

PROJECT TITLE: Seeding configuration, species competition and nitrogen rate effects on dry field pea and hay-barley forage production.

EXPERIMENT NO: #83

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OBJECTIVES:

To evaluate the effects of seeding configuration, competition between barley and pea and nitrogen (N) fertilizer rate on hay-barley and dry pea forage yield potential under dryland conditions in Central Montana.

METHODS:

Austrian winter peas, from the world population, and Haybet hay-barley were seeded in four seeding configurations: 2-rows of pea and 2-rows of barley (2 pea x 2 barley), 4-rows of pea (pure pea), 4-rows of barley (pure barley), and 4-rows of pea mixed with barley in the same row (mixed) in late April, 2001 (**Table 30**). These configurations represent three row to row (pea-barley, pea-pea and barley-barley) and one within row (pea-barley mix) competition effects. Dry pea and barley seeding rates were based on current guidelines, with the mixed rate consisting of a dry pea to barley ratio of 2:1. Three N fertilizer rates (0 lbs, 60 lbs, and 120 lbs per acre) were broadcast over each seeding configuration in May, 2001. Harvest of dry matter forage production was conducted July 11, 2001. Single rows of dry pea and hay-barley were hand harvested from each plot (and processed separately). All forage samples were weighed wet in the field by use of a portable plot scale. A sub-sample from each row was taken, dried at 105°F for minimum of 48-hours to obtain moisture content and ground to evaluate forage quality. Additional trial production concerns are summarized in **Table 30**.

RESULTS: Dry matter forage production over the four seeding configurations averaged 2,376 pounds of dry matter production per acre (**Table 31**). The pure barley configuration under 120 pounds N per acre had the most dry matter forage production, with 3,437 pounds per acre (1.7 tons/acre), but was equal to (5% level) pea – barley mixed and pure barley plots, under 60 pounds of N per acre. The pure barley plot under 120 lbs N, also had the greatest protein yield (455 lbs) and canopy height (25"). When plots were compared to Pea-Barley mixed plots over all three N-fertilizer rates, the pure pea plots were the only treatment affect that was significantly different than the pea-barley mixed plot in forage production and protein content (**Table 32**). There appeared to be no significant differences when Nitrogen fertilizer rates were varied. A more thorough analysis will be written at a later date.

FUTURE PLANS:

In order to optimize dry pea and cereal forage production in dryland cropping systems, evaluations of effective seeding configurations, competition effects and nutrient requirements will continue at Moccasin.

Table 30. 2001 Pea-Barley Competition Study - Seed source and trial layout and management summary.
 -Exp. 830701. Central Agricultural Research Center, Moccasin, Montana. **{File- 830701:Design}**

Seed Source:			Seeding Rates			
Species	Variety, Source	Seed Size	Single Row		Mixed Row	
		(seeds/lb)	(sds/ft ²)	(lbs/acre)	(sds/ft ²)	(lbs/acre)
Hay-Barley	Haybet, Foundation	13,620	16	50	8	25
Austrian winter pea	Common, World Population	4,240	8	85	5	50

Trial Layout:		Rows Harvested		
Configuration	Competition	Total	Pea	Barley
2-Rows Pea x 2-Rows Barley	----- Pea Row to Barley Row	2	1	1
4-Rows Pea x 4-Rows Barley	----- Pea Row to Barley Row Pea Row to Pea Row Barley Row to Barley Row	4	1 1	1 1
4-Rows Pea/Barley Mixed	----- Pea to Barley Within Row	2	Peas and Barley Separated during harvest	

Trial Management:		
Seeding	4/27	6' single row plot drill
Forage Harvest	7/11	Single Rows (see above)
Tillage History	Conventionally Till	
Previous Crop	Spring Wheat	Fallow
Fertilizer (lbs/acre)	46-0-0 (Urea)	3 N-Rates: 0 lbs, 60 lbs, 120 lbs
Method ^{1/}	Po-E Broadcast	Broadcast with belly-grinder: 5/10
Pesticides (pt-oz/ac)	No - Herbicides applied	Hand Weeded
Elevation	4300'	
Precipitation ^{2/}	5.53"	92-year average: 7.47" (5/1-7/31)

^{1/} - Pr-P = Pre-Plant; Po-E = Post-Emergence

^{2/} - Precipitation from seeding to forage harvest

Table 31. 2001 Pea-Barley Competition/N-Fertilizer Study - Dry pea and hay barley forage yield summary.
 - Exp. 830701. Central Agricultural Research Center, Moccasin, Montana. {File: 830701-CompAll}

Competition Effect (Seeding Configuration)	N-Rate (lbs/a)	Stand (%) ^{1/}	Forage Yield (lbs/a)	Protein		Canopy Height (in)
				Content (%)	Yield (lbs/a)	
Pure Barley	120	106	3,437 ^a	13.3	455 ^a	25.0 ^a
Pea-Barley (mixed w/in rows)	60	91	2,890 ^a	13.4	380 ^a	22.8 ^a
Pure Barley	60	97	2,844 ^a	12.4	354 ^a	21.5
Pea-Barley (mixed w/in rows)	120	109	2,592	12.8	324 ^a	23.9 ^a
Pure Barley	0	103	2,583	10.1	264	22.0
Pea-Barley (2 rows x 2 rows)	120	103	2,450	14.3	372 ^a	21.7
Pea-Barley (2 rows x 2 rows)	0	120 ^{ns}	2,448	10.6	288	21.8
Pea-Barley (mixed w/in rows)	0	86	2,277	11.4	262	21.4
Pea-Barley (2 rows x 2 rows)	60	112	2,222	14.6	349 ^a	19.9
Pure Pea	120	108	1,827	21.4 ^a	391 ^a	25.0 ^a
Pure Pea	60	105	1,509	17.5 ^a	269	20.5
Pure Pea	0	106	1,430	17.5 ^a	246	18.5
Means (n = 24)		104	2,376	14.1	330	22.0
LSD (0.05 by t)		26	728	5.1	136	2.8
C.V. % (s / means)		11.21	13.93	16.37	18.80	5.86
F-Value (Entry; df = 11)		1.23 ^{ns}	6.13 ^{**}	4.02 ^{**}	2.19 [*]	4.56 ^{**}

^{ns} - Indicates no statistical significance at 0.10 level. * - Indicates statistical significance at 0.10 level.
^{**} - Indicates statistical significance at 0.05 level. ^{1/} - Stand as a percentage of the target seeding rate.
^a - Denotes values equal to highest values (in **bold**) based on LSD_(0.05).

Table 32. 2002 Pea-Barley Comp/N-Fert. Study - Competition and N-rate affects on total forage production.
 - Exp. 830701. Central Agricultural Research Center, Moccasin, Montana. {File: 830701-Comp}

Species Competition					N-Fertilizer Rates				
Competition (Configuration)	Forage Yield	Protein Cont.	Canopy Yield	Canopy Height	N Fertilizer Rate (lbs N/acre)	Forage Yield	Protein Cont.	Canopy Yield	Canopy Height
	----- (% of Pea-Barley Mixed) ^{1/} -----					----- (% of 60 lbs N) ^{1/} -----			
Pea-Barley (mixed)	100	100	100	100	60	100	100	100	100
Pure Barley	117	96	112	101	0	94	86	80	99
Pea-Barley (2 x 2)	95	105	109	94	120	111	107	121	113 ^b
Pure Pea	64 ^a	152 ^a	98	94					
Means (n = 24)	94	113	105	97	Means (n = 24)	102	98	101	104
LSD (0.05 by t)	18	24	28	9	LSD (0.05 by t)	17	16	30	8
C.V. % (s / means)	16	18	22	7	C.V. % (s / means)	16	15.2	28.6	7.4
F-Value (df = 3)	12.9 ^{**}	10.0 ^{**}	0.52 ^{ns}	1.9 ^{ns}	F-Value (Rate; df = 2)	2.1 ^{ns}	4.4 ^{**}	4.1 ^{**}	8.2 ^{**}

^{ns} - Indicates no statistical significance at 0.10 level. * - Indicates statistical significance at 0.10 level.
^{**} - Indicates statistical significance at 0.05 level.
^a - Denotes entries significantly different from Pea-Barley mixed competition effect based on LSD(0.05).
^b - Denotes entries significantly different from competition effects at 60lbs N based on LSD(0.05).
^{1/} - Reflects the affect of species competition and N-rate on forage attributes, expressed as the relationship (percentage) of attributes to pea-barley mixed and 60lbs N (in **bold**; left and right tables, respectively).