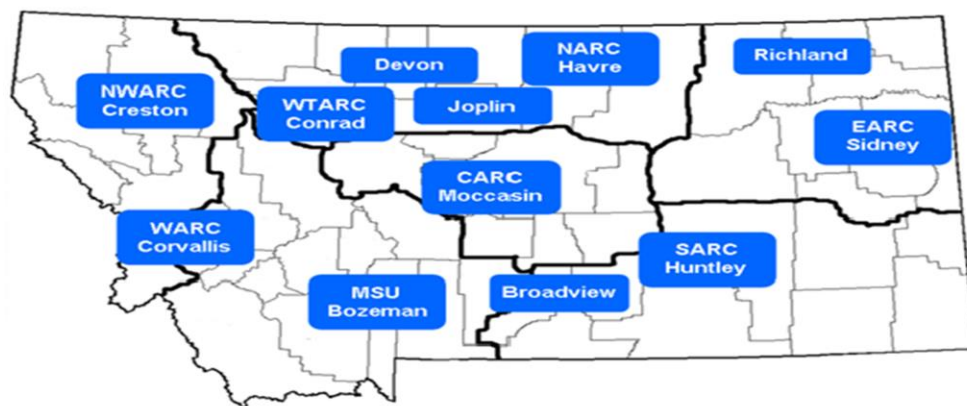


2014 Montana Cool-Season Spring Pulse Variety Evaluations Report

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**Montana State University
Montana Agricultural Experiment Stations**

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ACKNOWLEDGEMENT

The 2014 spring pulse (dry pea, lentils and chickpea) variety evaluations across Montana were made possible, in part, by the generosity and grant funding support from the Northern Pulse Growers Association and the USA Dry Pea and Lentil Council, and Private Breeding and Seed Trading Companies who paid fees for varieties they submitted in these trials. As with any trial, many individuals were involved and need to be acknowledged for their help in the successful completion of these spring pulse variety evaluation trials in 2014. The following list is not inclusive, as there are others who may not be listed but were just as vital in the success of these trials.

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PROJECT DESCRIPTION AND OBJECTIVES

Project Description

Montana took the lead in the country for pulse crops (pea, lentil, and chickpea) production. Increasing acreage in the state is mainly due to replacing summer fallow. The addition of pulse crops in the existing cropping systems has contributed to 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. To sustain the pulse crop production in the state, information on improved agronomic management practices and varietal development is needed for the production of good quality grain that is preferred by national and international market.

In order to avail research information that will help to make informed decision, the Central Agricultural Research Center (CARC) of Montana State University is coordinating a serious of state wide and western regional dry pea, lentils 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. Specifically, this varietal development project was designed to work together with pulse breeders at 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 to represent the state in terms of weather and soil variability. The finding of the research is published as annual spring pulse variety evaluation report and the report is distributed to different stakeholders free of charge to promote pulse crop production in the state. In 2014, the trials were conducted at seven Montana State University (MSU) Agricultural Research Centers, Bozeman (MSU) plus two cooperating producers' fields near Broadview and Richland, Montana. This report contains the summary of 2014 cropping season results from different locations, and summary from multiple years. The yield from Richland site are very low in 2014 due to several unusall natural events. First, it wa unusually wet and cold at planting due to tall stubble. Second since it was too wet, it was difficult to get the equipment into the field to spray herbicides thus weeds seriously affected the crop but we did hand weeding even if it was a little late. Moreover, four hail damages occurred on May 19, July 24, August 15 and September 3 which seriously

damage the crop and significantly decreased yield. Adjacent land was reported to have yield loss of 40% due to this weather issue. Therefore, results from 2014 at Richland were abnormal compared to long term results due to these unusual external factors beyond control.

Objectives

The objectives 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

Experimental Design

The Central Agricultural Research Center of MSU invited individual private seed companies and breeders to submit varieties and entries of dry pea, lentil and chickpea for 2014 state wide evaluation. The western regional variety evaluations were organized by the breeders at Pullman, WA and Fargo, NDSU. Available locations for evaluations were indicated in the invitation letter. All sites were dry land except two irrigated sites at Huntley and Corvallis. Once seeds were received by CARC, all seed for the trials were pre-treated with fludioxinil and mefenoxam fungicides (Apron MAXX[®] RTU, Syngenta Crop Protection, Inc) to protect fungal diseases. Furthermore, the seed for Moccasin site were additionally treated with thiamethoxam insecticide (CruiserMAXX[®], Syngenta Crop Protection, Inc) to control pea leaf weevil infestation. Seeds were then packaged per at CARC in Moccasin and distributed to testing sites with appropriate inoculant. The experiments were carried out in randomized complete block design with four replications except at Corvallis where we use unequal replications due to problem encountered while seeding (plugged). Plot size varied from site to site depends on land availability and nature (size) of machine used for seeding and harvesting. Best management practices were employed using available resources at each site (Table 3). The Statewide and

Western Regional Chickpea Variety Evaluation trials were combined together since the total number of entries was small (only 11). The coordinating center and cooperators recorded plant density, plant height, days to flowering, grain yield, test weight, grain moisture content and thousand kernel weights. Data from all sites were compiled into this annual report. Grain yield data was adjusted to 13% moisture content before statistical analysis (except Sidney, Bozeman, Conrad since no grain moisture data were available). 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.

Cooperators and Experimental Locations

Every year, all the agricultural research centers of MSU cooperate with this project and carried out the experiments successfully in most of the times. The type of pulse crops they evaluate vary from site to site. The cooperating centers, location and type of crop they evaluated are shown in Table 1.

Table 1. Summary of cooperators and locations participated in 2014 spring pulse variety evaluations

Cooperators	Location	Conditions	Pea	Lentil	Chickpea	Observations
CARC	Moccasin	Dry land	X	X	X	
CARC	Richland	Dry land	X	X	X	Yield was low due to reported hail damage, cool and wet season
EARC	Sidney	Dry land	X	X		
LRES	Bozeman	Dry land	X	X	X	
NARC	Havre	Dry land	X	X		
NWARC	Creston	Dry land	X	X		Yield was very high compared to other locations
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	Chickpea yield was low because antelope ate most of the pods

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 Management Practices

The experimental sites are scattered all over Montana and their precipitation, site information and management practices are shown in Tables 2 and 3.

Precipitation

The amount of precipitation received from April 1, 2014 to Aug 31, 2014 varied for the different testing sites. The summary is shown in Table 1.

Table 1. 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, 2014)	5.0	9.84	4.76	10.56	4.84	8.84	14.35	7.78
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					

Agronomic management practices

The agronomic management practices are very different for the different agricultural research centers. The summary of agronomic management practices by location is shown in Table 3.

Table 3. Major site information and agronomic management practices for 2014 by location

	Bozeman (LRES)	Broadview (SARC)	Conrad (WTARC)	Corvallis (WARC) Irri.	Creston (NWARC)	Sidney (EARC)	Havre (NARC)	Huntley (SARC)	Moccasin (CARC)	Richland (CARC)
Tillage	No till	No till	No till				No till	No till	No till	No till
Soil Type	Amsterdam silt loam		Scoby clay loam		Creston silt loam	Williams clay loam	Telstad clay loam		Judith clay	
Elevation (ft)	4800		3665		2890	2200	2728	2725	4250	2950
Pea Trials										
Dates:										
Seeding	5/5/2014	4/24/2014	5/5/2014	5/1/2014	4/23/2014	4/23/2014	4/20/14	5/5/2014	4/9/2014	5/9/2014
Harvest	8/6/2014	8/12/2014	8/6/2014	8/1/2014	9/4/2014	7/31/2014	7/28/14	8/4/2014	8/1/2014	8/29/2014
Previous crop	Fallow(rep1&2) and canola(rep3&4)	Wheat	Barley	cereals	Pea	fallow	Winter wheat	Barley	Winter wheat	Winter wheat
Fertilizer			11-22-20 actual lbs/ac		9-40-10	34-0-0	None			
Herbicides and insecticide	Pre-4 lbGlyph 16oz/a+2,4,D 16oz/a Post-Warrior II 2 oz/a		18 oz RT3, 20 oz Prowl H2O and + 1.5 pt Sevin XLR Plus/ac	Pursuit 35 ml and Prowl H2O 1.5pt/ac	Prowl H2O 3pt/A (pre-plant) and Raptor 3 floz/A, Basagran 12 floz/A, 0.25% NIS	Solan 1.5 pt/ac and Treflan 1pt/ac	RT3 24 oz/ac	RT3 32 oz/ac	Prowl H2O 3pt/A (pre-plant)	
Lentil Trials										
Dates:										
Seeding	5/5/2014		5/19/2014	5/1/2014	4/23/2014	4/23/2014	4/20/14	5/5/2014	4/10/2014	5/9/2014
Harvest	8/11/2014		9/23/2014	8/21/2014	9/4/2014	8/1/2014	8/6/14	8/4/2014	8/13/2014	9/8/2014
Previous crop	Same as pea		Barley	cereals	peas	fallow	Winter wheat	Barley	Winter wheat	Winter wheat
Fertilizer			Same as pea		9-40-10	34-0-0	None			
Herbicides	Same as pea		18 oz RT3, 20 oz Prowl H2O/ac	Same as pea	Prowl H2O 3pt/A (pre-plant)	Same as pea	RT3 24 oz/ac	RT3 32 oz/ac	Same as pea	
Chickpea Trials										
Dates:										
Seeding	5/5/2014			5/1/2014					4/25/2014	5/10/2014
Harvest	9/6/2014			9/2/2014					8/14/2014	9/22/2014
Previous			Barley	cereals					Winter wheat	Winter wheat
Fertilizer	Same as pea		Same as pea							
Herbicides and insecticide			Same as lentil	Same as pea					Same as pea	

RESULTS

Unusual wet and cool season together with several times of hail damage at Richland resulted in significantly lower yield for dry pea, lentil and chickpea in 2014. The yield loss due to hail damage to the adjacent field was estimated to be 40%. This point should be considered in interpreting the results from Richland.

It has been reported by collaborating agricultural research center at Conrad, the antelope likes the chickpea and they ate most of the pods since it was not fenced. This damage resulted in significantly lower yield of chickpea at Conrad. Therefore, one has to take this into account in making conclusion.

The variety evaluation results presented in this report include grain yield, thousand kernel weight, test weight, plant height and number of days to flowering. First, results for dry pea (yellow and green) presented followed by lentil and chickpea.

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.

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Dry Pea

Statewide Dry Pea Variety Evaluations

Dry pea entries (both commercial varieties and experimental lines) for the 2014 statewide dry pea variety evaluations were tested at 11 locations (Bozeman, Broadview, Conrad, Corvallis, Creston, Havre, Huntley dry land and Huntley irrigated, Moccasin, Richland and Sidney). A total of 47 dry pea (30 yellow and 17 green) entries were tested across the state. Some varieties were submitted by private companies on a fee basis and tested at select locations only. Of the varieties tested, 13 are commercially available smooth green, 27 are commercially available smooth yellow. The remaining 4 green and 3 yellow were experimental dry pea lines included from pea line advancement trial (Tables 4 and 10).

Yellow Pea Grain Yield

Yellow pea yields varied greatly from location to location due to differences in environmental conditions and management practices (Tables 1 and 2). Mean grain yields for yellow pea for the different locations ranged from 1126 lb/ac at Huntley (dryland) to 5016 lb/ac at Creston (Table 5). Average yellow pea yields were 2452 lb/ac at Bozeman, 1307 lb/ac at Broadview, 2723 lb/ac at Conrad, 1350 lb/ac with irrigation at Corvallis, 5016 lb/ac at Creston, 2228 lb/ac at Havre, 1126 lb/ac Huntley (dryland), 2165 lb/ac Huntley irrigated, 2165 lb/ac at Moccasin, 1200 lb/ac at Richland and 2604 lb/ac at Sidney (Table 5). The performance of the different varieties in different locations is shown in Table 5. The grain yield recorded at Creston was significantly higher than other sites.

Yellow Pea Thousand Kernel Weight (TKW)

Thousand kernel weights (TKW) data were obtained only from some research centers as shown in Table 6. The mean maximum TKW (245.1 g/1000seeds) was recorded from Richland and the lowest mean TKW (212.9 g/1000 seeds) was recorded from Sidney (Table 6).

Yellow Pea Test Weight

Test weight data were recorded in most of the sites as shown in Table 7. The mean test weight for most of the sites were very close and ranged from 65.86 lb/bu recorded at Havre to 59.54 lb/bu recorded at Richland. Interestingly, these same sites have the same results in 2013.

Yellow Pea Plant Height

Mean plant height ranged from 56 cm to 117 cm. The lowest mean plant height was recorded from Richland and the highest was recorded from Creston (Table 8). The taller plant may have more number of pods and seeds thus more grain yield compared to shorter plants. This may explain why Creston is having the highest yield compared to other testing sites. Beside this, the taller plant produce more biomass that will be left in the field after harvest thus contributing more residue that will improve soil organic matter and other related soil properties. But, the taller plant may also result in logging thus creating difficulty in harvesting.

Yellow Pea Days to Flowering

Days to flowering data were recorded for most of the locations (Table 9). From those locations, the mean number of days to flowering was longer at Moccasin (84 days) compared to other sites (Table 9). Moccasin also had longer time to flower in 2013 compared to other sites.

Green Pea Grain Yield

The mean grain yield for green pea ranged from 1042 lb/ac to 4462 lb/ac. The average yields for green pea were 2312 lb/ac at Bozeman, 1177 lb/ac at Broadview, 2723 lb/ac at Conrad, 1380 lb/ac with irrigation at Corvallis,

4462 lb/ac at Creston, 2080 lb/ac at Havre, 1042 lb/ac at Huntley (dryland), 1733 lb/ac at Huntley (irrigated), 2029 lb/ac at Moccasin, 1127 lb/ac at Richland and 2515 at Sidney (Table 11). Similar to 2013, in 2014, the mean grain yield both for green and yellow pea was higher at Creston than other locations.

Green Pea Thousand Kernel Weight (TKW)

TKW data for green pea was recorded only for few sites and ranged from 209 gm per 1000 seeds at Havre to 228 gm per 1000 seeds at Richland. Similarly, in 2013, the highest mean TKW for green pea was recorded from Richland compared to other locations (Table 12).

Green Pea Test Weight

The mean test weight for green pea ranged from 59.77 lb/bu at Richland sites to 65.38 lb/bu at Havre. The details are shown in Table 13.

Green Pea Plant Height

Mean plant height ranged from 53 to 115 cm. Like yellow pea, the mean plant height was shorter at Richland and taller at Creston compared to other locations (Table 14).

Green Pea Days to Flowering

The mean number of days to flower ranged from 48 days at Huntley to 85 days at Moccasin (Table 15). Similarly, in 2013, the mean number of days to flowering was longer at Moccasin compared to other sites. The higher elevation in Moccasin might result in lower temperature and slow growth thus lengthened the time to flower.

Summary

In 2014, the mean grain yield both for yellow and green pea was higher for Creston than other locations. The maximum mean grain yield (5570 lb/ac) was recorded from variety Salamanca compared to other yellow varieties at Creston. Similarly, the green color variety Daytona resulted in maximum grain yield (5413 lb/ac) for the same location compared to other green color varieties and locations. The exceptionally high yield recorded at Creston was in consistent with 2013 results and might indicate this is the right place for pea production in Montana.

Grain yield was higher in 2014 compared to 2013 for most of the varieties and testing sites except Corvallis and Richland. These two sites were wet and cold for pulse crops in 2014. Beside, hail damage at these sites reduced the yield. Hail damage not only resulted in low yield, but also caused high yield variability within the trial in some of the locations as indicated by high CV in Richland.

We found significant yield differences among varieties at several locations (Tables 5 and 11). On average, yellow pea varieties yielded 10% more grain yield than green pea. Several varieties have performed well in certain locations (Table 16). However, none of the varieties consistently out yield in all locations (Tables 10 and 14). 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 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 4. 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					
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
Universal					

NDSU = North Dakota State University; PG = ProGene Plant Research; 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 tested.

Table 5. 2014 Montana Statewide Dry Yellow Pea Variety Evaluations – Grain Yield (lb/ac)

Yellow pea variety/line	Bozeman	Broadview	Conrad	Corvallis (Irrigated)	Creston	Havre	Huntley (Dry)	Huntley (Irri)	Moccasin	Richland*	Sidney
Abarth		1458	3228			1943		2264	2350	1102	
Agassiz	2492	1258	2876	1066	4868	2215	1144	2989	2220	1359	2436
Bridger	2464	1043	2212	1593	4632	1920	892	863	2176	1145	1983
CDC Leroy	2258	1412	3625	1212	4440	2355	1021	2826	2098	1276	2840
CDC Treasure	2476	1063	2876	1337	5488	1983	799	1575	1944	1341	2636
DS Admiral	2665	1222	2795	1622	5018	2592	1223	2078	2213	1153	2693
Earlstar	2490	1476	1796	1309	5307	2012	1223	1960	2245	1284	2722
Gunner										1487	
Jet Set	2389	1447	3225	919	5209	2267	1256	3169	2242	1156	2704
Korando		1396	3182			1969	1026	1681	2257	1088	
Montech 4152	2444	1261	3459	1395	5009	2056	1103	2236	2176	1216	2521
Montech 4193			2209			2450				1344	
Mystique		1177	2281			2153	1260	2877	2008	1238	
Navarro		1436	2492		5230	2505	1408	1568	2349	1345	
Nette		1411	2867		5133	2440		2192	2209	1068	
Pro 822		1352						1906			
Pro127-2			2992			2610			2144	930	
Pro-7402						2191					
Pro793			3138			2312			2313	1002	
PSO826MT290						2232			2131	783	
PSO826MT460						2393			2186	979	
PSO877MT632						2344			1875	1039	
Quantum										1345	
Salamanca		1397	2157		5570	2256	1258	1773	2245	1464	
Spider		1127	3492		4890	1953	1012	2369	2069	1296	
SW Midas	2396	1309	3216	1495	4888	2100	1151	2984	2019	1034	2909
Torch										1513	
Trapeze										1240	
Universal					4727						
Yellow pea means	2452	1307	2723	1350	5016	2228	1126	2165	2165	1200	2604
P-Value	0.9073	0.9623	0.2898	0.0148	0.1929	<0.0001	0.0015	<0.0001	0.0019	0.1894	0.0156
LSD (0.05)	NS	NS	NS	147	NS	287	255	564	220	NS	460
CV (%)	13.86	32.41	32.53	15.56	10.41	9.15	15.91	18.56	7.20	15.56	12.18

*Hail damage at Richland resulted in yield loss to the extent of 40 to 60% depends on variety/line.

Table 6. 2014 Montana Statewide Dry Yellow Pea Variety Evaluations –Thousand Kernel Weight (TKW) Summary (g/1000seed)

Yellow pea variety/line	Bozeman	Broadview	Conrad	Corvallis (Irrigated)	Creston	Havre	Huntley (Dry)	Huntley (Irri)	Moccasin	Richland	Sidney
Abarth			272.3			263.7			263.2	257.6	
Agassiz			229.0		213.2	212.3			223.5	248.3	217.7
Bridger			217.5		219.3	206.5			217.0	223.7	213.4
CDC Leroy			162.7		138.3	140.9			151.1	172.2	161.9
CDC Treasure			224.7		208.2	194.7			226.4	207.4	213.7
DS Admiral			244.0		231.3	221.9			240.6	228.8	229.9
Earlstar			219.8		209.4	199.9			227.8	218.8	212.0
Gunner										255.6	
Jet Set			237.3		216.7	218.8			221.7	253.6	212.5
Korando			238.0			250.5			242.2	254.0	
Montech 4152			247.0		243.6	254.4			255.7	277.7	247.6
Montech 4193			250.8			239.7				240.8	
Mystique			235.0			239.5			259.6	243.4	
Navarro			270.3		272.3	251.1			255.0	265.9	
Nette			215.0			232.0			243.0	266.0	
Pro 822											
Pro127-2			263.8		239.9	228.4			245.9	238.2	
Pro-7402						218.9					
Pro793			275.0			262.3			276.4	278.5	
PSO826MT290						254.6			267.9	254.8	
PSO826MT460						237.0			244.0	243.9	
PSO877MT632						214.7			221.7	219.7	
Quantum										300.0	
Salamanca			239.0		249.7	231.4			260.2	254.7	
Spider			242.8		241.7	240.9			237.4	247.7	
SW Midas			219.3		206.9	204.5			194.6	216.7	207.9
Torch										283.3	
Trapeze										242.0	
Universal					227.3						
Yellow pea means			238.2		221.7	226.8			236.9	245.1	212.9
P-Value			<0.0001		<0.0001	<0.0001			<0.0001	<0.0001	<0.0001
LSD (0.05)			22.1		12.6	11.7			18.4	14.8	9.5
CV (%)			0.56		4.02	4.59			5.51	4.29	3.09

Table 7. 2014 Montana Statewide Dry Yellow Pea Variety Evaluations – Test Weight (lb/bu)

Yellow pea variety/line	Bozeman	Broadview	Conrad	Corvallis (Irrigated)	Creston	Havre	Huntley (Dry)	Huntley (Irri)	Moccasin	Richland	Sidney
Abarth		64.83	63.65			65.15		63.68	64.45	58.53	
Agassiz		63.75	63.73	59.73	63.28	65.58	63.80	64.08	64.45	59.85	65.25
Bridger		64.68	64.25	58.95	65.85	65.70	64.23	63.15	65.68	60.23	65.50
CDC Leroy		66.08	64.97	64.37	65.75	67.18	67.05	64.90	66.13	61.43	66.25
CDC Treasure		65.45	64.43	60.65	65.03	66.38	65.33	64.28	65.63	60.63	65.88
DS Admiral		63.85	63.35	57.10	63.83	65.08	63.88	63.30	64.70	59.03	65.63
Earlstar		64.75	63.95	64.37	64.40	65.15	64.33	63.38	64.55	59.88	64.88
Gunner										60.08	
Jet Set		63.33	63.85	60.35	63.18	66.38	63.23	63.85	64.65	59.68	65.00
Korando		64.38	63.23			65.48	63.88	61.93	65.48	57.95	
Montech 4152		64.45	65.05	62.85	65.58	66.85	64.33	62.93	65.35	60.05	66.13
Montech 4193			63.40			65.78				59.05	
Mystique		64.53	63.03			65.68	64.13	62.98	64.35	58.88	
Navarro		65.00	62.68		64.30	64.98	64.33	62.65	64.50	58.93	
Nette		66.33	63.98			66.13		64.68	65.95	60.43	
Pro 822		65.67						63.68			
Pro127-2			64.05		64.05	66.65			65.08	59.68	
Pro-7402						65.20					
Pro793			64.00			66.25			65.18	58.43	
PSO826MT290						65.28			64.43	58.78	
PSO826MT460						65.30			64.00	59.80	
PSO877MT632						66.18			65.10	59.88	
Quantum										59.03	
Salamanca		64.20	63.65		63.90	66.25	64.63	63.30	64.73	59.85	
Spider		65.20	64.08		64.10	66.88	65.13	63.03	65.60	59.73	
SW Midas		64.13	64.10	62.33	64.53	65.48	63.48	64.48	64.15	59.73	65.38
Torch										60.38	
Trapeze										58.33	
Universal					62.80						
Yellow pea means		64.73	63.85	61.06	64.32	65.86	64.41	63.55	64.96	59.54	65.54
P-Value		<0.0001	<0.0001	0.0219	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0180
LSD (0.05)		1.00	0.57	1.73	1.06	0.68	1.32	0.82	0.47	0.81	0.81
CV (%)		1.10	0.63	4.01	1.16	0.73	1.43	0.93	0.52	0.96	0.85

Table 8. 2014 Montana Statewide Dry Yellow Pea Evaluations – Plant Height (cm)

Yellow pea variety/line	Bozeman	Broadview	Conrad	Corvallis (Irrigated)	Creston	Havre	Huntley (Dry)	Huntley (Irri)	Moccasin	Richland	Sidney
Abarth		81	78			64		76	67	57	
Agassiz	68	80	76	59	121	62	70	83	62	59	75
Bridger	63	81	70	63	120	52	63	75	62	53	64
CDC Leroy	61	82	68	55	115	55	60	75	64	51	65
CDC Treasure	70	88	87	65	118	60	68	84	69	62	75
DS Admiral	74	78	74	68	115	62	72	83	74	55	67
Earlstar	70	81	81	69	116	62	74	82	76	67	79
Gunner										65	
Jet Set	64	78	83	56	110	58	65	81	65	60	73
Korando		85	67			56	65	79	70	58	
Montech 4152	68	76	80	54	120	57	67	76	71	54	70
Montech 4193			74			55				56	
Mystique		87	84			63	69	81	64	66	
Navarro		82	72		124	61	68	69	66	59	
Nette		76	77			48		74	68	54	
Pro 822		79						73			
Pro127-2			76		126	56			67	50	
Pro-7402						54					
Pro793			55			49			67	50	
PSO826MT290						60				49	
PSO826MT460						52			81	46	
PSO877MT632						53			59	55	
Quantum									58	61	
Salamanca		88	80		121	58	72	84	77	62	
Spider		85	84		113	71	71	78	71	57	
SW Midas	65	79	74	61	117	57	68	79	63	59	67
Torch										66	
Trapeze										53	
Universal					115						
Yellow pea means	66.7	81.4	75.7	61.7	117.8	57.7	67.9	77.9	67.6	56.8	70.3
P-Value	0.0852	0.0523	<0.0001	0.0025	0.5853	0.0676	0.0428	0.4869	<0.00001	0.0011	0.0002
LSD (0.05)	NS	NS	9.5	5.7	NS	NS	7.5	NS	4.8	4.9	5.6
CV (%)	8.59	6.97	8.89	6.59	8.03	14.42	7.74	11.10	5.09	12.39	5.22

Table 9. 2014 Montana Statewide Dry Yellow Pea Variety Evaluations – Number of Days to Flowering

Yellow pea variety/line	Bozeman	Broadview	Conrad	Corvallis (Irrigated)	Creston	Havre	Huntley (Dry)	Huntley (Irri)	Moccasin	Richland	Sidney
Abarth			58			62		57	83		
Agassiz	60		60	57	67	63	48	58	86		59
Bridger	59		58	57	63	61	48	57	85		58
CDC Leroy	62		61	61	67	64	49	57	86		60
CDC Treasure	60		59	58	65	62	48	56	84		58
DS Admiral	60		58	57	65	62	48	58	86		59
Earlstar	60		58	57	64	61	48	57	85		58
Gunner											
Jet Set	61		60	57	67	63	48	57	83		60
Korando			55			60	46	57	87		
Montech 4152	59		58	55	65	62	46	57	86		58
Montech 4193			58			62					
Mystique			59			62	48	58	84		
Navarro			54		60	58	46	56	82		
Nette			58			61		58	84		
Pro 822								56			
Pro127-2			59		65	63			84		
Pro-7402						61					
Pro793			57			60			84		
PSO826MT290						58			79		
PSO826MT460						62			86		
PSO877MT632						62			86		
Quantum											
Salamanca			60		65	63	49	58	87		
Spider			60		68	63	49	59	86		
SW Midas	61		59	59	67	62	47	58	84		60
Torch											
Trapeze											
Universal					61						
Yellow pea means	60.2		58.2	57.5	64.7	61.3	47.6	57.2	84.3		58.9
P-Value	0.0852		<0.0001	0.0005	<0.0001	<0.0001	0.0097	0.3907	<0.0001		0.0380
LSD (0.05)	NS		0.7	1.5	1.1	0.8	1.8	NS	1.54		1.9
CV (%)	8.59		0.27	1.90	0.45	0.36	0.72	0.96	1.29		1.03

Table 10. 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.

Table 11. 2014 Montana Statewide Dry Green Pea Variety Evaluations – Grain Yield (lb/ac)

Green pea variety/line	Bozeman	Broadview	Conrad	Corvallis (Irrigated)	Creston	Havre	Huntley (Dry)	Huntley (Irri)	Moccasin	Richland*	Sidney
Aragorn	2323	1036	2597	1229	4158	1791	1203	1523	1860	805	2442
Arcadia	2349	1347	3346	1295	4283	1817	956	1885	2010	1182	2575
Banner			2651			2267				1154	
Bluemoon			2827			2055			2239	1535	
CDC Striker	2283	1018	2017	1354	3934	1833	986	1081	2156	1125	2594
Crusier	2101	1188	2995	1384	4605	1856	991	1893	1860	998	2440
Daytona	2448	1296	2148	1561	5413	2262	1111	2502	2248	1261	2342
Ginny	2318	1226	3674		4324	1860		2177		1317	2703
Greenwood	2420	1239	2473		4787	2794		2110		1035	
K2		820	2619			1773	821	1024	1780	777	
Majoret	2255	1209	2469	1570	4430	2105	1128	1410	2054	1275	
PS07ND0190				1197					1818	1181	
PSO826MT190						2456			2000	789	
PSO877MT076						2378			2130	950	
PSO877MT499						2084			2045	851	
Shamrock										1643	
Viper		1422	2707			2063	1145	1672	2180	1259	
Green pea means	2312	1177	2723	1380	4462	2080	1042	1733	2029	1127	2515
P-Value	0.8638	0.5442	0.3342	0.5060	0.0352	<0.0001	0.4652	0.0003	0.0146	0.1284	0.7493
LSD (0.05)	NS	NS	NS	NS	724	310	NS	640	288	NS	NS
CV (%)	13.86	31.82	30.73	18.49	11.48	10.54	24.33	24.47	9.92	35.37	14.26

*Hail damage at Richland resulted in yield loss to the extent of 40 to 60% depends on variety/line.

Table 12. 2014 Montana Statewide Dry Green Pea Variety Evaluations – Thousand Kernel Weight (TKW) (g/1000 seed)

Green pea variety/line	Bozeman	Broadview	Conrad	Corvallis (Irrigated)	Creston	Havre	Huntley (Dry)	Huntley (Irri)	Moccasin	Richland	Sidney
Aragorn			218.8		199.0	203.6			218.6	201.2	210.1
Arcadia			208.0		197.4	197.8				221.7	205.5
Banner			219.3			201.6			200.0	212.7	
Bluemoon			236.0			220.5			245.5	252.8	
CDC Striker			241.8		240.0	222.6			251.1	239.6	235.7
Crusier			205.8		190.0	198.8			204.4	204.2	202.7
Daytona			253.3		267.7	247.1			252.3	267.0	257.7
Ginny			206.5		194.0	197.2				210.4	
Greenwood			216.5		213.4	188.6				213.7	
K2			209.5			198.0			217.8	227.3	
Majoret			234.3		236.6	217.2			238.8	249.2	236.8
PS07ND0190									214.6	225.7	
PSO826MT190						213.3			216.6	214.0	
PSO877MT076						192.5			208.9	219.1	
PSO877MT499						223.7			228.9	235.7	
Shamrock										246.6	
Viper			232.5			221.1			248.0	238.3	
Green pea means			222.9		215.6	209.9			226.0	228.0	224.7
P-Value			0.0224		0.6079	0.3066			<0.0001	<0.0001	0.0002
LSD (0.05)			20.6		NS	NS			13.3	9.4	10.1
CV (%)			11.38		7.71	11.72			4.11	2.90	5.22

Table 13. 2014 Montana Statewide Dry Green Pea Variety Evaluations – Test Weight (lb/bu)

Green pea variety/line	Bozeman	Broadview	Conrad	Corvallis (Irrigated)	Creston	Havre	Huntley (Dry)	Huntley (Irri)	Moccasin	Richland	Sidney
Aragorn		64.13	62.40	59.90	61.30	63.90	64.20	63.80	63.55	57.60	64.25
Arcadia		64.83	63.73	62.45	62.20	65.23	65.05	63.98	64.75	59.38	65.00
Banner			64.10			65.85				59.35	
Blumoon			62.85			65.13			63.58	59.70	
CDC Striker		65.85	63.98	57.97	62.65	66.55	65.50	63.73	65.40	60.25	65.75
Crusier		63.70	62.20	60.90	61.98	63.60	63.55	63.25	63.15	58.95	63.88
Daytona		64.95	63.97	60.70	63.90	65.53	65.58	63.95	65.63	59.58	65.50
Ginny		64.20	63.83		62.25	65.95		64.58		59.87	
Greenwood		65.20	64.93		64.23	65.67		63.68		60.55	
K2		64.40	63.18			64.90	64.35	62.05	64.65	59.95	
Majoret		63.80	64.00	58.50	63.25	66.33	65.03	64.30	65.43	60.18	66.63
PS07ND0190				58.67					63.63	60.43	
PSO826MT190						66.08			65.10	59.10	
PSO877MT076						65.08			64.00	60.88	
PSO877MT499						66.03			65.48	60.05	
Shamrock										60.85	
Viper		64.53	62.65			65.00	64.28	63.75	64.60	58.95	
Green pea means		64.55	63.46	59.80	62.68	65.38	64.69	63.70	64.53	59.77	65.17
P-Value		0.0008	<0.0001	0.6195	0.6079	0.3066	0.0016	0.3146	0.0001	<0.0001	0.0002
LSD (0.05)		0.85	0.83	NS	NS	NS	0.93	NS	1.14	0.65	0.91
CV (%)		0.93	0.92	4.86	7.71	11.72	0.99	1.93	1.24	0.78	5.22

Table 14. 2014 Montana Statewide Dry Green Pea Variety Evaluations – Plant Height (cm)

Green pea variety/line	Bozeman	Broadview	Conrad	Corvallis (Irrigated)	Creston	Havre	Huntley (Dry)	Huntley (Irri)	Moccasin	Richland	Sidney
Aragorn	59	76	67	56	113	51	69	68	62	48	63
Arcadia	56	70	55	54	112	51	62	67	59	53	60
Banner			74			57				57	
Bluemoon			70			60			64	59	
CDC Striker	68	81	69	60	125	55	67	68	66	47	73
Crusier	60	80	62	58	114	48	68	81	62	55	68
Daytona	68	85	73	60	116	60	75	79	70	56	74
Ginny	58	73	71		115	57		72		55	
Greenwood	64	71	70		115	51		72		54	
K2		73	69			56	63	64	60	51	
Majoret	69	87	77	61	117	54	68	74	64	54	68
PS07ND0190				71					77	55	
PSO826MT190						56			61	50	
PSO877MT076						58			58	54	
PSO877MT499						57			60	51	
Shamrock										62	
Viper		86	78			58	71	72	69	52	
<i>Green pea means</i>	<i>62.6</i>	<i>78.4</i>	<i>69.4</i>	<i>60.4</i>	<i>115.7</i>	<i>55.2</i>	<i>67.9</i>	<i>71.5</i>	<i>63.9</i>	<i>53.7</i>	<i>67.5</i>
<i>P-Value</i>	<i>0.0038</i>	<i>0.0028</i>	<i>0.0224</i>	<i>0.0447</i>	<i>0.6079</i>	<i>0.3066</i>	<i>0.0581</i>	<i>0.0810</i>	<i><0.0001</i>	<i>0.5387</i>	<i>0.0002</i>
<i>LSD (0.05)</i>	<i>7.4</i>	<i>8.7</i>	<i>11.1</i>	<i>7.5</i>	<i>NS</i>	<i>NS</i>	<i>NS</i>	<i>NS</i>	<i>6.2</i>	<i>NS</i>	<i>5.2</i>
<i>CV (%)</i>	<i>8.12</i>	<i>7.91</i>	<i>11.38</i>	<i>8.79</i>	<i>7.71</i>	<i>11.72</i>	<i>8.11</i>	<i>10.41</i>	<i>6.79</i>	<i>13.88</i>	<i>5.22</i>

Table 15. 2014 Montana Statewide Dry Green Pea Variety Evaluations – Number of Days to Flowering

Green pea variety/line	Bozeman	Broadview	Conrad	Corvallis (Irrigated)	Creston	Havre	Huntley (Dry)	Huntley (Irri)	Moccasin	Richland	Sidney
Aragorn	58		58	55	61	61	47	59	84		57
Arcadia	60		60	57	67	63	49	59	82		60
Banner			56				58				
Bluemoon			60				64		85		
CDC Striker	61		60	59	67	64	49	59	87		60
Crusier	60		58	57	63	62	47	57	83		58
Daytona	62		60	60	67	64	49	57	86		60
Ginny	59		58		65	62		58			
Greenwood	59		59		63	61		59			
K2			59			61	48	56	82		
Majoret	62		60	60	67	63	48	58	86		60
PS07ND0190				61					89		
PSO826MT190						63			86		
PSO877MT076						65			87		
PSO877MT499						62			87		
Shamrock											
Viper			59			61	48	58	86		
<i>Green pea means</i>	<i>60.1</i>		<i>58.7</i>	<i>58.6</i>	<i>64.9</i>	<i>62.1</i>	<i>48.0</i>	<i>57.8</i>	<i>85.2</i>		<i>59.2</i>
<i>P-Value</i>	<i><0.0001</i>		<i><0.0001</i>	<i>0.0002</i>	<i><0.0001</i>	<i><0.0001</i>	<i>0.0326</i>	<i>0.6578</i>	<i><0.0001</i>		<i>0.0380</i>
<i>LSD (0.05)</i>	<i>0.5</i>		<i>1.1</i>	<i>1.4</i>	<i>1.6</i>	<i>0.8</i>	<i>1.4</i>	<i>NS</i>	<i>0.9</i>		<i>2.6</i>
<i>CV (%)</i>	<i>0.51</i>		<i>0.43</i>	<i>1.70</i>	<i>0.62</i>	<i>0.33</i>	<i>0.57</i>	<i>1.41</i>	<i>0.50</i>		<i>1.03</i>

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

Table 16. Montana Statewide Dry Pea Variety Evaluations – 2008-2014 Multi-year Grain Yield Summary (lb/ac)

Variety	Bozeman							Conrad							Corvallis						
	2008	2009	2010	2011	2012	2013	2014	2008	2009	2010	2011	2012	2013	2014	2008	2009	2010	2011	2012	2013	2014
Yellow Pea																					
AC Agassiz					905	1857	2492				2867	2746	1519	2876				2812	1902	1066	
Bridger				2476	1085	1763	2464				3259	2793	1741	2212				1862	3170	2525	1593
Delta	1882	2158	3118	2105	1011	1779		2177	3996	869	2832	2526	1641		1725	3276	3671	1674	2987	2594	
DS Admiral	1846	2486	3439	2206	910	1910	2665	1966	3607	1212	3070	2204	1638	2795	1844	2882	2941	1770	2518	2385	1622
Montech 4152				2378	1074	2019	2444				3066	3116	1862	3456				1946	2899	2096	1395
Spider				2188	1037	1971			1100	2664	2426	1748	3492					2155	2899	1503	
SW Midas		2018	3436	2382	1048	1780	2396		3620	1212	2774	2674	1846	3216		2828	4029	1998	3064	2333	1495
Yellow Ave*	1777	2193	3277	2246	1008	1883	2452	2091	3789	1181	2853	2745	1741	2723	1923	3057	3590	1865	2907	2306	1350
Green Pea																					
Arcadia				2378	966	1978	2349				3178	2281	1718	3346				2272	3029	2704	1295
CDC Striker		2343	2585	2081	918	1502	2283		3189	1147	2632	2254	1812	2017		3144	3068	1866	2375	2053	1354
Cruiser	1438	2247	3041	2152	872	1731	2101	1592	3154	965	2746	2002	1488	2995	1332	3046	3144	1967	2562	1543	1384
K2				2018	962	1500				1304	2622	2246	1713	2619				1894	2470	2000	
Majoret	1766	2218	3008	2039	961	1705	2255	1884	3345	1623	2382	2407	1607	2469	2074	3278	3812	1641	2447	1439	1570
Stirling	1994	2031	3288	2184	1088			1887	3932	926	2651	2746			1654	3144	3525	1475			
Green Ave*	1724	2246	2934	2123	961	1709	2312	1794	3307	1164	2581	2373	1704	1177	1706	3173	3313	1750	2630		1380
Trial Means[§]	1747	2214	3145	2177	986	1811	2385	1836	3585	1174	2702	2577	1734	2798	1835	3101	3483	1801	2779	2203	1362
LSD (0.05)[§]	227	310	639	NS	144	NS	NS	583	479	298	NS	NS	483	NS	NS	627	495	NS	1057	950	NS
CV (%)[§]	9	10	14	7	10	11	14	19	8	18	14	29	20	32	39	14	10	23	14	30	17

*Average values brought from Table 5 and 11 for yellow and green pea, respectively. [§]Indicate results for both green and yellow color dry peas analyzed together.

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Table 16. Statewide Dry Pea Variety Evaluations – 2008 – 2014 Multi-year Grain Yield Summary (lb/ac)...continued

Variety	Havre							Huntley (Dry)							Joplin						
	2008	2009	2010	2011	2012	2013	2014	2008	2009	2010	2011	2012	2013	2014	2008	2009	2010	2011	2012	2013	2014
Yellow Pea																					
AC Agassiz				2236	1965	2027	2215				1965			1144							
Bridger				2149	1837	2127	1920				2360	1975	2687	892				773	1387		
Delta	3021	2446	3600	2139	2222	1700		1612	2542	2517	1904	1414	2648				2491	775	1454		
DS Admiral	2789	2331	3325	2102	1798	2008	2592		2669	2743	2128	1261	2840	1223			2236	1012	1299		
Montech 4152			3505	2266	2146	1828	2056				2337	1491	2637	1103				1040	1679		
Spider				2071	1903	1734	1953				2283	1220	2710	1012				908	1202		
SW Midas	2849	2314	3348	2111	1729	2033	2100		2329	2760	2106	1855	2745	1151			2371	1060	1702		
Yellow Ave*	3027	2340	3495	2173	2039	2032	2228	1457	2591	2773	2065	1630	2707	1126			2365	969	1454		
Green Pea																					
Arcadia				2405	1930	2598	1817				2224	1639		956				1142	2017		
CDC Striker	2682	2154	3222	2012	1953	1571	1833		2417	2556	1568	1128		986			2016	606	1517		
Cruiser	2735	2254	3194	2286	1735	1669	1856		2520	2575	1998	1232	2566	991			2162	977	1517		
K2				1576	1463	1650	1773				2092	1525		821				748	1457		
Majoret	2694	2352	3451	1612	1685	2193	2105	1277	2501	2945	1660	1331		1128			2514	465	1688		
Stirling	3103	2327	3274	1915	2122			1841	2633	2874	1527	1942					2630	1257	1854		
Green Ave*	2758	2252	3241	1987	1874	2011	2080	1462	2471	2632	1729	1482	2442	1042			2259	790	1686		
Trial Means[§]	2942	2306	3397	2069	1968	2022	2170	1486	2545	2719	1878	1556	2634	1096			2324	870	1570		
LSD (0.05)[§]	317	290	325	NS	309	447	294	355	274	NS	NS	NS	300	295			562	NS	NS		
CV (%)[§]	8	9	7	13	11	14	10	17	8	12	20	29	8	19			17	46	23		

*Average values brought from Table 5 and 11 for yellow and green pea, respectively. [§]Indicate results for both green and yellow color dry peas analyzed together.

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Table 16. Statewide Dry Pea Variety Evaluations – 2008 – 2014 Multi-year Grain Yield Summary (lb/ac)...continued

Variety	Moccasin							Richland							Sidney						
	2008	2009	2010	2011	2012	2013	2014	2008	2009	2010	2011	2012	2013	2014	2008	2009	2010	2011	2012	2013	2014
Yellow Pea																					
AC Agassiz			2855	1123	1100	559	2220				2224	3242	4107	1359					1619		2436
Bridger			2981	1160	1064	1826	2176			3295	2494	3878	3323	1145				2998	1249		1983
Delta	991	1177	3139	963	1313	1899		1633	2015	3226	1501	3706	3573		1420	1887	3105	2662	1464		
DS Admiral	1060	1158	2642	999	1295	1835	2213	1536	2018	3264	1664	3564	3645	1153	1078	1757	3016	2517	1158		2693
Montech 4152			2533	1018	1084	1791	2176				1809	3409	3786	1216				2463	1586		2521
Spider			2572	1005	1252	1750	2069			2731	1910	1252	3959	1296				2504	1297		
SW Midas	697	903	2603	1031	1165	1557	2019	2007	1435	2321	2166	2983	3873	1034		1511	3639	2589	1571		2909
Yellow Ave*	930	1058	2796	992	1241	1678	2165	1761	1855	2999	1855	3566	3807	1200	1261	1884	3489	2502	1421		2604
Green Pea																					
Arcadia				978	1186	1655	2010				1494	3143	3777	1182				2772	1302		2575
CDC Striker	809	1066	2427	774	1193	1753	2156		1918	2976	1732	3270	2914	1125		1988	3408	2212	1122		2594
Cruiser	682	1001	2680	988	1123	1502	1860	1456	1797	2642	1684	3010	3289	998	1398	1806	2820	2223	1202		2440
K2			2436	851	1457	1259	1780			2721	1772	3476	2803				2751	2296	1435		
Majoret	722	1091	2608	848	1027	1584	2054	1457	2221	2981	1653	3078	3022	1275	1048	2080	3342	2233	1336		
Stirling	885	1136	2907	838	1392			1590	1565	2566	1493	3725			1159	1658	3052	2601	2041		
Green Ave*	783	1091	2665	887	1200	1594	2029	1513	1927	2798	1628	3410	3440	1127	1221	1898	3104	2341	1406		2515
Trial Means[§]	875	1071	2754	934	1224	1640	2113	1677	1882	2922	1729	3501	3622	1172	1794	1964	3341	1659	1414		2569
LSD (0.05)[§]	172	208	203	120	NS	291	245	NS	577	NS	289	NS	777	NS	1005	301	792	NS	465		NS
CV (%)[§]	14	12	5	9	16	13	8	15	21	13	10	16	15	30	39	9	9	14	20		13

*Average values brought from Table 5 and 11 for yellow and green pea, respectively. [§]Indicate results for both green and yellow color dry peas analyzed together. *Hail damage at Richland in 2014 resulted in yield loss to the extent of 40 to 60% depends on variety/line.

Table 17. 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
Blumoon	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 Evaluations

The Western Regional dry pea variety evaluations were tested at three locations (Corvallis, Moccasin and Richland). The trial consisted of 10 advanced breeding lines and varieties of smooth green color for each sites and seven smooth yellow at Corvallis and Richland and 12 smooth yellow at Moccasin. 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 1573 lb/ac with irrigation at Corvallis, 2218 lb/ac at Moccasin, and 999 lb/ac at Richland (Tables 18 - 20). Among the yellow pea varieties, Delta resulted in mean maximum yield both at Corvallis and Moccasin. But the enter 1004 resulted in mean maximum yield at Richland compared to other yellow varieties/lines.

The average yields of green pea were reported 1456 lb/ac with irrigation at Corvallis, 2123 lb/ac at Moccasin, and 877 lb/ac at Richland (Tables 18 - 20). The green varieties perform differently in the different locations. The maximum mean grain yields were recorded from enter 471, 582 and W-133 at Corvallis, Moccasin and Richland, respectively, (Tables 18-20).

Table 18. 2014 Western Regional Dry Pea Variety Evaluation – Corvallis, MT

Variety/lines	Adjusted grain yield (lb/ac)	No of days to flowering	Plant height (cm)	TKW (gm)	Test wt (lb/bu)
Yellow					
1004	1528	56	63		60.53
925	1390	55	60		58.98
B10-10	1645	51	66		57.30
Carousel	1500	54	63		60.08
Delta	1752	52	64		61.25
PBL-37A	1669	53	62		59.63
Universal	1531	52	67		60.73
<i>Mean</i>	1573	53	64		59.78
<i>P-value</i>	0.6878	0.0079	0.7074		0.0087
<i>LSD (0.05)</i>	NS	2.49	NS		1.96
<i>CV (%)</i>	19.2	3.18	10.09		2.23
Green					
1445	1666	54	63		60.03
471	1758	57	66		58.90
582	1389	57	66		57.55
736	1331	58	59		56.55
840	1338	58	54		59.20
Aragorn	1233	55	59		60.00
Ariel	1247	54	65		60.88
Banner	1729	53	76		60.15
Columbia	1276	45	91		57.33
WR-133	1596	57	65		56.75
<i>Mean</i>	1456	55	66		58.70
<i>P-value</i>	0.0025	<0.0001	<0.0001		0.0024
<i>LSD (0.05)</i>	306	2.1	8.6		2.31
<i>CV (%)</i>	14.57	2.66	9.00		2.72

NA = Not applicable since error sum square = 0. (All varieties except one flower same day and the other variety flower same day in all four replications).

Table 19. 2014 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					
1004	2421	87	59.5	240.5	64.98
925	2122	88	52.0	253.9	63.63
B10-10	2101	77	51.3	220.5	63.15
B11-155	2337	82	53.8	224.6	63.48
B12-113	2328	82	46.5	226.2	63.53
B12-46	1804	79	65.8	220.1	62.30
B12-56	2297	85	48.0	222.4	63.30
B12-NN	2033	84	52.8	183.1	61.20
Carousel	2029	85	62.0	268.0	65.78
Delta	2632	82	58.8	234.8	66.10
PBL-37A	2185	82	55.0	215.2	62.08
Universal	2340	85	64.5	227.4	65.75
Mean	2218	83	55.8	228.1	63.80
P-value	<0.0001	<0.0001	0.0009	<0.0001	<0.0001
LSD (0.05)	278	2.05	9.1	15.2	0.417
CV (%)	8.75	1.72	11.36	6.64	0.52
Green					
1445	2162	85	54.3	220.0	64.25
471	2189	84	57.8	212.4	64.20
582	2353	85	67.8	219.3	63.73
736	2319	87	56.5	218.9	63.93
840	2323	86	50.0	226.0	64.18
Aragorn	1858	85	62.3	219.2	63.43
Ariel	1873	84	61.5	194.4	63.50
Banner	2236	81	63.5	201.5	65.60
Columbia	2011	75	85.0	206.4	64.53
WR-133	1913	86	57.3	223.8	63.93
Mean	2123	84	61.5	214.2	64.13
P-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
LSD (0.05)	181	2.48	9.30	7.30	0.40
CV (%)	5.93	2.05	10.51	2.36	0.44

Table 20. 2014 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				
1004	1416	58.3	244.0	59.57
925	811	45.7	255.9	60.07
B10-10	809	47.7	215.7	53.53
Carousel	1040	54.0	243.3	60.47
Delta	1054	50.0	230.8	57.90
PBL-37A	965	59.7	216.0	57.03
Universal	1040	55.3	229.2	60.17
<i>Mean</i>	999	52.9	233.5	58.39
<i>P-value</i>	0.0289	0.2282	0.0011	<0.0001
<i>LSD (0.05)</i>	139	NS	16.85	2.14
<i>CV (%)</i>	16.78	13.92	4.12	2.09
Green				
1445	860	54.3	221.20	60.63
471	920	51.0	214.13	60.40
582	761	57.3	220.40	58.87
736	920	52.7	215.47	59.30
840	954	48.7	234.53	59.87
Aragorn	818	51.0	220.53	58.30
Ariel	850	50.0	202.53	58.80
Banner	861	54.0	210.40	59.43
Columbia	881	78.7	210.13	58.40
W-133	986	50.0	233.40	59.50
<i>Mean</i>	877	54.7	217.7	59.35
<i>P-value</i>	0.9775	0.0049	0.0921	<0.0001
<i>LSD (0.05)</i>	NS	12.99	NS	0.75
<i>CV (%)</i>	24.32	13.92	5.36	24.32

Lentil

Statewide Lentil Variety Evaluations

The 2014 Statewide Lentil Variety Evaluation was tested at 9 locations (Table 22). This variety evaluation trial consisted of 20 entries. Among the commercially available varieties, we had 2 small green, 5 medium green, 3 large green, 4 small red and 2 small brown. The remaining entries were experimental lines from NDSU breeding program (Table 22).

Lentil Grain Yield

Lentil yields varied greatly from location to location in 2014 due to the differences in environmental conditions and management practices. The mean grain yield for the different locations ranged from 479 lb/ac to 1723 lb/ac (Table 22). Average lentil yields were 1723 lb/ac at Bozeman, 1682 lb/ac at Conrad, 511 lb/ac with irrigation at Corvallis, 1409 lb/ac at Creston, 1557 lb/ac at Havre, 650 lb/ac at Huntley (dry), 1383 lb/ac at Moccasin, 479 lb/ac at Richland and 938 lb/ac at Sidney. Hail damage decreased yield at Richland. .

The difference in grain yield among varieties in a location was significant (Table 22). The variety Essex resulted in mean maximum yield in three of the nine testing sites and Viceroy resulted in mean maximum grain yield in two of the nine testing sites (Table 22).

Lentil TKW

Thousand kernel weight data were measured for six of the nine locations and mean TKW ranged from 38.5 to 62.7 g/1000 seeds (Table 23). Varietal difference in TKW was significant in a location (Table 23).

Lentil Test Weight

Test weight varied from locations to locations. The mean test weight ranged from 54.46 lb/bu measured at Richland to 63.65 lb/bu measured at Sidney (Table 24).

Lentil Plant Height

The mean plant height ranged from 29 cm (recorded at Sidney) to 49 cm (recorded at Creston (Table 25). Creston had taller dry pea and lentil plant height compared to other locations.

Lentil Number of Days to Flowering

The number of days to flowering ranged from 29 to 83 days (Table 26). Recording the number of days to flowering was reported to be difficult in some of the testing locations since lentil keeps on flowering even during harvesting. In 2014, at Moccasin, the number of days for flowering was extended by 10 days compared to 2013 result.

Table 21. 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 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 22. 2014 Montana Statewide Lentil Variety Evaluations – Grain Yield (lb/ac)

Variety/lines	Bozeman	Conrad	Corvallis (Irrigated)	Creston	Havre	Huntley (Dry)	Moccasin	Richland	Sidney
Large Green									
CDC Greenland	1509	1768	496	1550	1603	776	1267	756	976
Merrit	1444	1744	536	1094	1306	499	1258	371	704
Riveland	1736	1616	340	710	1282	557	1519	398	821
Medium Green									
Avondale	1919	1597	528	1625	1808	718	1440	582	982
CDC Richlea	1911	1752	471	1753	1649	699	1672	755	1170
Essex	1839	1865	450	1299	2131	843	1713	441	1057
Imi-Green	1389	1174	353	1326	1523	617	1541	645	737
Impres CL	1739	1799	486	1427	1739	684	1390	449	966
NDL080141L			889				1463	502	
Small Green									
Eston	1914	2020	265	1670	1542	675	1388	430	968
LC07ND055E			608				1504	479	
NDLO90298E			514				1218	499	
Viceroy	1758	2056	612	2497	1140	700	1596	726	1058
Small Brown									
Morena	1763	1633	713	1088	1686	706	1350	411	867
Pardina	1744	1259	655	1080	1667	686	1395	316	972
Small Red									
CDC Impact	1712	1514	441	1731	1416	688	1093	295	1088
CDC Redberry	1700	1869	540	1851	1440	412	1456	524	867
CDC Red Coats	1623	1630	376	927	1306	569	1388	477	840
Crimson	1725	1590	365	1021	1685	578	1087	287	947
NDL090413T			422				929	258	
Trial means	1723	1682	511	1409	1557	650	1383	479	938
P-Value	0.6858	0.1820	0.3241	<0.0001	0.0002	<0.0001	<0.0001	0.0056	<0.0001
LSD (0.05)	NS	NS	NS	136	352	141	248	206	165
CV (%)	18.68	23.61	34.60	27.45	15.92	15.33	12.70	30.48	12.37

*Hail damage at Richland resulted in yield loss to the extent of 40 to 60% depends on variety/line.

Table 23. 2014 Montana Statewide Lentil Variety Evaluations – Thousand Kernel Weight (TKW) (g/1000 seeds)

Variety/lines	Bozeman	Conrad	Corvallis (Irrigated)	Creston	Havre	Huntley (Dry)	Moccasin	Richland	Sidney
Large Green									
CDC Greenland		65.8		67.2	53.4		65.0	69.0	60.1
Merrit		67.0		54.3	43.0		53.8	67.6	50.8
Riveland		109.3		72.0	60.0		72.8	75.2	64.0
Medium Green									
Avondale		60.5		51.2	42.3		48.5	53.7	47.4
CDC Richlea		68.0		53.3	43.5		53.8	56.9	48.1
Essex		46.3		49.1	37.5		44.5	47.9	42.3
Imi-Green		104.3		58.5	51.1		58.7	57.4	57.6
Impres CL		59.0		53.2	42.9		48.5	55.3	47.7
NDL080141L							44.0	49.7	
Small Green									
Eston		63.8		38.2	28.5		32.5	36.1	34.6
LC07ND055E							35.3	41.3	
NDLO90298E							38.4	45.8	
Viceroy		44.0		37.4	25.9		28.3	34.8	32.9
Small Brown									
Morena		64.8		41.6	31.8		37.0	37.1	35.6
Pardina		67.5		41.5	31.7		35.6	41.2	35.9
Small Red									
CDC Impact		47.0		38.8	29.2		34.8	37.3	32.2
CDC Redberry		45.0		42.8	35.1		41.9	45.8	40.7
CDC Red Coats		58.0		41.1	31.4		37.0	54.9	38.9
Crimson		33.3		38.2	29.4		30.6	39.9	33.6
NDL090413T							39.1	47.6	
Trial means		62.7		48.6	38.5		44.0	49.7	43.9
P-Value		0.0003		<0.0001	<0.0001		<0.0001	<0.0001	<0.0001
LSD (0.05)		29.7		2.2	2.0		3.89	6.91	2.74
CV (%)		33.38		3.26	3.6		6.25	9.81	4.39

Table 24. 2014 Montana Statewide Lentil Variety Evaluations – Test Weight (lb/bu)

Variety/lines	Bozeman	Conrad	Corvallis (Irrigated)	Creston	Havre	Huntley (Dry)	Moccasin	Richland	Sidney
Large Green									
CDC Greenland		56		57.09	60.08	59.30	59.65	52.30	62.50
Merrit		55		57.28	60.45	59.53	59.58	53.73	61.75
Riveland		47		54.36	58.93	57.83	58.78	50.68	60.63
Medium Green									
Avondale		53		59.15	62.28	61.78	61.58	53.13	63.50
CDC Richlea		54		57.85	61.68	60.85	61.10	53.63	62.63
Essex		58		59.25	63.40	62.80	62.78	55.45	64.38
Imi-Green		53		59.31	62.33	61.88	61.75	53.13	62.88
Impres CL		55		59.40	62.25	61.90	62.00	55.03	63.13
NDL080141L							62.13	54.98	
Small Green									
Eston		58		59.37	64.93	64.50	64.08	57.38	64.75
LC07ND055E							63.80	56.53	
NDLO90298E							63.20	55.60	
Viceroy		59		60.51	65.10	65.08	64.53	56.78	64.75
Small Brown									
Morena		58		60.95	65.53	65.33	64.33	57.33	65.00
Pardina		59		60.66	65.43	65.13	64.35	57.80	64.75
Small Red									
CDC Impact		60		60.81	65.80	65.75	64.80	56.70	65.00
CDC Redberry		58		58.51	64.35	64.25	62.90	54.83	64.25
CDC Red Coats		58		60.21	63.98	63.15	63.48	56.90	64.25
Crimson		61		60.04	64.55	64.53	63.50	59.13	64.35
NDL090413T							65.20	58.40	
Trial means		56.42		59.02	63.19	62.7	62.67	54.46	63.65
P-Value		<0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
LSD (0.05)		4.81		1.24	2.01	0.29	0.64	1.14	0.68
CV (%)		6.01		1.49	3.66	0.33	0.72	1.46	0.76

Table 25. 2014 Montana Statewide Lentil Variety Evaluations – Plant Height (cm)

Variety/lines	Bozeman	Conrad	Corvallis (Irrigated)	Creston	Havre	Huntley (Dry)	Moccasin	Richland	Sidney
Large Green									
CDC Greenland		44	36	48	40	38	38	39	34
Merrit		40	34	45	35	43	37	40	30
Riveland		46	35	46	39	45	37	45	32
Medium Green									
Avondale		38	31	55	33	40	38	42	30
CDC Richlea		39	29	50	36	44	35	39	30
Essex		38	27	48	37	39	36	46	29
Imi-Green		49	38	58	41	45	43	51	37
Impres CL		37	36	52	39	36	38	39	31
NDL080141L			33				38	46	
Small Green									
Eston		38	25	48	34	38	35	36	28
LC07ND055E			31				37	37	
NDLO90298E			28				34	39	
Viceroy		43	33	48	36	41	38	40	31
Small Brown									
Morena		40	31	51	33	40	33	42	26
Pardina		32	31	41	29	33	30	38	24
Small Red									
CDC Impact		35	27	49	30	35	31	44	22
CDC Redberry		50	31	53	36	36	36	39	30
CDC Red Coats		42	31	51	36	41	36	41	36
Crimson		35	28	47	27	33	34	32	22
NDL090413T			26				32	40	
Trial means		40.3	31.2	49.2	35.1	39.0	35.8	40.7	29.3
P-Value		<0.0001	0.0565	<0.0001	<0.0001	0.0027	<0.0001	0.0042	<0.0001
LSD (0.05)		6.0	NS	4.4	2.8	6.33	3.64	8.89	3.78
CV (%)		10.58	10.84	6.40	5.79	11.41	7.21	15.46	9.07

Table 26. 2014 Montana Statewide Lentil Variety Evaluations – Number of Days to Flowering

Variety/lines	Bozeman	Conrad	Corvallis (Irrigated)	Creston	Havre	Huntley (Dry)	Moccasin	Richland	Sidney
Large Green									
CDC Greenland	62		63	65	62	51	84		61
Merrit	58		55	60	56	47	82		55
Riveland	59		57	61	57	48	83		57
Medium Green									
Avondale	60		59	62	59	48	84		58
CDC Richlea	61		63	65	60	49	83		59
Essex	61		63	66	61	50	84		59
Imi-Green	61		63	64	61	51	84		60
Impres CL	62		60	64	62	52	84		61
NDL080141L			60				84		
Small Green									
Eston	61		63	63	58	48	83		58
LC07ND055E			57				82		
NDLO90298E			58				82		
Viceroy	62		63	68	62	52	85		62
Small Brown									
Morena	59		57	61	58	48	84		58
Pardina	59		55	61	57	48	82		57
Small Red									
CDC Impact	61		60	66	59	51	83		60
CDC Redberry	61		63	65	61	53	84		59
CDC Red Coats	63		64	68	63	52	84		62
Crimson	61		63	64	62	50	84		59
NDL090413T			55				81		
Trial means	60.7		60.0	63.8	59.7	49.8	83		29.3
P-Value	<0.0001		<0.00	<0.0001	<0.0001	<0.0001	0.4636		<0.0001
LSD (0.05)	0.77		1.4	1.6	1.1	1.58	NS		3.78
CV (%)	0.90		1.74	0.66	0.45	0.63	2.48		9.07

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

Table 27. Statewide Lentil Variety Evaluations – 2008 – 2014 Multi-year Grain Yield Summary (lb/ac)

Variety	Bozeman							Conrad						
	2008	2009	2010	2011	2012	2013	2014	2008	2009	2010	2011	2012	2013	2014
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		2831	623	2307	1800	1698	1752
Avondale			2224	1578	685	1745	1919	559	3113	687	2284	1696	1501	1597
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
Trial Means			1953	1476	560	1363	1723	450	2451	533	2227	1496	1460	1682
LSD (0.05)			382	138	98	167	NS	142	559	214	NS	NS	236	NS
CV (%)			14	7	12	8	19	22	14	28	21	25	11	24
Variety	Corvallis							Creston						
	2008	2009	2010	2011	2012	2013	2014	2008	2009	2010	2011	2012	2013	2014
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	---	2831	2150	1873	1625	1303	1753
Avondale	1338	2495	1052		837	1387	528	2676	3016	2626	2024	1790	1244	1625
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
Trial Means	1112	1802	860		700	1155	511	2312	2522	2164	1822	1345	1347	1409
LSD (0.05)	386	395	348		354	222	NS	270	448	456	NS	421	279	136
CV (%)	24	15	28		36	13	35	8	12	15	22	22	14	28

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Table 27. Statewide Lentil Variety Evaluations – 2008 – 2014 Multi-year Grain Yield Summary (lb/ac)...continued

Variety	Havre							Huntley (Dry)						
	2008	2009	2010	2011	2012	2013	2014	2008	2009	2010	2011	2012	2013	2014
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	---	1603	569	873	734	1585	699
Avondale	1844	1807	2790	1385	874	1483	1808	1457	1916	926	877		1767	718
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>1336</i>	<i>1397</i>	<i>573</i>	<i>672</i>	<i>614</i>	<i>1690</i>	<i>650</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>244</i>	<i>NS</i>	<i>272</i>	<i>NS</i>	<i>167</i>	<i>NS</i>	<i>141</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>9</i>	<i>43</i>	<i>33</i>	<i>54</i>	<i>19</i>	<i>16</i>	<i>15</i>
Variety	Joplin							Moccasin						
	2008	2009	2010	2011	2012	2013	2014	2008	2009	2010	2011	2012	2013	2014
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
Avondale				581	2421			1800		1944	903	955	1859	1440
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>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>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>

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Table 27. Statewide Lentil Variety Evaluations – 2008 – 2014 Multi-year Grain Yield Summary (lb/ac)...continued

Variety	Richland							Sidney						
	2008	2009	2010	2011	2012	2013	2014	2008	2009	2010	2011	2012	2013	2014
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	1699	1959	1594	530			1170
Avondale		1284	1850	1398	2041	2193	582	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	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 Evaluations

The Western Regional lentil variety trials were conducted at three sites (Corvallis, Moccasin and Richland). The trial consisted of 15 entries, 7 commercially available and 8 advanced breeding lines from the USDA-ARS Grain Legume Genetics and Physiology Program in Pullman, Washington.

The average yields of lentil were 427 lb/ac with irrigation at Corvallis, 1329 lb/ac at Moccasin, and 238 lb/ac at Richland (Tables 28-30). The entries that resulted in mean maximum grain yield varied from location to location. The entries 2062T, Avondale and CDC Richlea resulted in mean maximum grain yield at Corvallis, Moccasin and Richland, respectively (Tables 28-30).

Table 28. 2014 Western Regional Lentil Variety Evaluation – Corvallis, MT

Variety/lines	Grain Yield (lb/ac) 13% Moisture	Number of days to flower	Height (cm)
113P	510	57	34
116P	374	58	33
123L	284	56	31
130L	350	56	38
1734L	373	57	33
2062T	661	55	33
2273E	512	62	29
507P	288	57	31
Avondale	484	60	32
CDC Richlea	354	62	31
Crimson	526	63	29
Eston	428	58	30
Merit	343	56	32
Morena	629	55	36
Pardina	365	56	30
Mean	427	57.8	32.1
P-value	0.4366	<0.0001	0.0400
LSD (0.05)	NS	1.7	4.4
C.V.(%)	44.14	2.18	9.73

Table 29. 2014 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)
113P	1251	75	34	50.9	63.80
116P	1301	77	35	48.3	62.63
123L	1135	77	34	86.3	58.10
130L	1357	77	38	72.6	58.40
1734L	1403	78	36	61.9	60.73
2062T	1212	76	33	42.7	63.13
2273E	1321	75	34	35.8	63.98
507P	1137	75	34	44.5	63.53
Avondale	1532	78	36	52.5	61.80
CDC Richlea	1519	78	36	56.4	60.80
Crimson	1188	77	31	31.9	63.65
Eston	1524	76	33	30.5	64.60
Merit	1323	76	36	63.3	59.33
Morena	1411	77	34	38.9	64.30
Pardina	1325	77	31	38.5	64.58
Mean	1329	76.5	34.2	50.3	62.20
P-value	0.0014	0.0028	0.0007	<0.0001	<0.0001
LSD (0.05)	208	1.90	2.90	7.90	1.26
C.V.(%)	11.01	1.76	5.99	11.11	1.42

Table 30. 2014 Western Regional Lentil Variety Evaluation – Richland, MT

Variety/lines	Grain Yield (lb/ac) 13% Moisture[*]	Height (cm)	TKW (g/1000 seeds)
113P	147	40	49.5
116P	193	40	63.2
123L	183	44	74.9
130L	254	44	79.3
1734L	202	40	67.8
2062T	237	42	43.9
2273E	195	37	41.1
507P	176	34	45.2
Avondale	399	39	50
CDC Richlea	417	41	55.9
Crimson	181	33	38.1
Eston	247	37	35.4
Merit	308	40	66.7
Morena	262	38	40.8
Pardina	186	38	39.2
Mean	238	38.9	52.7
P-value	<0.0001	0.5328	<0.0001
LSD (0.05)	91	NS	12.3
C.V.(%)	26.78	17.05	16.35

^{*}Hail damage resulted in significant yield loss at Richland and most of the varieties shattered.

Chickpea

Statewide Chickpea Variety Evaluations

Both statewide and western regional chickpea variety evaluations were seeded as one experiment in the different locations since the number of entries was small (11). Six commercial varieties and five experimental lines were tested (Table 31). This trial was carried out at seven locations (Bozeman, Conrad, Corvallis, Creston, Huntley dry land and irrigated, Moccasin and Richland). The trial at Conrad was seriously affected by antelope damage since they eat most of the pods. The results from Richland was low due to hail damage. The results from these two sites may not be representative but included to give some information in bad conditions. Summary of results are shown in Table 32.

Summary of Statewide and Western regional chickpea variety evaluations

Mean grain yield ranged from 269 lb/ac to 3219 lb/ac for the different locations (Table 32). The average yields of chickpea were 1734 lb/ac at Bozeman, 269 lb/ac at Conrad, 1087 lb/ac at Corvallis, 553 lb/ac at Huntley (dry), 3219 lb/ac at Huntley (irrigated), 871 lb/ac at Moccasin, and 459 lb/ac at Richland (Table 32). This year data were significantly lower for some of the locations compared to last year. Most of the varieties in Richland site were affected by ascochyta leaf blight. Among the experimental lines, 549C gave highest mean grain yield both at Moccasin and Richland sites than other entries (Table 32). Among the commercial varieties, CDC Orion and Myles resulted in maximum yield in 3 of the seven testing sites (Table 32).

Table 31. Chickpea Variety Sources and Characteristics

Variety/lines	Type
043C	Large Café Kabul
429C	Large Café Kabul
547C	Large Café Kabul
549C	Large Café Kabul
733	Large Café Kabuli
Dwelley	Large Café Kabul
Sawyer	Large Café Kabul
CDC Alma	Med/Large Kabuli
CDC Frontier	Large Kabuli
CDC Orion	Large Kabuli
Myles	Desi

Table 32. 2014 Montana Chickpea Variety Evaluations – Yield (lb/ac)

Variety/lines	Bozeman	Conrad*	Corvallis (Irrigated)	Huntley (Dryland)	Huntley (Irrigated)	Moccasin	Richland [§]
043C			856			594	105
429C			1352			563	282
547C			1175			529	244
549C			701			702	488
733			1205			477	487
CDC Alma	1458	214	734	428	3082	1036	599
CDC Frontier						1020	838
CDC Orion	1923	118	934	633	3598	999	416
Dwelley							175
Myles	1821	476	1155	600	2979	1566	922
Sawyer			1546			1228	374
Trial means	1734	269	1087	553	3219	871	459
P-Value	0.3117	0.0054	0.5707	0.0251	0.0484	<0.000	<0.0001
LSD (0.05)	NS	189	NS	147	510	307	245
CV (%)	24.42	43.91	43.78	16.65	9.91	24.44	37.83

*Yield is low since antelope eat most of the pods. [§]Yield was low due to 40-60% hail damage.

Multi-Year and Multi-Location Statewide Chickpea Variety Evaluations

Table 33. Multi-Year and Multi-Location Statewide Chickpea Variety Evaluations –

2011– 2014 - Grain Yield Summary (lb/ac)

Variety	Bozeman				Conrad				Corvallis (irrig)			
	2011	2012	2013	2014	2011	2012	2013	2014	2011	2012	2013	2014
BGC08008M												
BGC08009M												
BGC090016												
BGC090023												
CA0790B0042C									1801			
CA0790B0547C												
CA0790B0549C												
CAO890B0427C									1746			
CDC Alma		828	1396	1458		1946	3250	214	1771			734
CDC Frontier		875	1594		3422	2103	2488		1971			
CDC Orion		852	1574	1923		2090	3008	118				934
Myles		994	1233	1821	2748	1626	1294	476	1693			1155
<i>Trial Means*</i>		796	1449	1734	2860	1750	2510	269	1678			1087
<i>LSD (0.05)</i>		136	145	NS	NS	575	412	189	NS			NS
<i>CV (%)</i>		10	6	24	19	18	10	43	22			43
Variety	Huntley (Irrig)				Moccasin				Richland			
	2011	2012	2013	2014	2011	2012	2013	2014	2011	2012	2013	2014
BGC08008M							1810				2339	
BGC08009M							2084				3902	
BGC090016							1719				2019	
BGC090023							1812				2619	
CA0790B0042C						981	1600		201	506		
CA0790B0547C							1551				1617	
CA0790B0549C							1700				1227	
CAO890B0427C							1807				867	
CDC Alma		3056	1467	3082		919	1533	1036		1467	2763	599
CDC Frontier		2745	1874		823	605	1420	1020	1605	2488	3529	838
CDC Orion		3167	1521	3598		1619	1806	999		1907	2930	416
Myles		2668	2411	2979	995	964	1392	1566	1096	1588	2641	922
<i>Trial Means*</i>		2595	1818	3219		830	1623	871	1010	1175	2363	459
<i>LSD (0.05)</i>		526	NS	510		304	425	307	557	577	784	245
<i>CV (%)</i>		12	35	9		19	18	24	32	29	23	37

*Trial means include other varieties as indicated in the previous table (Table 32).

Western Regional Chickpea Variety Evaluations

As mentioned above, Western Regional variety trial was seeded in combination with the Statewide chickpea variety trial. Varieties and entries included are indicated in Table 31 and results presented in Table 32.

FUTURE PLANS

Besides continuing statewide and western regional spring dry pea, lentil and chickpea variety evaluations, we are also evaluating advanced lines of these crops. In the next cropping season, we will include three green and three yellow dry pea varieties from pea line advancement trial for potential release. We are also evaluating winter pea and winter lentil varieties as additional options for growers. Agronomic management practices need further attention since they are major bottle neck for increasing quality pulse production in Montana. These include nutrient management, weed control both for conventional and organic farming of these crops. These are research topics that are in top priority since they are demand driven. The research will continue as far as funding is available to carry out the experiments.

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.

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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.