PROJECT TITLE: 2008 Statewide Spring Dry Pea and Lentil Variety Evaluations

EXPERIMENT NOs.: #8008; 8508

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OBJECTIVES: To evaluate spring dry pea and lentil varieties for grain production potential in diverse Montana environments.

METHODS: The 2008 Statewide Spring Dry Pea Trial consisted of 10 varieties, of which, three are commercially available smooth green, four are commercially available smooth yellow and three are experimental smooth yellow dry pea lines from the USDA-ARS Grain Legume Genetics and Physiology program at Pullman, Washington (**Table 1a**). The 2008 Statewide Spring Lentil Trial consisted of 10 lentil varieties, of which, six are commercially available varieties and four are experimental lines from the USDA-ARS program (**Table 1a**). The dry pea trial was seeded no-till into barley stubble on April 10, 2008, while the lentil trial was seeded no-till into winter wheat stubble on April 13, 2008 (**Table 2**). Additional trial production methods can be found in **Table 2**.

RESULTS: **Dry Pea Grain Yields** were respectable among most of the testing sites (**Table 3**). Havre had the greatest production, with a trial average (converted to 13% moisture) of nearly 65 bushels acre^{-1} (65.6 bu/acre – 3,868 lbs/acre). Moccasin had the worst yield averaging less than 17 bushels acre^{-1} (16.1 bu/acre - 986 lbs/acre) which is much below long-term means and is thought to be due to poor sub-soil moisture, hail damage, snow and record lows in mid-June, and an insect infestation. As expected, no single entry was the top yielding variety at every location. However, the smooth yellow line PS9910140 did top the trial yields at three locations, and was among the top cultivars in the other locations. **Kernel Weights,** measured as test weight, were consistent across the three locations reporting them and ranged from 62.8 to 63.9 lbs bu^{-1} (**Table 4**). Delta and CDC Mozart yellow peas consistently had the highest test weights. Kernel size ranged from 190 to 240g 1,000-kernels^{-1}. The smooth yellow line PS0010836 had the largest seed size at all four of sites it was tested. **Flowering and Maturity** differed from site to site due to differences in seeding dates and environmental conditions (**Table 5**), however, Stirling green pea was found to flower first among all reporting sites, and was earliest to reach maturity at Bozeman (only significant at Havre and Moccasin). **Plant Heights**, although differing from location to location (**Table 6**), the green pea Medora was consistently the tallest cultivar tested at grain-ripe maturity (not significant, based on $LSD_{0.05}$).

Lentil Grain Yields ranged from 450 to 2300 lbs acre^{-1} and were respectable across the state (**Table 7**), with the exceptions being Conrad (450 lbs acre^{-1}), which had a poor stand establishment and Sidney (trial abandoned), which had poor soil moisture at seeding and experienced drought-like conditions through the growing season. Differences in grain yield between the dry pea and lentil trials at Moccasin can be attributed to planting of the lentil trial in a different field, which contained better stored soil moisture. The "Richlea"-type lentil line LC01602300R showed the greatest seed production at three of the six sites, with a grain yield ranging from 9.0 (at Conrad) to over 44 bushels acre^{-1} (Creston), but was not significant at

any location (based on $LSD_{0.05}$). **Kernel Weights**, such as test weight, ranged from 59.4 to 62.2 lbs bu^{-1} (**Table 8**). The Pardina-type line LC01602245P consistently had the heaviest test weight (statistically significant, based on $LSD_{0.05}$ at Moccasin). Kernel size data showed Riveland had the largest seed size (significant) at all locations (**Table 8**). **Flowering and Maturity** was not consistent across sites (**Table 8**). **Plant Heights** ranged from 27.6 to 34.7 cm with the Laird-type Riveland lentil having consistently, although not statistically significant, the tallest grain height across the state (**Table 9**).

FUTURE PLANS: With continued industry funding, statewide dry pea and lentil variety evaluations will continue across Montana.

Table 1a. 2008 Statewide Srping Dry Pea Variety Evaluations - Variety Characteristic Table -Exp. 80xx08. Montana State University - Montana Agricultural Experiment Stations.

Variety	Color	Type	Size[1/]	Plant Physiology	Maturity[2/]
Majoret	Smooth Green	Food/Feed	Medium	Semi-Leaf/Semi-Dwarf	Late
Delta	Smooth Yellow	Food/Feed	Medium	Semi-Leaf/Semi-Dwarf	Moderate
CDC Mozart	Smooth Yellow	Food/Feed	Medium	Semi-Leaf/Semi-Dwarf	Late
DS Admiral	Smooth Yellow	Food/Feed	Medium	Semi-Leaf/Semi-Dwarf	Moderate
Cruiser	Smooth Green	Food/Feed	Medium	Semi-Leaf/Semi-Dwarf	Moderate
Stirling	Smooth Green	Food/Feed	Small	Semi-Leaf/Semi-Dwarf	Early
Medora	Smooth Green	Food/Feed	Small	Semi-Leaf/Semi-Dwarf	Late
PS01102958	Smooth Yellow	Food/Feed	Medium	Semi-Leaf/Semi-Dwarf	Moderate
PS9910140	Smooth Yellow	Food/Feed	Medium	Semi-Leaf/Semi-Dwarf	Moderate
PS0010836	Smooth Yellow	Food/Feed	Medium	Semi-Leaf/Semi-Dwarf	Moderate

[1/] - Seed Size Ranges (g/1000 seeds) : Very Large = >290-295 Medium = 190-250
- {Size of seed at planting} Large = 250-290 Small = <190

[2/] - Relative Maturity (days to flower) as compared with other varieties tested;
Late: 2+ Days later than average
Mod: ± 1 Day from average
Early: 2+ Days earlier than average

Table 1b. 2008 Statewide Spring Lentil Variety Evaluation - Variety Characteristic Table - Exp: 85xx08. Montana State University - Montana Agricultural Experiment Stations

Entry	Type	Seed Color Coat	Cotyledon	Size1/	Maturity	Seed Source
CDC Vantage	Richlea	Green	Yellow	Medium	Moderate	CARC
Brewer	Brewer	Mottled Green	Yellow	Medium	Mod Early	Spokane Seeds
Crimson	Turkish	Brown	Red	Small	Mod Early	Spokane Seeds
Merrit	Richlea	Green	Yellow	Large	Moderate	USDA-ARS
Pennell	Richlea	Green	Yellow	Large	Moderate	USDA-ARS
Riveland	Laird	Green	Yellow	Large	Late	USDA-ARS
LC01602307E	Eston	Green	Yellow	Small	Early	CARC
LC01602062T	Turkish	Brown	Red	Small	Moderate	CARC
LC01602245P	Pardina	Brown	Yellow	Small	Moderate	CARC
LC01602300R	Richlea	Green	Yellow	Medium	Moderate	CARC

[1/] - Seed Size Classes: Small: < 40.0 g/1000 Large: > 60.0 g/1000
Medium: 40.0 - 60.0 g/1000

Table 2. 2008 Statewide Spring Pulse Variety Evaluations - Management summary.
-Exp. 80&85xx08. Montana State University - Montana Agricultural Experiment Stations

Field Summary	**Moccasin**	**Havre**	**Conrad**	**Sidney[1/]**	**Huntley**	**Bozeman[2/]**	**Corvallis**	**Creston**	**Richland[3/]**
Environment:	Dryland	Dryland	Dryland	Dryland	Dryland	Dryland	Irrigated	Dryland	Dryland
Tillage History:	No-Till	No-Till	Conv-Till	Cov-Till	No-Till	No-Till	Conv-Till	Conv-Till	No-Till
Previous Crop:	Brly/W W	Barley	Fallow	Fallow	Fallow	Spr Wht	Bckwht/saff	Barley	Spr Wht
Soil Type:	Judith C-L	Joplin C-L	Scobey C-L	Williams C-L	Ft Collins C-L	AmstrdmSi-L	Burnt Fork L	Creston Si-L	
Elevation:	4250'	2700'	3665'	2200'	3020'	4500'	3600'	2970'	2800'
Trial Management									
Seeding Date:	4/10-13/08	4/14-16/08	4/28/08	4/18/08	3/12-20/08	4/17/08	4/28/08	4/14/08	4/10/08
Fertilizer:	None	None	6-30-25 lbs/a	None	None	PKS (50/50)	11-52-40 lbs/a	11-52-0 lbs/ac	None
Plot Size:	100 ft^2	88 ft^2	125 ft^2	16 ft^2	140 ft^2	100 ft^2	80 ft^2	80 ft^2	3ft x ?
Pesticides: (rates)	glyphosate (14-16oz/ac) quizalofop (10oz/acre) malathion	none	bentazon salt (1.5 pt/a)	ethalfluralin (3 pt/ac)	glyphosate (16 oz/ac) pendimethalin (16 oz/ac) Dimethenamid-P (12 oz/ac)	none	pendimethalin (2 pt/ac)	imazethapyr (5 oz/ac)	??
Harvest Date:	8/1-11/08	8/1/08	8/26/08	7/30/08	8/1/08	8/4/08	8/13/08	8/1-13/08	8/1-7/08
Crop-Yr Precip:	8.15"	8.09"	7.54"	4.55"	7.50"	7.14"	2.78"	10.31"	
	4/1 - 7/31	4/15 - 8/1	Grow Seas.[4/]	4/1 - 8/31	3/12 - 8/1	4/27 - 8/4	4/28 - 8/13	4/14 - 8/10	
Site Ave:	8.89"			9.39"				9.81"	
Observations:	Hail/Insects		Pea seed rate was high	Drought-like conditions		Severe grass-hoppers - July	+ 8.00" Irr		Hail-Minor

* - Bozeman site is located near Amsterdam

[1/] - Lentil trial failed due to poor emergence and drought-like conditions

[2/] - Bozeman site is in producer's field near Amsterdam, west of Bozeman

[3/] - Richland site was on Marvin Tarum's farm near Richland, Valley County, Montana

[4/] - Precipitation reported as "Growing Season" actual dates unknown

Table 3. 2008 Statewide Spring Dry Pea Variety Evaluations - Grain yield summary by testing site.
- Exp:80xx08. Montana State University - Montana Agricultural Experiment Stations

	Grain Yields (Adjusted to 13% moisture)*								
Variety[1/]	Moccasin	Havre	Conrad*	Huntley	Sidney*	Corvallis*	Creston*	Bozeman[2/]	Valley[3/]
	(lbs/acre)								
Majoret	789	3506	1884 [a]	1680	1048	2027 [a]	3242 [a]	1766	1457
DS Admiral	**1204** [a]	3922	1966 [a]	-------	1078	1803	3398 [a]	1846 [a]	1536 [a]
Delta	1052 [a]	3701	2177 [a]	2043	1420 [a]	1686	**3633** [a]	1882 [a]	1633 [a]
CDC Mozart	923	4116 [a]	2033 [a]	1841	**1489** [a]	1727	3207	1604	**1932** [a]
Cruiser	786	3926 [a]	1592	-------	1398 [a]	1302	2724	1438	1456
Stirling	1025 [a]	4121 [a]	1887 [a]	2622 [a]	1159	1617	3281 [a]	**1994** [a]	1590 [a]
Medora	912	3464	1811 [a]	1822	1277	1723	2885	1697	1549 [a]
PS01102958	874	3427	**2287** [a]	1612	1187	1506	3162	------	------
PS9910140	1017 [a]	**4288** [a]	2203 [a]	**2712** [a]	1081	**2904** [a]	3188	------	------
PS0010836	1101 [a]	4260 [a]	1877 [a]	1287	1309 [a]	1652	3473 [a]	------	------
Means	968	3873	1836	1937	1245	1794	3219	1747	1677
LSD0.05 (by t)	195	363	583	471	185	1005	398	227	443
CV% (s/means)	13.9	6.5	19.2	16.6	10.2	38.6	8.6	8.7	15.4
F-Value	4.05	6.94	2.61		6.09	1.56		5.9	1.87

[a] - Denotes values equal to highest value (in **bold**) based on $LSD_{0.05}$

* - Conrad, Sidney, Corvallis, and Creston yield reported as harvest moisture; grain moisture not known

[1/] - "PSxx" lines are from USDA-ARS Grain Legume Genetics and Physiology Program in Pullman, WA, which have performed well at Moccasin over the past two to five years.

[2/] - Bozeman site was located on a producer's farm near Amsterdam, Montana, west of Bozeman

[3/] - Valley site was on a producer's farm in northern Valley County, near Richland, Montana

Table 4. 2008 Statewide Spring Dry Pea Variety Evaluations. Seed Weight Summary.
- Exp: 80xx08. MSU-Montana Agricultural Experiment Stations.

	Test Weight			Kernel Weight						
Variety	Mocc.	Havre	Huntley	Mocc.	Boze.	Huntley	Sidney	Valley	Creston	
	(lbs/bu)			(g/1,000)					(#/lb)	(g/1,000)
Majoret	63.3 [a]	63.6	63.1	191.8	187.3	192.0	188.6	215.0	2009	225.8
DS Admiral	62.6	62.8	------	220.5	**206.6** [a]	------	213.2	**238.3** [a]	1734 [a]	261.6
Delta	63.5 [a]	**65.7** [a]	**64.2** [a]	207.8	204.5 [a]	193.0	198.2	223.7	1724 [a]	263.1
CDC Mozart	**63.7** [a]	65.3 [a]	64.1 [a]	203.0	187.2	190.1	201.5	214.7	1908	237.7
Cruiser	61.9	62.9	------	185.8	174.7	------	171.1	196.7	2005	226.3
Stirling	62.6	64.6 [a]	62.6	196.5	177.6	180.3	183.8	200.0	2048	221.5
Medora	62.3	63.9 [a]	62.2	190.8	186.9	175.1	197.6	213.7	2102	215.8
PS01102958	63.5 [a]	64.3 [a]	63.6 [a]	227.0	------	213.6 [a]	220.1 [a]	------	1732 [a]	261.9
PS9910140	62.4	62.4	61.6	220.8	------	210.1	212.7	------	1891	239.9
PS0010836	62.1	63.6	62.7	**238.5** [a]	------	**225.1** [a]	**227.7** [a]	------	**1683** [a]	**269.6**
Means	62.8	63.9	63.0	208.2	189.3	200.9	201.5	213.7	1883	240.8
$LSD_{0.05}$ (by t)	0.6	2.0	0.7	7.5	5.6	12.6	8.0	10.3	117	
CV% (s/means)	0.62	2.13	0.7	2.50	2.00	4.3	2.747	2.8	4.3	
F-Value	11.31	2.48		46.5	41.8		39.55	11.83		

[a] - Denotes values equal to highest value (in **bold**) based on $LSD_{0.05}$

Table 5. 2008 Statewide Spring Dry Pea Variety Evaluations - Maturity Summary - Exp: 80xx08. MSU-Montana Agricultural Experiment Stations.

Variety	Havre	Moccasin	Corvallis	Huntley	Sidney	Bozeman
	----------	----------	Flower Date	----------	----------	Maturity
Majoret	Jun 24	Jul 1	Jun 29	Jun 17	Jun 23	Jul 28
DS Admiral	Jun 22	Jun 29	Jun 26		Jun 22	Jul 27
Delta	Jun 21	Jun 28	Jun 25 [a]	Jun 14	Jun 20	Jul 25 [a]
CDC Mozart	Jun 22	Jul 1	Jun 28	Jun 14	Jun 22	Jul 26
Cruiser	Jun 21	Jun 30	Jun 25 [a]		Jun 21	Jul 27
Stirling	**Jun 19** [a]	**Jun 27** [a]	**Jun 23** [a]	**Jun 11** [a]	**Jun 18**	**Jul 25** [a]
Medora	Jun 25	Jul 1	Jun 30	Jun 17	Jun 25	Jul 28
PS01102958	Jun 23	Jun 30	Jun 27	Jun 16	Jun 22	-----
PS9910140	Jun 21	Jun 30	Jun 26	Jun 13	Jun 22	-----
PS0010836	Jun 22	Jun 30	Jun 27	Jun 15	Jun 23	-----
Site Means	Jun 22	Jun 30	Jun 26	Jun 14	Jun 22	Jul 26
$LSD_{0.05}$ (by t)	1	1	3	1	Jan 1	1
CV% (s/means)	0.4	0.4	1.0	0.4	0.778	0.3
F-Value	34.74	15.5	4.49		6.51	14.6

[a] - Denotes values equal to earliest value (in **bold**) based on $LSD_{0.05}$.

Table 6. 2008 Statewide Spring Dry Pea Variety Evaluations - Grain Ripe Canopy Heights - Exp: 80xx08. MSU-Montana Agricultural Experiment Stations.

Variety	Havre	Moccasin	Corvallis	Bozeman	Huntley	Sidney
	----------	----------	Grain Canopy Height	----------	----------	----------
			(cm)			
Majoret	59.2 [a]	34.8 [a]	40.2	50.8	51.3	36.5
DS Admiral	58.9 [a]	37.3 [a]	51.3 [a]	65.0 [a]	-----	47.0 [a]
Delta	58.0 [a]	33.8	37.2	54.3	58.2 [a]	40.3
CDC Mozart	62.7 [a]	29.0	34.9	47.0	51.6	40.0
Cruiser	67.4 [a]	30.8	48.3 [a]	56.8	-----	**48.3** [a]
Stirling	59.7 [a]	26.3	38.1	45.8	47.8	33.3
Medora	**67.7** [a]	**40.3** [a]	**55.1** [a]	**68.8** [a]	**60.2** [a]	**48.3** [a]
PS01102958	59.6 [a]	30.8	34.5	-----	52.6	37.0
PS9910140	56.9	25.3	23.9	-----	50.8	36.0
PS0010836	55.3	27.8	34.1	-----	51.6	34.5
Site Means	60.5	31.6	39.7	55.5	53.8	40.1
$LSD_{0.05}$ (by t)	10.0	5.6	7.1	5.2	6.6	4.2
CV% (s/means)	11.3	12.2	12.4	6.3	8.4	7.244
F-Value	1.47	6.41	14.38	24.71		15.71

[a] - Denotes values equal to highest value (in **bold**) based on $LSD_{0.05}$.

Table 7. 2008 Statewide Spring Lentil Variety Evaluations - Agronomic Summary.
- Exp: 85xx08. Montana State University - Montana Ag. Experiment Stations

	Grain Yields (Adjusted to 13% moisture)*						
Variety[1/]	Havre	Moccasin	Huntley	Conrad*	Corvallis*	Creston**	Richland*
CDC Vantage	1434	1751 [a]	964	398	964	2089	1254 [a]
Brewer	1371	1395	950	357	738	1844	992
Crimson	1277	1655 [a]	1597	403	1262	2309	1247 [a]
Merrit	**1892** [a]	1501	1210	510 [a]	1192	2445 [a]	1105 [a]
Pennell	1755 [a]	1614	1380	543 [a]	1221	2256	1077 [a]
Riveland	1686 [a]	1572	957	433 [a]	798	2046	910
LC1602307E	1680 [a]	1743 [a]	1586	512 [a]	**1688** [a]	2670 [a]	-----
LC01602062T	1421	1599	1515	453 [a]	973	2310	-----
LC01602245P	1619 [a]	1733 [a]	**1836** [a]	332	948	2477 [a]	-----
LC01602300R	1844 [a]	**1800** [a]	1457	**559** [a]	1338 [a]	**2676** [a]	-----
Means (n = 40)	1598	1636	1336	450	1112	2312	1108
$LSD_{0.05}$ (by t)	325	176	224	142	386	270	230
CV% (s/means)	14.0	7.43	8.6	21.69	23.94	8.1	12.1
F-Value (9,27 df)		4.3		2.60	4.58		2.81

[a] - Denotes values equal to highest value (in **bold**) based on $LSD_{0.05}$

* - Conrad, Corvallis and Valley County yield reported as harvest moisture; grain moisture not known

** - Creston grain moisture was between 13% and 15%.

[1/] - "LCxx" lines are from USDA-ARS Grain Legume Genetics and Physiology Program in Pullman, WA, which have performed well at Moccasin over the past two to five years.

Table 8. 2008 Statewide Spring Lentil Variety Evaluations. Seed Weight Summary.
- Exp: 85xx08. MSU-Montana Agricultural Experiment Stations.

	------- Test Weight -------			---------- Kernel Weight ----------				
Variety	Mocc.	Havre	Huntley	Mocc.	Huntley	Richland	Creston	
	---------- (lbs/bu) ----------			----- (g/1,000) -----			(#/lb)	(g/1,000)
CDC Vantage	62.5	62.8	60.3	53.8	46.8	58.3	8668	52.3
Brewer	59.9	60.6	58.0	57.8	50.3	66.7	7276	62.3
Crimson	63.6	64.4 [a]	61.8 [a]	35.0	31.4	38.0	12971	35.0
Merrit	59.0	59.9	57.4	66.3	55.7	76.7	6486	69.9
Pennell	58.6	59.5	56.7	67.8	59.5	79.3	6503	69.8
Riveland	57.9	58.6	55.3	**76.5** [a]	**65.4** [a]	**83.7** [a]	**5690** [a]	**79.7**
LC1602307E	62.8	63.9	59.8	45.5	40.4	----	9332	48.6
LC01602062T	63.7	64.3 [a]	61.1	46.0	41.3	----	9080	50.0
LC01602245P	**64.7** [a]	**64.9** [a]	**63.5** [a]	39.5	34.2	----	11035	41.1
LC01602300R	61.8	62.7	59.7	48.5	45.2	----	9080	50.0
Means	61.5	62.2	59.4	53.7	47.0	59.7	8459	53.6
LSD0.05 (by t)	0.5	0.8	2.0	3.1	3.0	0.4	548	
CV% (s/means)	0.52	0.8	2.4	4.0	4.3	3.9	4.3	
F-Value	227.0		0.7	156.9	4.3	157.1		

[a] - Denotes values equal to highest value (in **bold**) based on $LSD_{0.05}$

Table 9. 2008 Statewide Spring Lentil Variety Evaluations - Physiological Information.
- Exp: 85xx08. Montana State University - Montana Agricultural Experiment Stations.

Variety	Havre	Huntley	Creston	Havre	Moccasin	Corvallis	Huntley
	Flower Date			Grain Canopy Height			
				(cm)			
CDC Vantage	Jun 21	Jun 15	Jun 23	32.6	36.0 [a]	29.8 [a]	36.1 [a]
Brewer	**Jun 19** [a]	Jun 15	**Jun 21**	34.3	30.8	27.6	35.1 [a]
Crimson	Jun 22	Jun 15	Jun 23	31.0	25.8	23.7	29.0
Merrit	Jun 20	Jun 14	**Jun 21**	34.7	33.8 [a]	29.0 [a]	34.8 [a]
Pennell	Jun 20	**Jun 14** [ns]	Jun 22	36.2 [a]	33.5 [a]	28.2	34.0
Riveland	Jun 20	Jun 15	Jun 22	**39.5** [a]	**37.5** [a]	**31.8** [a]	**36.8** [a]
LC1602307E	Jun 22	Jun 15	Jun 23	37.9 [a]	33.5 [a]	28.8 [a]	36.6 [a]
LC01602062T	Jun 20	Jun 15	Jun 22	33.2	31.5	23.7	32.5
LC01602245P	Jun 20	Jun 15	**Jun 21**	33.0	27.3	22.2	28.7
LC01602300R	Jun 22	Jun 15	Jun 22	35.1 [a]	33.8 [a]	31.1 [a]	36.3 [a]
Site Means	Jun 21	Jun 15	Jun 22	34.7	32.3	27.6	34.0
$LSD_{0.05}$ (by t)	0.6	ns		4.6	5.1	3.5	2.8
CV% (s/means)	0.2	0.5		9.2	10.9	8.64	5.6
F-Value					4.24	7.62	

[a] - Denotes values equal to highest value (in **bold**) based on $LSD_{0.05}$

[ns] - Denotes no significant differences among varieties