PROJECT TITLE: Evaluation of fall seeded winter pea and lentil line performance.

EXPERIMENTS: 8207 & 8407

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OBJECTIVES: To evaluate winter hardiness of fall seeded winter dry pea and lentil lines.

METHODS:
Winter pea and winter lentil trials were seeded September 12, 2003 into chemical fallowed barley stubble. The trial area was rolled just after seeding to ensure seed coverage and maximize winter exposure. The winter pea trial consisted of eight winter pea lines from the USDA-ARS dry pea breeding program at Pullman, Washington and one Austrian winter pea (Granger; **Table 1**). The winter lentil trial consisted of eight winter lentil lines from the USDA-ARS program and one Montana State University winter lentil release (Toni; **Table 1**). Seedling counts were conducted in early spring (March 31 - April 1, 2004). Determination of winter survival was established by comparing the counts of both dead and frost damaged seedlings (fall emerged) with all green, growing seedlings (spring stand). Biomass samples were collected at the 2-3 podding nodes stage. Grain harvest was conducted during the last two weeks of July and the first week of August. **Table 2** provides additional agronomical information.

RESULTS:
Dry Pea Winter Survival: All winter pea lines exhibited good winter hardiness, with the trial having an average of 106% survivability (**Table 3**). No differences were observed among the winter pea lines. **Forage Biomass**: When cut at the 2-3 podding nodes growth stage, forage production averaged 3,829 pounds of dry matter per acre (**Table 3**). Granger Austrian winter pea produced the most dry matter (4,913 lbs acre^{-1}), but was not significantly different (based on $LSD_{0.05}$) from three other dry pea lines. **Grain Production**: The winter pea trial averaged 1,741 pounds of grain production per acre (**Table 3**). The yellow pea line PS9830S358 produced the most seed (2,366 lbs acre^{-1}), but was not significantly different than the yellow pea line PS9830F011. **Seed Weights**: The trial had an average test weight of 63.2 pounds per bushel (**Table 3**) with line PS9830S358 having the heaviest weight (65.1 lbs bu^{-1}), but was similar (based on $LSD_{0.05}$) to Line PS9830F011 and Granger. **Growth Stages**: The yellow pea line PS9830S431 was the earliest to reach flowering (June 12th; **Table 3**), but was not earlier than lines PS9830S358 and PS9830F011 (based on $LSD_{0.05}$).

Lentil Winter Survival: The winter lentil lines did no exhibit good winter survival as the trial averaged only 69.8% survival (**Table 4**). Line LC9978094 had the highest survival rating (88.5%), but was not significantly higher than lines LC9979120, WA8649041 and LC9978057. **Forage Biomass**: Despite having below optimal stands, the lentil trial produced an average of 3,523 pounds per acre, nearly as much dry matter production (at the early podding stage) as the dry peas (**Table 4**). The MSU release, Toni, and the line WA8649041 lentils produced the most forage production (4,129 and 3,398 lbs acre^{-1}, respectively). **Grain Production**: Although the lentils produced good forage on sub-par stands, they did not produce much grain, averaging only 835 pounds per acre (**Table 4**). Line LC9979120 had the highest grain yield (1,206 lbs acre^{-1}), but was not significantly greater than line LC9979065 or Morton (a new USDA-ARS winter lentil release). **Seed Weights**: The winter lentil's test weights averaged 64.5 pounds per bushel (**Table 4**), with Morton and line LC9979120 being the heaviest (each weighing 65.5 lbs bu^{-1}). **Growth Stages**: The small red, winter lentil line LC9978057 was the earliest line to reach flowering on June 10th (**Table 4**).

Future Plans: Evaluation of winter hardy lines of dry pea and lentils will continue at CARC, with the hope of releasing a line suitable for forage and seed production in Central Montana's environment.

Table 1. 2003 Winter Pea and Lentil Evaluation Trial - Dry pea and lentil characteristics.
-Exp. 82-840703. Central Agricultural Research Center, Moccasin, MT. **{File- 820703:Character}**

Peas	Type	Vine Length	Leaf-Type	Seed Size [1/]	Maturity
Granger	Austrian	Long	Afilia	115	Medium
PS9430706	Smooth Yellow	Long	Afilia	130	Late
PS9530726	Smooth Green	Semi-Dwarf	Afilia	135	Medium
PS9830S431	Smooth Yellow	Semi-Dwarf	Normal	110	Early
PS9830F009	Smooth Yellow	Long	Afilia	120	Late
PS9830F010	Smooth Yellow	Long	Afilia	120	Late
PS9830F011	Smooth Yellow	Semi-Dwarf	Afilia	120	Early
PS9630448	Smooth Yellow	Long	Afilia	120	Late
PS9830S358	Smooth Yellow	Semi-Dwarf	Afilia	120	Early
Lentils	Type	Cotyledon Col	Seed Color	Seed Size	Maturity
Toni	Small Red	Red	Brown	25	Very Late
LC9978094	Small Red	Red	Purple Mottled	30	Late
WA8649041	Small Red	Red	Brown	25	Very Late
LC9978057	Small Red	Red	Brown	30	Early
LC9979120	Small Red	Red	Brown	25	Medium
LC9979065	Small Red	Red	Green	30	Late
LC9979062	Small Red	Red	Green	30	Medium
LC9976079	Small Red	Red	Brown	30	Medium
Morton	Small Red	Red	Green	30	Medium

[1/] - Seed sizes were similar among culitvars, values are average seed size at planting.

Table 2. 2003 Winter Pea and Lentil Evaluation Trial - Site management summary.
- Exp. 82-840703. Central Agricultural Research Center, Moccasin, MT. **{File: 820703:Manage}**

Field Summary				
Environment:	Dryland			
Tillage History:	Conventional		Previous Crop:	Fallowed Barley (Chem)
Trial Management				
Seeding Date:	09/12		Plot Dimensions:	5-rows x 11" spacing x 40'
Fertilizer: (lbs/ac)	None			
Pesticides:(rates)	Assure II	(10oz/acre)	Hand Weeded: Prickly Lettuce; Wild Buckwheat	
Harvest Dates:				
Forage:	Peas:	6/25-7/2/2004	Hand harvested - 1.0 m x 5 rows	
	Lentils:	6/25-7/12/2004		
Grain Harvest:	Peas:	7/28-8/1/2004	Timing: At grain maturity	
	Lentils:	7/28-8/6/2004		
Precipitation:	12.43"	- Crop-year (9/12/2003 - 7/27/2004)		
	12.90"	- 95-year Average:(9/1 - 7/31)		
Elevation:	4300'			

Table 3. 2004 Western Regional Winter Dry Pea Trial - Dry-land winter dry pea agronomy results.
- Exp. 820704 Central Ag Research Center, Moccasin, MT **{File: 820704-Summary}**

		Stand (Spring)		-- Forage Production ----------		Grain Production ----------			
Selection	Flower	Density	Survive	Canopy Ht	Dry Matter	Canopy	Yield	Test Wt	Moisture
	(date)	(#/m^2)	(%)[1/]	(cm)	(lbs/acre)	(cm)	(lbs/acre)	(lbs/bu)	(%)
PS9830S358	6/13 [a]	64.9 [a]	111.6	44.8	3,164	51.8 [a]	**2,366** [a]	**64.13** [a]	12.6 [a]
PS9830F011	6/13 [a]	63.7 [a]	**124.1** [n]	48.3	3,659	**54.3** [a]	2,096 [a]	63.68 [a]	12.2 [a]
Granger AWP	6/15	**72.8** [a]	120.2	97.0 [a]	**4,913** [a]	49.3 [a]	1,886	63.75 [a]	13.0 [a]
PS7530726	6/16	56.1	122.9	46.8	4,263 [a]	42.5	1,802	62.55	12.3 [a]
Specter (ARS)	6/18	23.6	94.6	**97.3** [a]	3,981	52.3 [a]	1,650	62.93	13.1 [a]
PS9630448	6/19	23.6	91.5	96.3 [a]	4,156 [a]	46.3 [a]	1,533	62.60	11.8
PS9830S431	**6/12** [a]	28.6	94.4	71.3	2,313	42.0	1,482	63.38	13.2 [a]
PS9430706	6/19	42.5	93.7	86.8 [a]	4,790 [a]	50.8 [a]	1,450	63.15	**14.0** [a]
PS9830F010	6/20	23.9	103.3	86.8 [a]	3,224	50.5 [a]	1,405	62.33	13.5 [a]
Mean (n = 36)	6/16	44.4	106.2	75.0	3,829	48.8	1,741	63.16	12.9
LSD (t = 0.05)	2	16.1	35.3	11.3	840	8.2	383	0.69	1.9
CV % (s/mean)	0.66	20.87	19.2	10.28	15.04	11.53	15.06	0.7496	10.07
F-value	22.5	14.29	1.34 [n]	34.91	8.38	2.36	6.23	6.76	1.21 [n]

[1/] - Survival greater than 100% indicates seed germinated during winter or in early spring.

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

[n] - Denotes not statistically significant at 0.05 level.

Table 4. 2004 Western Regional Winter Lentil Trial - Dry-land winter lentil agronomy results.
- Exp: 840704. Central Ag. Research Center, Moccasin, MT **{File: 840704-Summary}**

		- Stand (Spring) -		-Forage Production -		---------- Grain Production ----------			
Selection	Flower	Density	Survival	Canopy	Dry Matter	Canopy	Yield	Test Wt	Moisture
	(date)	(#/m^2)	(%)[1/]	(cm)	(lbs/acre)	(cm)	(lbs/acre)	(lbs/bu)	(%)
LC9979120	6/16	**37.7** [a]	85.3 [a]	27.3	2,008	31.5	**1,206** [a]	**65.5** [a]	13.0
LC9979065	6/20	26.7 [a]	58.7	26.8	1,877	31.8	1,002 [a]	64.7	13.9 [a]
Morton (ARS)	6/15	22.2	61.8	28.3	2,421	31.5	953 [a]	**65.5** [a]	13.2
LC9979062	6/14	21.7	64.1	31.8 [a]	2,297	33.3 [a]	881	64.7	13.7 [a]
LC9976079	6/15	18.6	53.2	29.0	2,847	32.8 [a]	815	63.8	12.9
LC9978057	**6/10** [a]	33.7 [a]	71.2 [a]	25.9	1,264	29.0	815	64.8	13.9 [a]
LC9978094	6/24	37.5 [a]	**88.5** [a]	27.8	2,466	29.3	792	64.8	**14.6** [a]
Toni (MSU)	6/30	34.9 [a]	67.5	**34.5** [a]	**4,129** [a]	**35.8** [a]	545	63.8	14.2 [a]
WA8649041	6/29	33.4 [a]	78.2 [a]	33.3 [a]	3,398 [a]	33.5 [a]	504	64.3	12.8
Mean (n = 36)	6/19	29.6	69.8	29.7	3,523	32.0	835	64.6	13.56
LSD (0.05 by t)	1/1	15.3	18.7	3.0	965	3.3	254	0.5	1.099
CV% (s/mean)	0.7	29.9	15.5	7.0	26.1	7.0	20.8	0.5	5.5
F-Value (8,23 df)	120.7	2.08 [n]	3.73 [n]	8.95	6.65	3.60	6.25	12.92	2.94

[1/] - Survival greater than 100% indicates seed germinated during winter or in early spring.

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

[n] - Denotes not statistically significant at 0.05 level.