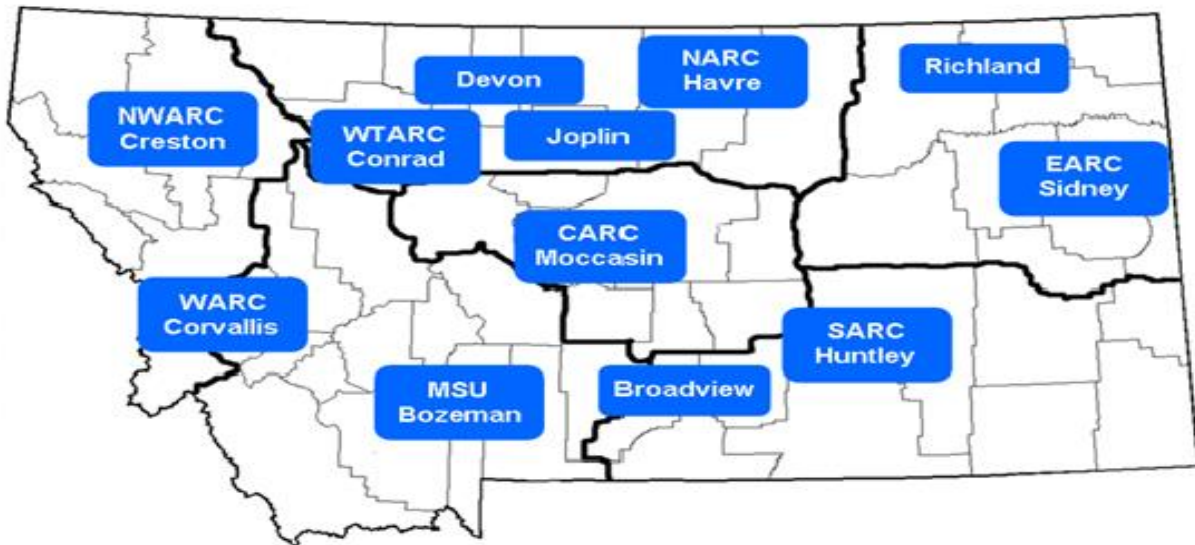


2013 Montana Spring Pulse Variety Evaluations Report

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PROJECT DESCRIPTION AND OBJECTIVES

Project Description

Pulse crops (pea, lentil, and chickpea) production is very important in Montana cropping systems. According to Montana Department of Agriculture report, the production of pulse crops has seen growing substantially in the last decade (<http://agr.mt.gov>). This report and news release from USDA showed that pea and lentil acres increased from 35,000 to 380,000 and 16,000 to 115,000 acres, respectively, from 1998 to 2013. The percentage increase of these crops in the last decade was very high. In 2013, Montana became the largest pea producer in US. The above report indicated that Montana took over the lead in lentil and pea production in United States, accounting for over half of all lentil acres and nearly half of all pea acres. This report showed that looking ahead, Montana is poised to become a world-class pulse production region as acreages continue to expand and as Montana's reputation for quality becomes increasingly recognized across the globe. Increasing crop diversification and thus including pulse crops production in the cropping systems in Montana will have several benefits. Among those benefits, growing of pulse crops will allow enhancing soil fertility thus less chemical fertilizer requirement, reduced weed and disease pressure for the next crop as opposed to the long term practice of wheat-fallow rotation. These will contribute in achieving sustainability.

However, for Montana to continue as a leading pulse crop production state in the country, variety development and testing is essential. Therefore, a coordinated multi-years, multi-locations three trials were initiated in 2008 to evaluate spring pea, lentil and chickpea varieties led by Central Agricultural Research Center (CARC) of Montana State University. This report contains the results from 2013 cropping season from different locations, and a summary from multiple years. The trials were conducted at seven Montana State University (MSU) Agricultural Research Centers, Bozeman (MSU) and in cooperating producers' fields near Broadview, Fort Smith and Richland, Montana (Table 2).

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

Central Agricultural Research Center (CARC) of MSU (coordinating center) organize the core varieties and invited individual private seed companies and breeders to submit varieties and entries of their interest for evaluation. 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 the coordinating center, all seed in the trial was pre-treated with fludioxinil and mefenoxam fungicides (Apron MAXX®RTU, Syngenta Crop Protection, Inc) to protect against soil seed and seedling diseases, with the exception of Moccasin, where the seed was additionally treated with thiamethoxam insecticide (CruiserMAXX®, Syngenta Crop Protection, Inc) to control a heavy pea leaf weevil infestation. Then, seeds were packaged at CARC in Moccasin and shipped to each individual testing site. All seed was properly inoculated prior to seeding and best management practices were employed using available resources at each site (Table 3). The experiments were conducted in randomized complete block design with four replications. Statewide and Western Regional Pea and Lentil Variety Evaluation trials were separated at Moccasin but combined for other locations (Corvallis and Richland). Similarly, Statewide and Western Regional Lentil Variety Evaluations trials were separated at Moccasin but combined at other locations (Corvallis and Richland). However, Statewide and Western Regional Lentil Variety Evaluations trials data were analyzed and reported separately. Data on stand count, plant height, days to flowering, grain yield, test weight, grain moisture content and thousand kernel weights were recorded for most of the testing locations. Grain yield data was adjusted to 13% moisture content before statistical analysis. Analysis of variance were done using SAS statistical package (SAS 9.3). The protected LSD ($\alpha = 0.05$) procedure was used to differentiate treatment means.

Precipitation

Table 1. Growing season and long term average precipitation and irrigation amount applied by location

	Conrad (WARC)	Corvallis (WARC)	Creston (NWARC)	Havre (NARC)	Huntley (SARC)	Moccasin (CARC)
Season Precipitation (April – Aug, 2013)	8.11”	5.54”	9.13”	14.65”	9.78”	10.30”
Site Average	8.52”	2.57”	9.33”	8.03”	7.99”	10.73”
Irrigation applied		6” in 3 2” sets				

Cooperators, Experimental Locations and Management Practices

Table 2. Summary of cooperators and locations participated in 2013 spring pulse variety evaluations

Cooperators	Location	Conditions	Pea	Lentil	Chickpea	Observations
MSU	Bozeman	Dry land	X	X	X	
SARC	Broadview	Dry land	X	X		
WTARC	Conrad	Dry land	X	X	X	
WARC	Corvallis	Irrigated	X	X	X	Chickpea harvested late and results are not included in this report
NWARC	Creston	Dry land	X	X	X	Deer ate chickpea trial and thus no data included for chickpea.
WTARC	Devon	Dry land	X	X		Stand was not good due to soil crusting and trials not harvested.
SARC	Fort Smith	SARC	X	X	X	Dry land chickpea yield was abnormally too low and not considered in this report
NARC	Havre	Dry land	X	X		Yield was low due to reported hail damage
SARC	Huntley	Dry land	X	X	X	Dry land chickpea yield was abnormally too low and not considered in this report
SARC	Huntley	Irrigated	X	X	X	
WTARC	Joplin	Dry land	X	X		Data not reported due to hail damage
CARC	Moccasin	Dry land	X	X	X	
CARC	Richland	Dry land	X	X	X	
EARC	Sidney	Dry land	X	X		Data not reported due to hail damage

CARC = Central Agricultural Research Center, EARC = Eastern Agricultural Research Center, MSU = Montana State University, 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.

Table 3. Site management information by location

	Bozeman (MSU) Dry land	Broadview (SARC) Dry land	Conrad (WTARC) Dry land	Corvallis (WARC) Irrigated	Creston (NWARC) Dry land	Fort Smith (SARC) Dry land	Havre (NARC) Dry land	Huntley (SARC) Irrigated	Moccasin (CARC) Dry land	Richland (CARC) Dry land
Tillage		No till	No-till and rolled	Shank	Conventional	No till	Chem Fallow	Disking	No till and rolled	No-till
Soil Type			Scoby CL		Sandy L		Telstad CL		Judith CL	Farnuf L
Elevation	4775'		3665'		2970'	3020'	2725'	3020'	4250'	2950'
Pea Trials										
Dates:										
Seeding	24-Apr	19-Apr	22-May	3-May	17-Apr	29-Apr	Apr. 24	22-Mar	19-Apr	6-May
Harvest	1-Aug	20-Aug	5-Sep	22-Aug	14-Aug	24-Jul	Aug. 06	26-Jul	30-Jul	28-Aug
Previous crop		Wheat	Barley	S. Wheat	Winter wheat	Wheat	Barley	Barley	W. Wheat	W. Wheat
Fertilizer			11-52-20	11-52-40- 23	0-20-35		None		None	
Herbicides and insecticide		RT3 @22oz/a	Roundup Max and Prowl H2O at 18 oz/a and 28 oz/a on + Sevin XLR plus(1.5qt/ac)	Pursuit (1oz/a); Prowl H2O (1.5pt/ac)	None	RT3 @22oz/a	None	RT3 (22 oz/a)	RT3(12 oz/ac); Prowl H2O (1.75 pt/ac) and Assure II (10 oz/ac)	Roundup and Prowl preplanting
Lentil Trials										
Dates:										
Seeding	24-Apr	19-Apr	22-May	3-May	17-Apr	29-Apr	Apr. 24	22-Mar	19-Apr	6-May
Harvest	7-Aug	20-Aug	17-Sep	22-Aug	11-Sep	24-Jul	Aug. 14	26-Jul	9-Aug	28-Aug
Previous crop		Wheat	Barley	S. Wheat	Winter wheat	Wheat	Barley	Barley	W. Wheat	W. Wheat
Fertilizer			11-52-20	11-52-40- 23	0-20-35		None		None	
Herbicides		Same as pea trial	Same as pea trial	Same as pea trial	None		None	RT3 (22 oz/a) and hand weeding	Same as pea trial	Same as pea trial
Chickpea Trials										
Dates:										
Seeding	24-Apr							Mar 22	26-Apr	7-May
Harvest	22-Aug							July 26	30-Aug	23-Sep
Previous Fertilizer								Barley	W. Wheat None	W. Wheat
Herbicides and insecticide								Same as pea trial	Same as pea trial	Same as pea trial

RESULTS

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.

Dry Pea

2013 Statewide Dry Pea Variety Evaluations

Dry pea entries (both commercial varieties and experimental lines) for the 2013 statewide dry pea variety evaluations were tested at 11 locations (Bozeman, Broadview, Conrad, Corvallis, Creston, Fort Smith, Havre, Huntley, Moccasin, Richland and Sidney). The trial at Sidney was severely affected by hail damage and data is not included in this report.

A total of 46 dry pea 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, 15 are commercially available smooth green, 21 are commercially available smooth yellow and the remaining are experimental dry pea lines from public and private breeding companies (Tables 4 and 10).

Yellow Pea Grain Yield

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 992 lb/ac at Broadview to 4404 lb/ac at Creston (Table 5). Average yellow pea yields were 1883 lb/ac at Bozeman, 992 lb/ac at Broadview, 1741 lb/ac at Conrad, 2306 lb/ac with irrigation at Corvallis, 4404 lb/ac at Creston, 1047 lb/ac at Fort Smith, 2032 lb/ac at Havre, 2707 lb/ac irrigation at Huntley, 1678 lb/ac at Moccasin, and 3803 lb/ac at Richland (Table 5). The performance of the different varieties in different locations is shown in Table 5.

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 (266 g/1000seeds) was recorded from Richland and the lowest mean TKW (200 g/1000 seeds) was recorded from Creston (Table 6).

Yellow Pea Test weight

Test weight data were recorded in most of the sites as shown in Table 7. The test weight means for most of the sites were close and ranged from 62.79 lb/bu recorded at Havre to 64.59 lb/bu recorded at Richland. As compared to other sites, Richland has better mean TKW and test weight.

Yellow Pea Plant height

Mean plant height ranged from 45 cm to 106 cm. The lowest mean plant height was recorded at Broadview and the highest was recorded at Creston (Table 8). The taller plant may have more number of pods and seeds thus more grain yield compared to shorter plants. 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 lodging thus creating difficulty in harvesting.

Yellow Pea Days to flowering

Days to flowering data were recorded only in a few locations (Table 9). From those locations, the number of days to flowering was longer at Moccasin (71 days) compared to other sites (Table 9).

Green Pea Grain Yield

The mean grain yield for green pea ranged from 773 lb/ac to 3907 lb/ac. The average yields for green pea were 1709 lb/ac at Bozeman, 773 lb/ac at Broadview, 1704 lb/ac at Conrad, 2031 lb/ac with irrigation at Corvallis, 3907 lb/ac at Creston, 1013 lb/ac at Fort Smith, 2011 lb/ac at Havre, 2442 lb/ac irrigation at Huntley, 1594 lb/ac at Moccasin, and 3415 lb/ac at Richland (Table 11). In 2013, the mean grain yield both for green and yellow pea was higher at Creston than other locations.

Green Pea Thousand kernel weight (TKW)

Like yellow pea, TKW data obtained only from few locations. TKW for green pea ranged from 198 to 242 g/1000 seeds. The highest mean TKW for green pea was recorded from Richland compared to other locations (Table 12).

Green Pea Test weight

Test weight data were obtained from all locations and mean test weight for different locations ranged from 62.76 (recorded at Creston) to 64.61 lb/bu (recorded at Corvallis) (Table 13).

Green Pea Plant height

Mean plant height ranged from 44 to 107 cm. Like yellow pea, the mean plant height was shorter at Broadview and taller at Creston compared to other locations (Table 14).

Green Pea Days to flowering

The mean number of days to flowering (recorded only in few locations) was longer (72 days) at Moccasin and shorter at Havre (58 days) (Table 15).

Summary

In 2013, the mean grain yield both for yellow and green pea was higher for Creston than other locations. The exceptionally high yields recorded at Creston and Richland might be due to timely rainfall and other suitable growing factors. The lowest mean grain yield of both yellow and green pea was recorded at Broadview.

Grain yield was higher in 2013 compared to 2012 for some sites such as Bozeman, Moccasin and Richland probably due to sufficient amount and distribution of precipitation in 2013 crop season compared to 2012. Better grain yield could have been obtained in some locations such as Havre but the effect of hail damage contributed to low yield. Hail damage not only resulted in low yield, but also caused high yield variability within the trial in some of the locations.

We found significant yield differences among varieties at several locations (Tables 5 and 11). On average, yellow pea varieties yielded 9% more grain yield than green pea. Several varieties have performed well in certain locations (Table 16). Among yellow dry pea entries, the variety Navarro resulted in consistently higher mean grain yield in three of the ten testing locations compared to others in 2013 (Tables 10 and 14). For the rest of the seven testing locations, 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.

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.

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 Meadows					
CDC Treasure	M		Tall	CDC	2009
Delta	M	Mod	Short		1995
DS Admiral	L	Mod	Tall		2000
Gunner					
Jetset	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		
NDP080164	L	Mod	Short	NDSU	
Nette					
Pro 127-2	M	Mod	Mod	PG	
Pro 793	VL	Early	Short	PG	
PS07100925					
PS08101004					
PS08101022					
Salamanca					
Spider	L	Mod	Tall	LL	2008
SW Midas	M	Mod	Mod	SW	2004
Torch					
Trapeze	VL	Late	Short	SW	2010
Universal					
Vegas	VL		Tall		

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 companies did not provide detail variety information, the variety characteristics in this table is not complete.

Table 5. 2013 Montana Statewide Dry Yellow Pea Variety Evaluations – Grain Yield (lb/ac)

Yellow pea variety	Bozeman	Broadview	Conrad	Corvallis (Irrigated)	Creston	Fort Smith	Havre	Huntley (Irrigated)	Moccasin	Richland
AC Agassiz	1857	913	1519	1902	*		2027		559**	4107
Bridger (LL7020)	1763		1741	2525	4440	1104	2127	2687	1826	3323
CDC Meadows	1917		1854	3109	4647		2263		1703	3931
CDC Treasure	1899	1036	1927	2075	4872		2487		1634	3596
Delta	1779		1641	2594	4020	1002	1700	2648	1899	3573
DS Admiral	1910	891	1638	2385	4938	1065	2008	2840	1835	3645
Gunner		842								3926
Jetset	1942		2002	2546	3711	1080	1616	2395	1758	3706
Korando		989	1718				1779		1779	3402
Montech 4152	2019		1862	2096	4346	920	1828	2637	1791	3786
Montech 4193			1371				2218			4222
Mystique			1581				1814		1667	4339
Navarro			1987		4494	1167	2114	2997	2016	3799
NDP080164		984					2101		1448	4074
Nette			1821				2307		1676	3292
Pro 127-2			2139				1887			4003
Pro 793		1218	1628				2256			3750
Salamanca		1140				1050			1891	3585
Spider	1971		1748	1503	4440	1011	1734	2710	1750	3959
SW Midas	1780		1846	2333	3912	1034	2033	2745	1557	3873
Torch										3713
Trapeze										4075
Universal					4633					
Vegas		913	1316				2322		1745	3682
Yellow Pea Means	1883	992	1741	2306	4404	1047	2032	2707	1678	3803
P-Value	0.5387	0.1463	0.0318	0.1006	0.0001	0.0790	0.0069	0.0002	<0.0001	0.0112
LSD (0.05)	NS	NS	456	NS	467	NS	444	291	269	766
CV (%)	10.77	20.07	18.26	29.26	7.34	9.56	13.22	7.32	11.29	14.28
Trial Analysis:										
Trial Means	1811	939	1734	2203	4215	1034	2022	2634	1640	3622
P-Value	0.0776	0.0122	0.0309	0.0410	<0.0001	0.0602	<0.000	<0.0001	<0.0001	<0.0001
LSD (0.05)	NS	277	483	950	498	NS	447	300	291	777
CV (%)	10.67	20.46	19.82	30.29	8.36	9.58	13.59	7.90	12.64	15.17

*Was totally damaged by leaf weevil in both four replications. **Agassiz had poor germination at Moccasin site.

Table 6. 2013 Montana Statewide Dry Yellow Pea Variety Evaluations –Thousand Kernel Weight (TKW) Summary (g/1000seed)

Yellow pea variety	Bozeman	Broadview	Conrad	Corvallis (Irrigated)	Creston	Fort Smith	Havre	Huntley (Irrigated)	Moccasin	Richland
AC Agassiz			224	246			241		213	251
Bridger (LL7020)			218	225	201		210		209	255
CDC Meadows			197	216	175		214		195	239
CDC Treasure			210	224	189		223		205	232
Delta			222	239	194		232		218	259
DS Admiral			230	242	214		237		225	239
Gunner										252
Jetset			246	240	215		238		220	279
Korando			251				252		242	303
Montech 4152			242	261	214		265		234	276
Montech 4193			237				249			264
Mystique			242				269		244	277
Navarro			264		231		247		251	249
NDP080164							232		216	241
Nette			222				227		219	269
Pro 127-2			233				241			255
Pro 793			264				256			309
Salamanca									232	283
Spider			247	241	199		252		229	273
SW Midas			210	212	179		208		199	221
Torch										316
Trapeze										270
Universal					198					
Vegas			227				236		229	272
Yellow Pea Means			232	234	200		238		222	266
P-Value			<0.0001	<0.0001	<0.0001		<0.000		<0.0001	<0.0001
LSD (0.05)			15.4	11.8	11.2		18.7		8.2	19.9
CV (%)			4.65	3.48	3.87		4.74		2.60	5.35
Trial Analysis:										
Trial Means			227	236	199		231		217	255
P-Value			<0.0001	<0.0001	<0.0001		<0.000		<0.0001	<0.0001
LSD (0.05)			14.1	11.6	12.5		16.2		7.8	21.7
CV (%)			4.43	3.46	4.42		4.32		2.56	6.07

Table 7. 2013 Montana Statewide Dry Yellow Pea Evaluations – Test Weight (lb/bu)

Yellow pea variety	Bozeman	Broadview	Conrad	Corvallis (Irrigated)	Creston	Fort Smith	Havre	Huntley (Irrigated)	Moccasin	Richland
AC Agassiz	62.33	63.38	63.13	63.35			63.17		62.55	64.35
Bridger (LL7020)	64.87		63.90	64.63	64.20	63.98	63.00	64.53	64.63	65.10
CDC Meadows	64.40		64.65	66.90	64.43		64.17		64.03	65.35
CDC Treasure	64.70	63.13	64.45	65.10	65.03		64.53		64.70	65.63
Delta	65.50		63.75	65.00	62.75	64.33	63.93	65.38	64.70	64.70
DS Admiral	62.83	64.50	63.13	61.13	63.38	62.38	62.83	63.65	63.30	65.20
Gunner		63.18								64.78
Jetset	63.40		63.48	64.73	64.05	62.65	63.07	64.25	63.48	64.03
Korando		63.23	63.40				61.10		64.75	64.50
Montech 4152	64.80		64.03	62.75	64.30	63.38	62.53	65.13	64.35	64.68
Montech 4193			63.03				61.67			64.13
Mystique			62.20				62.10		63.40	63.15
Navarro			63.27		63.33	62.98	61.80	64.40	64.43	65.40
NDP080164		62.83					62.67		63.18	64.15
Nette			63.73				63.70		64.68	65.58
Pro 127-2			63.70				63.43			65.27
Pro 793		62.25	64.63				62.20			64.47
Salamanca		63.58				63.18			64.00	63.93
Spider	65.07		63.50	65.10	64.25	63.10	62.90	64.78	64.20	64.25
SW Midas	62.30		63.53	61.43	62.93	62.73	61.67	63.40	62.33	65.28
Torch										63.88
Trapeze										64.50
Universal					63.33					
Vegas		63.38	64.10				62.63		63.83	63.98
Yellow Pea Means	64.02	63.26	63.66	63.98	63.81	63.19	62.79	64.44	63.91	64.59
P-Value	<0.0001	0.0008	0.0005	<0.0001	0.0008	<0.0001	<0.000	<0.0001	<0.0001	<0.0001
LSD (0.05)	0.83	0.74	0.85	1.57	0.91	0.53	0.89	0.67	0.59	0.65
CV (%)	0.76	0.80	0.93	1.69	0.99	0.57	0.86	0.71	0.66	0.71
Trial Analysis:										
Trial Means	63.91	63.29	63.39	64.20	63.41	63.25	62.86	64.19	63.65	64.53
P-Value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000	<0.0001	<0.0001	<0.0001
LSD (0.05)	0.69	0.70	0.82	1.36	0.86	0.74	0.86	0.62	0.53	0.65
CV (%)	0.66	0.77	0.91	1.49	0.97	0.82	0.84	0.67	0.59	0.73

Table 8. 2013 Montana Statewide Dry Yellow Pea Evaluations – Plant Height (cm)

Yellow pea variety	Bozeman	Broadview	Conrad	Corvallis (Irrigated)	Creston	Fort Smith	Havre	Huntley (Irrigated)	Moccasin	Richland
AC Agassiz	67		52	52	66		55		42	72
Bridger (LL7020)	65	45	50	67	110	57	53	71	48	68
CDC Meadows	67		57	68	119		57		54	75
CDC Treasure	67		58	64	113		61		58	70
Delta	66	42	43	53	101	59	47	64	44	57
DS Admiral	67	47	52	66	107	62	62	75	55	72
Gunner										57
Jetset	68	44	58	65	113	65	65	67	55	68
Korando			53				54		42	76
Montech 4152	65	47	57	55	119	60	58	71	49	76
Montech 4193			42				50			66
Mystique			57				60		50	72
Navarro		44	52		116	60	50	75	47	63
NDP080164							54		41	70
Nette			56				50		48	67
Pro 127-2			57				53			63
Pro 793			47				51			72
Salamanca						65			58	74
Spider	67	49	56	52	105	64	57	72	55	79
SW Midas	67	45	51	53	105	57	52	65	45	66
Torch										66
Trapeze										70
Universal					100					
Vegas			55				65		51	70
Yellow Pea Means	66.7	45.3	53.0	59.5	106	60.8	55.4	69.8	49.4	69.5
P-Value	<0.0001	0.6007	0.0008	<0.0026	<0.0001	0.0408	0.0135	0.0854	<0.0001	0.1203
LSD (0.05)	0.7	NS	8.1	12.5	17.1	5.9	10.5	NS	5.2	NS
CV (%)	0.63	8.86	10.77	14.51	11.20	6.71	11.52	7.31	7.52	14.19
Trial Analysis:										
Trial Means	66.54	44.9	52.1	56.6	106	59.7	55	68.6	50.4	68.6
P-Value	<0.0001	0.4370	<0.0001	<0.0003	<0.0001	0.0296	0.0003	0.0581	<0.0001	<0.0001
LSD (0.05)	0.64	NS	8.6	12.5	16.9	5.8	9.7	NS	5.2	14.3
CV (%)	0.58	8.93	11.72	15.53	11.20	6.86	10.81	8.97	7.43	14.96

Table 9. 2013 Montana Statewide Dry Yellow Pea Variety Evaluations – Number of Days to Flowering

Yellow pea variety	Bozeman	Broadview	Conrad	Corvallis (Irrigated)	Creston	Fort Smith	Havre	Huntley (Irrigated)	Moccasin	Richland
AC Agassiz				59	78		58		71	
Bridger (LL7020)				59	69		57		70	
CDC Meadows				59	70		58		72	
CDC Treasure				59	71		58		72	
Delta				59	68		56		72	
DS Admiral				59	70		59		71	
Gunner									69	
Jetset				59	72		58			
Korando							52		70	
Montech 4152				59	68		54		71	
Montech 4193							59			
Mystique							59		71	
Navarro					64		52		70	
NDP080164							60		72	
Nette							55		71	
Pro 127-2							59			
Pro 793							52			
Salamanca									72	
Spider				59	72		59		71	
SW Midas				59	70		58		71	
Torch										
Trapeze										
Universal					65					
Vegas							58		72	
Yellow Pea Means				59	69.5		56.9		71.0	
P-Value				NA	<0.0001		<0.000		0.0114	
LSD (0.05)				NA	0.79		1.4		1.6	
CV (%)				NA	0.79		1.74		1.60	
Trial Analysis:										
Trial Means				NA	69.8		57.3		71	
P-Value				NA	<0.0001		<0.000		0.0041	
LSD (0.05)				NA	0.8		1.4		1.7	
CV (%)				NA	0.82		1.68		1.74	

NA= Not applicable since all varieties in this location flower same day in all four replications.

Table 10. Green Pea Variety Sources and Characteristics

Variety*	Size	Maturity	Height	Breeding Program	Release Date
Aragorn	M	Mod	Mod	PG	2006
Arcadia	M	Mod	Short		2009
Ariel					
Banner	M	Early	Tall	PG	2007
Bluemoon	VL	Late	Short		
CDC Raezer					
CDC Striker	L	Mod	Mod	CDC	2002
Cruiser	S	Mod	Tall	PG	2002
Daytona	VL	Late	Short		
Greenwood (Pro 7040)					
K2	M	Mod	Mod	LL	2005
Majoret	M	Mod	Short	SW	1994
Montech 1103	ML	Mod	Tall	LIMG	
NDP080111	M	Late	Mod	NDSU	
NDP080114	M	Late	Short	NDSU	
NDP080138	L	Mod	Mod	NDSU	
Pro-081-7161					
Pro 091-7137	M	Mod	Tall	PG	
Pro-101-7155					
PS03101445					
PS05100736					
PS05100840					
PS07100470					
PS07100471					
PS07ND0190	M	Late	Tall	NDSU	
PS08100133					
PS08100582					
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 companies did not provide detail variety information, the variety characteristics in this table is not complete.

Table 11. 2013 Montana Statewide Dry Green Pea Variety Evaluations – Grain Yield (lb/ac)

Green pea variety	Bozeman	Broadview	Conrad	Corvallis (Irrigated)	Creston	Fort Smith	Havre	Huntley (Irrigated)	Moccasin	Richland
Aragorn	1807		1994		4034	1003	1921		1488	3223
Arcadia	1978		1718	2704	4701		2598		1655	3777
Ariel							1972			
Banner			1346				2155			3764
Bluemoon			1423						1507	3526
CDC Raezer			1605				1690		1662	3052
CDC Striker	1502		1812	2053	3391		1571		1753	2914
Cruiser	1731	790	1488	1543	3150	945	1669	2566	1502	3289
Daytona	1740	783	1815	2449	4455	1059	2031	2552	1786	3616
Greenwood (Pro7040)			1868			1070	2261	2209		3802
K2	1500	748	1713	2000	3418	1025	1650		1259	2803
Majoret	1705		1607	1439	4303		2193		1584	3022
Montech 1103			1772				2016			2856
NDP080111							2424		1537	3141
NDP080114							2180		1722	4221
NDP080138							1937		1713	3847
Pro 081-7161										3591
Pro 091-7137			1632			981	2013			3922
Pro 101-7155										3193
PS07ND0190							1930		1441	3414
Shamrock										3287
Viper			2068				1993		1711	3573
<i>Green Pea Means</i>	<i>1709</i>	<i>773</i>	<i>1704</i>	<i>2031</i>	<i>3907</i>	<i>1013</i>	<i>2011</i>	<i>2442</i>	<i>1594</i>	<i>3415</i>
<i>P-Value</i>	<i>0.0931</i>	<i>0.5886</i>	<i>0.1579</i>	<i>0.1118</i>	<i>0.0013</i>	<i>0.4700</i>	<i>0.0009</i>	<i>0.0069</i>	<i>0.0002</i>	<i>0.0067</i>
<i>LSD (0.05)</i>	<i>NS</i>	<i>NS</i>	<i>NS</i>	<i>NS</i>	<i>626</i>	<i>NS</i>	<i>446</i>	<i>272</i>	<i>304</i>	<i>812</i>
<i>CV (%)</i>	<i>9.77</i>	<i>26.33</i>	<i>21.29</i>	<i>30.54</i>	<i>10.79</i>	<i>10.03</i>	<i>13.37</i>	<i>6.46</i>	<i>13.34</i>	<i>16.81</i>
Trial Analysis										
Trial Means	1811	939	1734	2203	4215	1034	2022	2634	1640	3622
P-Value	0.0776	0.0122	0.0309	0.0410	<0.0001	0.0602	<0.0001	<0.0001	<0.0001	<0.0001
LSD (0.05)	NS	277	483	950	498	NS	447	300	291	777
CV (%)	10.67	20.46	19.82	30.29	8.36	9.58	13.59	7.90	12.64	15.17

Table 12. 2013 Montana Statewide Dry Green Pea Evaluations – Thousand Kernel Weight (TKW) (g/1000 seed)

Green pea variety	Bozeman	Broadview	Conrad	Corvallis (Irrigated)	Creston	Fort Smith	Havre	Huntley (Irrigated)	Moccasin	Richland
Aragorn			209		183		204		195	223
Arcadia			199	222	187		206		186	242
Ariel							198			
Banner			185				208			223
Bluemoon			231						229	267
CDC Raezer			236				212		223	245
CDC Striker			231	238	206		236		217	261
Cruiser			199	234	179		213		192	226
Daytona			265	269	232		259		236	287
Greenwood (Pro 7040)			202				220			223
K2			218	243	197		226		204	218
Majoret			228	233	200		235		220	258
Montech 1103			267				268			288
NDP080111							199		195	200
NDP080114							221		214	235
NDP080138							229		230	258
Pro 081-7161										224
Pro 091-7137			204				221			223
Pro 101-7155										237
PS07ND0190							227		207	218
Shamrock										284
Viper			236				239		219	248
Green Pea Means			220	240	198		223		211	242
P-Value			<0.0001	<0.0001	0.0001		<0.0001		<0.0001	<0.0001
LSD (0.05)			13.0	10.8	15.6		12.8		7.8	22.8
CV (%)			4.11	2.96	5.28		3.47		2.58	6.67
Trial Analysis:										
Trial Means			227	236	199		231		217	255
P-Value			<0.0001	<0.0001	<0.0001		<0.0001		<0.0001	<0.0001
LSD (0.05)			14.1	11.6	12.5		16.2		7.8	21.7
CV (%)			4.43	3.46	4.42		4.32		2.56	6.07

Table 13. 2013 Montana Statewide Dry Green Pea Variety Evaluations – Test Weight (lb/bu)

Green pea variety	Bozeman	Broadview	Conrad	Corvallis (Irrigated)	Creston	Fort Smith	Havre	Huntley (Irrigated)	Moccasin	Richland
Aragorn	62.77		62.35		62.15	61.93	61.63		62.70	63.90
Arcadia	63.77		62.85	64.75	62.70		63.50		63.58	64.73
Ariel							63.03			
Banner			62.80				62.90			64.67
Bluemoon			63.05						62.90	64.50
CDC Raezer			62.93				62.77		63.10	64.50
CDC Striker	64.37		64.17	65.98	63.25		64.03		64.73	65.03
Cruiser	63.13	62.65	62.48	62.73	62.40	62.95	62.40	62.33	62.20	64.13
Daytona	64.33	64.30	63.33	64.85	63.15	64.18	62.50	64.75	63.90	64.15
Greenwood (Pro 7040)			63.95			63.98	63.47			65.65
K2	63.50	63.18	62.40	64.48	62.78	64.00	63.17	63.50	63.70	64.98
Majoret	64.57		63.90	64.33	62.90		63.23		63.88	64.83
Montech 1103			63.17				62.60			64.53
NDP080111							64.50		62.73	64.15
NDP080114							63.23		63.08	64.30
NDP080138							63.03		63.55	64.33
Pro 081-7161										64.87
Pro 091-7137			63.28			62.98	62.57			64.60
Pro 101-7155										64.37
PS07ND0190							62.13		62.95	63.60
Shamrock										64.80
Viper			62.63				61.93			63.80
Green Pea Means	63.78	63.38	63.06	64.61	62.76	63.33	62.92	63.53	63.32	64.48
P-Value	0.0002	0.0162	0.0011	0.0052	0.4226	0.0086	<0.0001	0.0005	<0.0001	<0.0007
LSD (0.05)	0.57	0.78	0.83	1.12	NS	1.06	0.87	0.55	0.48	0.74
CV (%)	0.50	0.71	0.92	1.14	1.01	1.11	0.83	0.50	0.53	0.81
Trial Analysis:										
Trial Means	63.91	63.29	63.39	64.20	63.41	63.25	62.86	64.19	63.65	64.53
P-Value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
LSD (0.05)	0.69	0.70	0.82	1.36	0.86	0.74	0.86	0.62	0.53	0.65
CV (%)	0.66	0.77	0.91	1.49	0.97	0.82	0.84	0.67	0.59	0.73

Table 14. 2013 Montana Statewide Dry Green Pea Variety Evaluations – Plant Height (cm)

Green pea variety	Bozeman	Broadview	Conrad	Corvallis (Irrigated)	Creston	Fort Smith	Havre	Huntley (Irrigated)	Moccasin	Richland
Aragorn	64		53		101	58	51		46	57
Arcadia	67		42	50	101		49		45	63
Ariel							51			
Banner			45				47			60
Bluemoon			41						48	68
CDC Raezer			57				64		52	73
CDC Striker	68		57	58	109		54		50	67
Cruiser	65	43	50	45	114	58	50	64	48	75
Daytona	67	47	59	57	107	59	53	71	53	62
Greenwood (Pro 7040)			52			59	56			67
K2	64	43	48	50	101		52	61	45	55
Majoret	68		49	51	114		57		50	71
Montech 1103			55				55			64
NDP080111							61		58	91
NDP080114							57		57	92
NDP080138							61		58	83
Pro-081-7161										63
Pro091-7137			44			57	53			66
Pro-101-7155										69
PS07ND0190							65		57	87
Shamrock										71
Viper			60				55		56	59
Green Pea Means	66.3	43.8	50.9	51.8	106.8	57.9	55	65.33	51.5	69.8
P-Value	<0.0001	0.6514	0.0006	0.1661	0.1437	0.8958	0.0057	0.4481	<0.0001	<0.0001
LSD (0.05)	0.55	NS	8.9	NS	NS	NS	9.3	NS	5.51	15.3
CV (%)	0.47	10.75	21.16	17.06	10.12	7.46	10.28	13.36	7.48	15.52
Trial Analysis:										
Trial Means	66.54	44.9	52.1	56.6	106	59.7	55	68.6	50.4	68.6
P-Value	<0.0001	0.4370	<0.0001	<0.0003	<0.0001	0.0296	0.0003	0.0581	<0.0001	<0.0001
LSD (0.05)	0.64	NS	8.6	12.5	16.9	5.8	9.7	NS	5.2	14.3
CV (%)	0.58	8.93	11.72	15.53	11.20	6.86	10.81	8.97	7.43	14.96

Table 15. 2013 Montana Statewide Dry Green Pea Variety Evaluations – Number of Days to Flowering

Green pea variety	Bozeman	Broadview	Conrad	Corvallis (Irrigated)	Creston	Fort Smith	Havre	Huntley (Irrigated)	Moccasin	Richland
Aragorn					68		55		71	
Arcadia				59	71		58		72	
Ariel							55			
Banner							53			
Bluemoon									72	
CDC Raezer							61		72	
CDC Striker				59	72		62		72	
Cruiser				59	69		56		71	
Daytona					72		59		72	
Greenwood (Pro 7040)							56			
K2				59	71		55		72	
Majoret				59	71		60		73	
Montech 1103							58			
NDP080111							62		74	
NDP080114							61		71	
NDP080138							54		71	
Pro 081-7161										
Pro 091-7137							56			
Pro 101-7155										
PS07ND0190							62		73	
Shamrock										
Viper							55		72	
Green Pea Means				59.0	70.4		57.7		71.8	
P-Value				NA	<0.0001		<0.0001		0.4245	
LSD (0.05)				NA	0.9		1.6		NS	
CV (%)				NA	0.88		1.66		1.91	
Trial Analysis:										
Trial Means				NA	69.8		57.3		71	
P-Value				NA	<0.0001		<0.0001		0.0041	
LSD (0.05)				NA	0.8		1.4		1.7	
CV (%)				NA	0.82		1.68		1.74	

NA= Not applicable since all varieties in this location flower same day in all four replications.

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

Table 16. Montana Statewide Dry Pea Variety Evaluations – 2008-2013 Multi-year Grain Yield Summary (lb/ac)

Variety	Bozeman						Conrad						Corvallis					
	2008	2009	2010	2011	2012	2013	2008	2009	2010	2011	2012	2013	2008	2009	2010	2011	2012	2013
Yellow Pea																		
AC Agassiz					905	913				2867	2746	1519					2812	1902
Bridger				2476	1085	1763				3259	2793	1741				1862	3170	2505
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	1966	3607	1212	3070	2204	1638	1844	2882	2941	1770	2518	2385
Montech 4152				2378	1074	2019				3066	3116	1862				1946	2899	2096
Spider				2188	1037	1971			1100	2664	2426	1748				2155	2899	1503
SW Midas		2018	3436	2382	1048	1780		3620	1212	2774	2674	1846		2828	4029	1998	3064	2333
Yellow Ave	1777	2193	3277	2246	1008	1883	2091	3789	1181	2853	2745	1741	1923	3057	3590	1865	2907	2306
Green Pea																		
Arcadia				2378	966	1978				3178	2281	1718				2272	3029	2704
CDC Striker		2343	2585	2081	918	1502		3189	1147	2632	2254	1812		3144	3068	1866	2375	2053
Cruiser	1438	2247	3041	2152	872	1731	1592	3154	965	2746	2002	1488	1332	3046	3144	1967	2562	1543
K2				2018	962	1500			1304	2622	2246	1713				1894	2470	2000
Majoret	1766	2218	3008	2039	961	1705	1884	3345	1623	2382	2407	1607	2074	3278	3812	1641	2447	1439
Stirling	1994	2031	3288	2184	1088		1887	3932	926	2651	2746		1654	3144	3525	1475		
Green Ave	1724	2246	2934	2123	961	1709	1794	3307	1164	2581	2373	1704	1706	3173	3313	1750	2630	
Trial Means	1747	2214	3145	2177	986	1811	1836	3585	1174	2702	2577	1734	1835	3101	3483	1801	2779	2203
LSD (0.05)	227	310	639	NS	144	NS	583	479	298	NS	NS	483	NS	627	495	NS	1057	950
CV (%)	9	10	14	7	10	11	19	8	18	14	29	20	39	14	10	23	14	30

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Table 16. Statewide Dry Pea Variety Evaluations – 2008 – 2013 Multi-year Grain Yield Summary (lb/ac)...continued

Variety	Havre						Huntley (Dry)						Joplin					
	2008	2009	2010	2011	2012	2013	2008	2009	2010	2011	2012	2013	2008	2009	2010	2011	2012	2013
Yellow Pea																		
AC Agassiz				2236	1965	2027					1965							
Bridger				2149	1837	2127				2360	1975	2687				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		2669	2743	2128	1261	2840			2236	1012	1299	
Montech 4152			3505	2266	2146	1828				2337	1491	2637				1040	1679	
Spider				2071	1903	1734				2283	1220	2710				908	1202	
SW Midas	2849	2314	3348	2111	1729	2033		2329	2760	2106	1855	2745			2371	1060	1702	
Yellow Ave	3027	2340	3495	2173	2039	2032	1457	2591	2773	2065	1630	2707			2365	969	1454	
Green Pea																		
Arcadia				2405	1930	2598				2224	1639					1142	2017	
CDC Striker	2682	2154	3222	2012	1953	1571		2417	2556	1568	1128				2016	606	1517	
Cruiser	2735	2254	3194	2286	1735	1669		2520	2575	1998	1232	2566			2162	977	1517	
K2				1576	1463	1650				2092	1525					748	1457	
Majoret	2694	2352	3451	1612	1685	2193	1277	2501	2945	1660	1331				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	1462	2471	2632	1729	1482	2442			2259	790	1686	
Trial Means	2942	2306	3397	2069	1968	2022	1486	2545	2719	1878	1556	2634			2324	870	1570	
LSD (0.05)	317	290	325	NS	309	447	355	274	NS	NS	NS	300			562	NS	NS	
CV (%)	8	9	7	13	11	14	17	8	12	20	29	8			17	46	23	

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Table 16. Statewide Dry Pea Variety Evaluations – 2008 – 2013 Multi-year Grain Yield Summary (lb/ac)...continued

Variety	Moccasin						Richland						Sidney					
	2008	2009	2010	2011	2012	2013	2008	2009	2010	2011	2012	2013	2008	2009	2010	2011	2012	2013
Yellow Pea																		
AC Agassiz			2855	1123	1100	559				2224	3242	4107					1619	
Bridger			2981	1160	1064	1826			3295	2494	3878	3323				2998	1249	
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	1536	2018	3264	1664	3564	3645	1078	1757	3016	2517	1158	
Montech 4152			2533	1018	1084	1791				1809	3409	3786				2463	1586	
Spider			2572	1005	1252	1750			2731	1910	1252	3959				2504	1297	
SW Midas	697	903	2603	1031	1165	1557	2007	1435	2321	2166	2983	3873		1511	3639	2589	1571	
Yellow Ave	930	1058	2796	992	1241	1678	1761	1855	2999	1855	3566	3807	1261	1884	3489	2502	1421	
Green Pea																		
Arcadia				978	1186	1655				1494	3143	3777				2772	1302	
CDC Striker	809	1066	2427	774	1193	1753		1918	2976	1732	3270	2914		1988	3408	2212	1122	
Cruiser	682	1001	2680	988	1123	1502	1456	1797	2642	1684	3010	3289	1398	1806	2820	2223	1202	
K2			2436	851	1457	1259			2721	1772	3476	2803			2751	2296	1435	
Majoret	722	1091	2608	848	1027	1584	1457	2221	2981	1653	3078	3022	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	1513	1927	2798	1628	3410	3440	1221	1898	3104	2341	1406	
Trial Means	875	1071	2754	934	1224	1640	1677	1882	2922	1729	3501	3622	1794	1964	3341	1659	1414	
LSD (0.05)	172	208	203	120	NS	291	NS	577	NS	289	NS	777	1005	301	792	NS	465	
CV (%)	14	12	5	9	16	13	15	21	13	10	16	15	39	9	9	14	20	

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
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
Jetset	X	X				Med
K2	X	X			X	Early
Korando						Early
Majoret		X				Med
Medora	X		Tall			
Montech 4152			Tall			
Navarro	X	X				Early
Spider	X	X				Med
Stirling	X					Early
SW Midas	X	X				Early
Trapeze	X	X	Med			Early
Vegas	X	X	Tall			Med

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 companies did not provide detail variety information, the variety characteristics in this table is not complete.

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 from the USDA-ARS Grain Legume Genetics and Physiology Program in Pullman, Washington.

The yellow pea had average yields of 2341 lb/ac with irrigation at Corvallis, 1907 lb/ac at Moccasin, and 3838 lb/ac at Richland (Tables 18 - 20). Among the yellow pea varieties, PS07100925 resulted in mean maximum yield both at Corvallis and Richland. But PS08101004 resulted in mean maximum yield at Moccasin compared to other yellow varieties.

The average yields of green pea were reported 2068 lb/ac with irrigation at Corvallis, 1826 lb/ac at Moccasin, and 3523 lb/ac at Richland (Tables 18 - 20). The green varieties perform differently for the different locations. The maximum mean grain yields were recorded from PS08100133, PS081010145 and PS08100582 at Corvallis, Moccasin and Richland, respectively.

Table 18. 2013 Western Regional Dry Pea Variety Evaluation – Corvallis, MT

Variety	Grain yield at 13% Moisture (lb/ac)	Test Wt (lb/bu)	TKW (g/1000 seeds)	Height (cm)	# of days to flower
Yellow Pea					
PS07100925	2663	65.38	255	48	59
PS08101004	1814	64.97	236	46	59
PS08101022	2547	63.38	251	44	52
<i>Yellow Pea Means</i>	<i>2341</i>	<i>64.54</i>	<i>247</i>	<i>46</i>	<i>56.7</i>
<i>P-Value</i>	<i>0.1648</i>	<i>0.1137</i>	<i>0.3491</i>	<i>0.4078</i>	<i>NA</i>
<i>LSD (0.05)</i>	<i>NS</i>	<i>NS</i>	<i>NS</i>	<i>NS</i>	<i>NA</i>
<i>CV (%)</i>	<i>30.79</i>	<i>1.41</i>	<i>5.25</i>	<i>24.99</i>	<i>6.74</i>
Green Pea					
PS03101445	2096	65.73	224	49	59
PS05100736	2396	64.43	233	49	59
PS05100840	1675	64.95	236	43	59
PS07100470	2098	64.45	216	57	59
PS07100471	1564	64.40	228	40	59
PS08100133	2559	63.90	241	51	59
PS08100582	2091	64.40	221	47	59
<i>Green Pea Means</i>	<i>2068</i>	<i>64.61</i>	<i>228</i>	<i>48</i>	<i>59</i>
<i>P-Value</i>	<i>0.6210</i>	<i>0.1247</i>	<i>0.2837</i>	<i>0.0799</i>	<i>NA</i>
<i>LSD (0.05)</i>	<i>NS</i>	<i>NS</i>	<i>NS</i>	<i>NS</i>	<i>NA</i>
<i>CV (%)</i>	<i>35.17</i>	<i>1.12</i>	<i>5.43</i>	<i>19.11</i>	<i>NA</i>
Trial Analysis:					
Trial Means	2150	64.59	234	47.4	58.3
P-Value	0.2643	0.0470	0.0067	0.0430	NA
LSD (0.05)	NS	1.20	17.9	13.7	NA
CV (%)	34.21	1.28	5.26	19.92	4.09

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. 2013 Western Regional Dry Pea Variety Evaluation – Moccasin, MT

Variety	Grain yield at 13% Moisture (lb/ac)	Test Wt (lb/bu)	TKW (g/1000 seeds)	Height (cm)	# of days to flower
Yellow Pea					
PS07100925	1977	63.30	222	46	71
PS08101004	2045	63.75	221	48	71
PS08101022	1702	64.35	224	48	66
<i>Yellow Pea Means</i>	<i>1907</i>	<i>63.80</i>	<i>222</i>	<i>47.2</i>	<i>69</i>
<i>P-Value</i>	<i>0.5461</i>	<i>0.1462</i>	<i>0.2408</i>	<i>0.8895</i>	<i><0.0001</i>
<i>LSD (0.05)</i>	<i>NS</i>	<i>NS</i>	<i>NS</i>	<i>NS</i>	<i>3.1</i>
<i>CV (%)</i>	<i>12.08</i>	<i>0.39</i>	<i>0.45</i>	<i>12.81</i>	<i>3.72</i>
Green Pea					
PS03101445	1956	63.50	201	46	72
PS05100736	1883	63.40	218	46	71
PS05100840	1813	62.40	212	49	72
PS07100470	1741	63.20	207	51	72
PS07100471	1736	63.33	199	48	72
PS08100133	1904	63.40	214	43	71
PS08100582	1713	63.60	212	47	71
<i>Green Pea Means</i>	<i>1826</i>	<i>63.27</i>	<i>208</i>	<i>46.9</i>	<i>71</i>
<i>P-Value</i>	<i>0.2696</i>	<i>0.0344</i>	<i>0.0822</i>	<i>0.0153</i>	<i>0.1552</i>
<i>LSD (0.05)</i>	<i>NS</i>	<i>0.58</i>	<i>NS</i>	<i>3.8</i>	<i>NS</i>
<i>CV (%)</i>	<i>9.63</i>	<i>0.60</i>	<i>4.01</i>	<i>5.26</i>	<i>1.09</i>
Trial Analysis:					
Trial Means	1844	63.39	211	47	71
P-Value	0.5616	0.0054	0.0130	0.1149	<0.0001
LSD (0.05)	NS	0.54	11.4	NS	1.1
CV (%)	11.00	0.56	3.57	6.75	1.03

Table 20. 2013 Western Regional Dry Pea Variety Evaluation – Richland, MT

Variety	Grain yield at 13% Moisture (lb/ac)	Test Wt (lb/bu)	TKW (g/1000 seeds)	Height (cm)	# of days to flower
Yellow Pea					
PS07100925	4137	63.93	279	59	
PS08101004	3887	64.95	278	60	
PS08101022	3493	63.93	279	50	
<i>Yellow Pea Means</i>	3838	64.27	279	55.8	
<i>P-Value</i>	0.6011	0.0015	0.9320	0.4737	
<i>LSD (0.05)</i>	NS	0.33	NS	NS	
<i>CV (%)</i>	15.37	0.29	2.09	15.61	
Green Pea					
PS03101445	2747	64.90	244	60	
PS05100736	3520	64.63	237	55	
PS05100840	3856	63.73	247	62	
PS07100470	3551	63.93	239	66	
PS07100471	3335	64.28	224	69	
PS08100133	3534	63.60	247	61	
PS08100582	4015	64.33	241	62	
<i>Green Pea Means</i>	3523	64.24	238	62.1	
<i>P-Value</i>	0.0960	0.0009	0.4771	0.3602	
<i>LSD (0.05)</i>	NS	0.46	NS	NS	
<i>CV (%)</i>	16.40	0.48	5.61	18.20	
Trial Analysis:					
Trial Means	3628	64.21	251	60.0	
P-Value	0.1625	<0.0001	<0.0001	0.1522	
LSD (0.05)	NS	0.86	16.1	NS	
CV (%)	16.65	0.44	4.36	16.84	

Lentil

2013 Statewide Lentil Variety Evaluations

The 2013 Statewide Lentil Variety Evaluation was tested at 10 locations (Table 22). This variety evaluation trial consisted of 11 entries. Among the commercially available varieties, we had 1 small green, 3 medium green, 1 large green, and 2 small red. The remaining varieties are experimental lentil lines from public and private breeding companies (Table 21).

Lentil Grain yield

Lentil yields varied greatly from location to location in 2013 due to the differences in environmental conditions and management practices. The mean grain yield for the different locations ranged from 627 lb/ac to 1896 lb/ac (Table 22). Average lentil yields were 1363 lb/ac at Bozeman, 627 lb/ac at Broadview, 1460 lb/ac at Conrad, 1155 lb/ac with irrigation at Corvallis, 1347 lb/ac at Creston, 656 lb/ac at Fort Smith, 1123 lb/ac at Havre, 1690 lb/ac with irrigation at Huntley, 1538 lb/ac at Moccasin, and 1896 lb/ac at Richland. Hail damage affected seedling stand at Sidney site and data were not collected. The difference in grain yield among varieties in a location was significant in for all testing locations (Table 22). The variety CDC Richela resulted in mean maximum yield in three of the testing sites and CDC Redberry resulted in mean maximum grain yield in two of the testing sites. Similarly, the variety Avondale resulted in maximum grain yield in two of the testing sites (Table 22).

Lentil TKW

Thousand kernel weight data were measured only in few locations and mean TKW ranged from 40 to 52 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 55.73 lb/bu measured at Creston to 63.93 lb/bu measured at Moccasin (Table 24).

Lentil Plant height

The mean plant height ranged from 21 (recorded at Creston) to 41 cm (recorded at Huntley irrigated) (Table 25). Creston had taller dry pea plant height but shorter lentil height compared to other locations.

Lentil Number of days to flowering

Only three locations recorded number of days to flowering data. The number of days to flowering for these locations ranged from 59 to 73 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.

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.

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.

Table 21. Lentil Variety Sources and Characteristics

Variety*	Type	Maturity ¹	Breeding Program ²	Release Date
Large Green				
CDC Greenland	Green	Mod	CDC	2006
LC06601734L	Green			
LC0860B123L	Green			
LC0860B130L	Green			
Medium Green				
Avondale (LC01602300R)	Green	Early	USDA	
CDC Richlea	Green	Mod	CDC	1994
Imi-Green	Green			
Impress CL	Green			
Small Green				
LC01602273E	Green			
LC07ND068E	Green	Late	NDSU	
Viceroy	Green			
Small Red				
Crimson	Red	Mod	USDA	1990
LC01602062T	Red			
LC07ND055E	Red			
CDC Redberry	Red	Mod	CDC	2004
LC07ND202T	Red	Late	NDSU	
LC07ND176T	Red	Late	NDSU	
Spanish Brown				
LC08600113P	Pardina		USDA	

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.

Table 22. 2013 Montana Statewide Lentil Variety Evaluations – Grain Yield (lb/ac)

Variety	Bozeman	Broadview	Conrad	Corvallis (Irrigated)	Creston	Fort Smith	Havre	Huntley (Irrigated)	Moccasin	Richland
Large Green										
CDC Greenland	1324	785	1571	1012	1379	276	1079	1461	1553	2145
Medium Green										
Avondale	1745	747	1501	1387	1244	745	1483	1767	1859	2193
CDC Richlea	1400	778	1698	1330	1303	806	1530	1585	1904	1914
Imi-Green	1171		1456	1251	990		1402		1262	1599
Impress CL	1249		1498	1246	1310		1502		1777	1885
Small Green										
LC07ND068E							1288		1413	2244
Viceroy	1248		1571	1274	1496		1396		1864	2462
Small Red										
Crimson	1424	449	1039	951	1238	621	625	1683	1403	1573
LC07ND055E							1290		1499	2024
CDC Redberry	1348	407	1351	795	1816	837	760	1956	1491	1582
LC07ND202T							570		1266	1960
LC07ND176T							507		1172	1419
Trial Means	1363	627	1460	1155	1347	656	1123	1690	1538	1896
P-Value	<0.0001	<0.0001	<0.0001	<0.0001	0.0009	0.0007	<0.0001	0.0579	<0.0001	0.0079
LSD (0.05)	167	107	236	222	279	192	173	NS	320	603
CV (%)	8.37	10.99	11.02	13.10	14.12	18.99	10.63	15.58	14.48	22.18

Table 23. 2013 Montana Statewide Lentil Variety Evaluations – Thousand Kernel Weight (TKW) (g/1000 seeds)

Variety	Bozeman	Broadview	Conrad	Corvallis (Irrigated)	Creston	Fort Smith	Havre	Huntley (Irrigated)	Moccasin	Richland
Large Green										
CDC Greenland			71.5	64.4	56.1		69.3		60.6	60.50
Medium Green										
Avondale			52.50	48.1	44.3		48.1		47.7	46.5
CDC Richlea			56.3	52.8	48.3		51.3		48.0	47.47
Imi-Green			61.8	57.3	49.3		59.6		55.6	48.60
Impress CL			57.0	47.8	45.2		51.9		43.7	48.40
Small Green										
LC07ND068E							43.1		37.0	39.50
Viceroy			34.5	35.4	34.2		33.0		28.2	30.40
Small Red										
Crimson			37.0	35.0	33.4		37.3		32.2	39.40
LC07ND055E							37.3		35.3	37.90
CDC Redberry			45.5	45.8	41.0		41.5		39.3	39.54
LC07ND202T							33.0		29.6	28.70
LC07ND176T							32.7		31.2	29.30
Trial Means			52.0	48.3	43.9		44.6		40.7	41.1
P-Value			<0.0001	<0.0001	<0.0001		<0.0001		<0.0001	<0.0001
LSD (0.05)			3.3	4.23	3.3		1.5		1.54	3.09
CV (%)			4.37	5.96	5.25		2.38		2.64	5.23

Table 24. 2013 Montana Statewide Lentil Variety Evaluations – Test Weight (lb/bu)

Variety	Bozeman	Broadview	Conrad	Corvallis (Irrigated)	Creston	Fort Smith	Havre	Huntley (Irrigated)	Moccasin	Richland
Large Green										
CDC Greenland	61.10	59.15	62.20	61.26	53.10	45.08	59.30	57.13	60.50	57.18
Medium Green										
Avondale	63.37	61.83	63.22	62.80	56.12	61.42	62.22	59.50	92.95	60.40
CDC Richlea	62.63	60.68	62.93	61.88	54.08	60.45	61.27	57.65	61.83	58.80
Imi-Green	63.03		63.08	62.10	53.88		61.10		62.85	56.43
Impress CL	63.35		65.08	62.66	54.88		61.50		62.60	58.70
Small Green										
LC07ND068E							64.05		64.45	61.33
Viceroy	65.93		64.53	64.49	58.38		64.25		65.48	62.95
Small Red										
Crimson	65.18	62.75	63.53	64.25	58.18	64.35	64.37	61.18	64.73	63.80
LC07ND055E							63.60		64.60	62.95
CDC Redberry	64.80	62.98	63.30	63.40	57.25	66.20	63.77	61.30	64.48	62.77
LC07ND202T							65.18		66.75	62.68
LC07ND176T							62.27		65.98	63.10
Trial Means	63.67	61.45	62.85	62.86	55.73	59.50	62.82	59.35	63.93	61.08
P-Value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.3602	<0.0001	<0.0001	<0.0001	<0.0001
LSD (0.05)	0.41	0.65	1.4	0.69	1.40	NS	0.45	1.08	0.33	1.15
CV (%)	0.44	0.68	0.75	0.80	1.71	23.08	0.49	1.19	0.36	1.32

Table 25. 2013 Montana Statewide Lentil Variety Evaluations – Plant Height (cm)

Variety	Bozeman	Broadview	Conrad	Corvallis (Irrigated)	Creston	Fort Smith	Havre	Huntley (Irrigated)	Moccasin	Richland
Large Green										
CDC Greenland		33	35	21	20	39	31	44	36	39
Medium Green										
Avondale		33	30	25	23	38	29	44	33	44
CDC Richlea		33	30	26	20	36	32	41	34	37
Imi-Green			37	29	28		35		39	51
Impress CL			32	23	24		32		33	38
Small Green										
LC07ND068E							30		29	39
Viceroy			32	25	18		30		34	41
Small Red										
Crimson		30	24	19	19	32	21	36	25	33
LC07ND055E							27		32	37
CDC Redberry		33	30	29	20	36	29	43	33	33
LC07ND202T							20		26	32
LC07ND176T							21		31	36
Trial Means		32.3	31.2	24.5	21	36	28.1	41.6	31.8	37.9
P-Value		0.1409	<0.0001	0.0331	0.0016	0.0777	<0.0001	0.0254	<0.0001	0.0002
LSD (0.05)		NS	2.8	5.47	3.8	NS	3.7	5.1	3.02	7.13
CV (%)		6.69	6.13	15.12	12.37	6.78	9.06	8.07	6.63	13.08

Table 26. 2013 Montana Statewide Lentil Variety Evaluations – Number of Days to Flowering

Variety	Bozeman	Broadview	Conrad	Corvallis (Irrigated)	Creston	Fort Smith	Havre	Huntley (Irrigated)	Moccasin	Richland
Large Green										
CDC Greenland	68				74		61		71	
Medium Green										
Avondale	66				73		57		71	
CDC Richlea	67				75		58		71	
Imi-Green	68				73		59		72	
Impress CL	67				74		60		73	
Small Green										
LC01602273E										
LC07ND068E							56		72	
Viceroy	69				74		61		74	
Small Red										
Crimson	67				73		60		71	
LC07ND055E							57		73	
CDC Redberry	68				73		59		72	
LC07ND202T							61		72	
LC07ND176T							61		71	
Trial Means	67.4				73.5		59.2		71.7	
P-Value	<0.0001				0.0913		<0.0001		0.0063	
LSD (0.05)	0.47				NS		1.4		1.36	
CV (%)	0.47				1.12		1.63		1.32	

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

Table 27. Statewide Lentil Variety Evaluations – 2008 – 2013 Multi-year Grain Yield Summary (lb/ac)

Variety	Bozeman						Conrad						Corvallis					
	2008	2009	2010	2011	2012	2013	2008	2009	2010	2011	2012	2013	2008	2009	2010	2011	2012	2013
Small Green																		
Essex			2111	1538	462		512	3248	436	2842	1823		1688	2224	1087		536	
Medium Green																		
Brewer			1855	1340	528		357	2272	381	2034	1120		738	940	964		405	
CDC Richlea			2266	1534	569	1400		2831	623	2307	1800	1698		2552	973		893	1330
Avondale			2224	1578	685	1745		559	3113	687	2284	1696	1501	1338	2495	1052	837	1387
Large Green																		
Merrit			2064	1360	607		510	2183	385	2151	1243		1192	1411	690		394	
Riveland			1825	1558	567		433	2127	324	1821	1464		798	1353	430		552	
Small Red																		
Crimson			1999	1281	588	1424	403	1921	544	1762	1543	1039	1262	1629	1095		838	951
CDC Redberry			982	1400		1348		2234	833	2318	1338	1351		2411	1059		706	795
Trial Means			1953	1476	560	1363	450	2451	533	2227	1496	1460	1112	1802	860		700	1155
LSD (0.05)			382	138	98	167	142	559	214	NS	NS	236	386	395	348		354	222
CV (%)			14	7	12	8	22	14	28	21	25	11	24	15	28		36	13
Variety	Creston						Havre						Huntley (Dry)					
	2008	2009	2010	2011	2012	2013	2008	2009	2010	2011	2012	2013	2008	2009	2010	2011	2012	2013
Small Green																		
Essex	2670	2395	2464	2091	1409		1680	1654	3119	1838			1586	2103	464	784	569	
Medium Green																		
Brewer	1844	2460	2164	1464	1250		1371	1173	2487	1024	1121		950	494	425	402	583	
CDC Richlea	---	2831	2150	1873	1625	1303	---	1546	2853	1743	830	1530	---	1603	569	873	734	1585
Avondale	2676	3016	2626	2024	1790	1244	1844	1807	2790	1385	874	1483	1457	1916	926	877		1767
Large Green																		
Merrit	2445	2829	1954	1730	1038		1892	1331	2868	1127	977		1210	947	466	717	523	
Riveland	2046	2478	1898	1547	1310		1686	1368	2463	968	1033		957	1814	399	717	727	
Small Red																		
Crimson	2309	2082	2259	2095	1245	1238	1277	1072	2343	1705	902	625	1597	1629	738	458	607	1683
CDC Redberry		2326	2346	2090		1816		1217	2592	904	846	760		2411	684	819	620	1956
Trial Means	2312	2522	2164	1822	1345	1347	1598	1399	2736	1362	830	1123	1336	1397	573	672	614	1690
LSD (0.05)	270	448	456	NS	421	279	325	302	340	299	179	173	244	NS	272	NS	167	NS
CV (%)	8	12	15	22	22	14	14	15	9	10	15	11	9	43	33	54	19	16

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Table 27. Statewide Lentil Variety Evaluations – 2008 – 2013 Multi-year Grain Yield Summary (lb/ac)...continued

Variety	Joplin						Moccasin						Richland					
	2008	2009	2010	2011	2012	2013	2008	2009	2010	2011	2012	2013	2008	2009	2010	2011	2012	2013
Small Green																		
Essex			2491	726	2521		1743		2036	918	809		1181	1752	1097	1705		
Medium Green																		
Brewer			2236	350	2027		1395		1768	730	756		992	939	1324	581	1882	
CDC Richlea			2371	616	1919				2062	1100	958	1904		1596	1562	1077	1874	1914
Avondale				581	2421		1800		1944	903	955	1859		1284	1850	1398	2041	2193
Large Green																		
Merrit			2549	546	2127		1501		1890	771	838		1105	1098	1435	880	1710	
Riveland				247	2303		1572		1805	926	827		910	1013	1571	836	1712	
Small Red																		
Crimson			2162	774	1479		1655		1919	911	907	1403	1247	1308	1222	859	1734	1573
CDC Redberry			1973	785	1717				1642	764		1491		1296	1390	933	1743	1582
Trial Means			2324	624	2077		1636		1906	888	833	1538	1108	1200	1537	945	1666	1896
LSD (0.05)			562	NS	NS		176		NS	NS	144	320	230	288	294	392	332	603
CV (%)			17	44	20		7		11	24	12	15	12	17	11	25	12	22
Variety	Sidney																	
	2008	2009	2010	2011	2012	2013												
Small Green																		
Essex		1768	2251	1737	458													
Medium Green																		
Brewer		1103	1423	1061	184													
CDC Richlea		1699	1959	1594	530													
Avondale		1653	2169	1774	453													
Large Green																		
Merrit		1407	1350	1418	222													
Riveland		1387	1564	1413	401													
Small Red																		
Crimson		836	1924	981	261													
CDC Redberry		1332	2186	1604	448													
Trial Means		1351	1835	1444	371													
LSD (0.05)		260	390	434	NS													
CV (%)			13	17	42													

Western Regional Lentil Variety Evaluations

The Western Regional lentil variety trials were conducted at 3 sites (Corvallis, Moccasin and Richland). The trial consisted of 7 varieties, 1 commercially available and 6 advanced breeding lines from the USDA-ARS Grain Legume Genetics and Physiology Program in Pullman, Washington.

The average yields of lentil were reported 1362 lb/ac with irrigation at Corvallis, 1798 lb/ac at Moccasin, and 1940 lb/ac at Richland (Tables 28-30). The enteries that resulted in mean maximum grain yield varied from location to location. The enteries LC01602273E, Avondale and C08600113P resulted in mean maximum grain yield at Corvallis, Moccasin and Richland, respectively (Tables 28-30).

Table 28. 2013 Western Regional Lentil Variety Evaluation – Corvallis, MT

Variety	Grain Yield (lb/ac) 13% Moist.	Test Wt (lb/bu)	TKW (g/1000 seeds)	Height (cm)	Number of days to flower
Large Green					
LC06601734L	1558	61.29	65.4	23.0	
LC0860B123L	1063	59.51	92.2	24.8	
LC0860B130L	1261	60.27	74.2	19.0	
Medium Green					
Avondale	1388	62.80	48.1	25.3	
Small Green					
LC01602273E	1604	64.02	35.8	19.5	
Small Red					
LC01602062T	1372	63.69	48.5	19.5	
Spanish Brown					
LC08600113P	1290	64.41	47.7	17.5	
Trial Analysis:					
Trial Means	1362	62.28	58.8	21.2	
P-Value	0.2042	<0.0001	<0.0001	0.0983	
LSD (0.05)	NS	0.51	6.1	NS	
CV (%)	18.63	0.54	6.97	17.71	

Table 29. 2013 Western Regional Lentil Variety Evaluation – Moccasin, MT

Variety	Grain Yield (lb/ac) 13% Moist.	Test Wt (lb/bu)	TKW (g/1000 seeds)	Height (cm)	Number of days to flower
Large Green					
LC06601734L	2036	60.50	69.3	36.3	69
LC0860B123L	1262	58.85	86.1	33.5	71
LC0860B130L	1896	60.60	69.4	35.0	69
Medium Green					
Avondale	2178	63.10	47.4	35.4	70
Small Green					
LC01602273E	1746	63.43	33.9	34.5	69
Small Red					
LC01602062T	1653	65.03	42.9	30.0	70
Spanish Brown					
LC08600113P	1786	65.13	41.0	32.5	71
Trial Analysis:					
Trial Means	1798	62.46	54.9	33.9	69.8
P-Value	0.0025	0.0013	<0.0001	0.3522	0.2330
LSD (0.05)	387	2.53	2.6	NS	NS
CV (%)	14.49	2.73	3.22	12.17	2.94

Table 30. 2013 Western Regional Lentil Variety Evaluation – Richland, MT

Variety	Grain Yield (lb/ac) 13% Moist.	Test Wt (lb/bu)	TKW (g/1000 seeds)	Height (cm)	Number of days to flower
Large Green					
LC06601734L	1792	58.50	64.1	40.0	
LC0860B123L	1582	54.63	91.5	44.0	
LC0860B130L	1613	56.63	71.6	38.7	
Medium Green					
Avondale	2074	60.66	46.0	43.8	
Small Green					
LC01602273E	1994	62.05	39.4	35.8	
Small Red					
LC01602062T	2033	61.75	41.1	38.0	
Spanish Brown					
LC08600113P	2253	61.95	49.2	35.0	
Trial Analysis:					
Trial Means	1940	59.80	55.0	39.3	
P-Value	0.7264	<0.0001	<0.0001	0.0567	
LSD (0.05)	NS	1.38	4.53	NS	
CV (%)	26.37	1.53	5.49	9.59	

Chickpea

2013 Statewide Chickpea Variety Evaluations

Both statewide and western regional chickpea variety evaluations were seeded as one experiment in the different locations. Four commercial varieties and eight 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 Huntley dry land was abnormal and not included in this report. The chickpea trial at Creston had deer damage. Chickpea trial from Corvallis was harvested late and data were not ready for this report. Summary of results are shown in Table 32.

Summary of Statewide and Western regional chickpea variety evaluations

Mean grain yield ranged from 1449 lb/ac to 2363 lb/ac for the different locations (Table 32). The average yields of chickpea were 1449 lb/ac at Bozeman, 2510 lb/ac at Conrad, 1818 lb/ac at Huntley, 1623 lb/ac at Moccasin, and 2363 lb/ac at Richland (Table 32). This year data were significantly higher in some of the location such as Moccasin and Bozeman compared to last year. Most of the varieties in Richland site were affected by ascochyta leaf blight. Among the experimental lines, BGC08009M gave highest mean grain yield both at Moccasin and Richland sites than other enteries (Table 32). Among the commercial varieties, CDC Frontier, CDC Alama and Myles produced good grain yield at Bozeman, Conrad and Huntley, respectively (Table 32).

Table 31. Chickpea Variety Sources and Characteristics

Variety*	Type	Leaf-type	Breeding Program¹	Release Date
BGC08008M	Large Café Kabul			
BGC08009M	Large Café Kabul			
BGC090016	Large Café Kabul			
BGC090023	Large Café Kabul			
CA0790B0042C	Large Café Kabuli	Compound	USDA	
CA0790B0547C	Large Café Kabul			
CA0790B0549C	Large Café Kabul			
CA0690B0427C	Large Café Kabuli	Compound	USDA	
CDC Alma	Med/Large Kabuli	Compound	CDC	2010
CDC Frontier	Large Kabuli	Compound	CDC	2003
CDC Orion	Large Kabuli	Compound	CDC	2010
Myles	Desi	Compound	USDA	1994

¹Refers to developer: CDC = Crop Development Centre, University of Saskatchewan; 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.

Table 32. 2013 Montana Chickpea Variety Evaluations – Yield (lb/ac)

Variety	Bozeman	Conrad	Corvallis* (Irrigated)	Huntley (Irrigated)	Moccasin	Richland
BGC08008M					1810	2339
BGC08009M					2084	3902
BGC090016					1719	2019
BGC090023					1812	2619
CA0790B0042C					1600	506
CA0790B0547C					1551	1617
CA0790B0549C					1700	1227
CA0890B0427C					1807	867
CDC Alma	1396	3250		1467	1533	2763
CDC Frontier	1594	2488		1874	1420	3529
CDC Orion	1574	3008		1521	1806	2930
Myles	1233	1294		2411	1392	2641
Trial Analysis:						
Trial Means	1449	2510		1818	1623	2363
P-Value	0.0027	<0.0001		0.2271	0.0121	<0.0001
LSD (0.05)	145	412		NS	425	784
CV (%)	6.28	10.26		34.68	18.21	23.12

*Data were not ready for this report due late harvesting.

Multi-Year and Multi-Location Statewide Chickpea Variety Evaluations

Table 33. Multi-Year and Multi-Location Statewide Chickpea Variety Evaluations –
2011– 2013 - Grain Yield Summary (lb/ac)

Variety	Bozeman			Conrad			Corvallis (irrig)		
	2011	2012	2013	2011	2012	2013	2011	2012	2013
BGC08008M									
BGC08009M									
BGC090016									
BGC090023									
CA0790B0042C								1801	
CA0790B0547C									
CA0790B0549C									
CA0890B0427C								1746	
CDC Alma		828	1396		1946	3250		1771	
CDC Frontier		875	1594	3422	2103	2488		1971	
CDC Orion		852	1574		2090	3008			
Myles		994	1233	2748	1626	1294		1693	
Trial Means		796	1449	2860	1750	2510		1678	
LSD (0.05)		136	145	NS	575	412		NS	
CV (%)		10	6	19	18	10		22	
Variety	Huntley (Irrig)			Moccasin			Richland		
	2011	2012	2013	2011	2012	2013	2011	2012	2013
BGC08008M						1810			2339
BGC08009M						2084			3902
BGC090016						1719			2019
BGC090023						1812			2619
CA0790B0042C					981	1600		201	506
CA0790B0547C						1551			1617
CA0790B0549C						1700			1227
CA0890B0427C						1807			867
CDC Alma		3056	1467		919	1533		1467	2763
CDC Frontier		2745	1874	823	605	1420	1605	2488	3529
CDC Orion		3167	1521		1619	1806		1907	2930
Myles		2668	2411	995	964	1392	1096	1588	2641
Trial Means		2595	1818		830	1623	1010	1175	2363
LSD (0.05)		526	NS		304	425	557	577	784
CV (%)		12	35		19	18	32	29	23

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.

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.

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.

FUTURE PLANS

Statewide spring dry pea, lentil and chickpea variety evaluations will continue across Montana as industry funding and support continues.

Note: Results and summaries in this report are for **informational purposes only**. Inclusion and/or exclusion of any commercial variety in this report does not constitute a recommendation by MSU-Montana Agricultural Experiment Station (MAES) or Central Agricultural Research Center (CARC).