

**PROJECT TITLE:** Evaluation of dry field pea for forage production in Montana (Uniform Dry Pea Forage Trial).

**EXPERIMENT NO:** #87

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**OBJECTIVES:**

To evaluate Austrian winter pea variety forage production in pure stands and with a companion cereal forage (Haybet hay barley) under different cropping and environmental conditions in Montana.

**METHODS:**

The 2001 **Uniform Dry Pea Forage Trial (UPFT)** was established at two dryland sites (Moccasin and Bozeman) and two irrigated sites (Huntley and Corvallis) and included three Austrian winter pea varieties and Trapper small yellow pea, in pure stands and mixed with Haybet hay-barley (**Table 24**). Successful seeding of the trial occurred from the middle to end of April. Dry matter forage harvest was conducted at optimal forage production and quality during the first two weeks of July (**Table 25**).

**RESULTS:**

**Forage Yields:** Average dry matter forage production under dryland conditions was 3,320 pounds per acre (1.7 tons/acre) and under irrigation was 7,044 pounds per acre (3.5 tons/acre; **Table 26**). Haybet hay barley was the top dry forage producer at all sites (significant under irrigation), having an average dryland production of 4,389 lbs/acre (2.2 tons/acre) and an irrigated average production of 10,980 pounds per acre (5.5 tons/acre). Dry pea varieties mixed with barley had higher yields compared to pure stands (not significant at Bozeman). When all peas and pea/barley mixed plots were combined and compared with pure barley forage production, pure pea plots had significantly lower yields under both cropping conditions (**Table 27**). Under irrigation, the pea/barley mixed plots also had significantly lower forage yields than pure barley stands. These differences may be attributed to the disparity in total plot (pea + barley in mixed plots) stand densities between pure pea, pure barley and mixed plots under dryland (8, 12, and 12 plants/ft<sup>2</sup>, respectively) and irrigated conditions (10, 21 and 17 plants/ft<sup>2</sup>; see Table 24).

**Plant Canopy Heights:** Plant canopy heights varied from site to site and averaged 31.7 inches (**Table 26**). Except for at Moccasin, the pure dry pea stands appeared to have shorter canopy heights than their accompanying pea/barley mixed stands. When all pea varieties were combined, both the pea/barley mixed and pure barley stands had taller plant canopy heights than pure dry pea stands (not significant at Moccasin; **Table 27**).

**Forage Quality:** Under both dryland and irrigated conditions, Sioux Austrian winter pea had the highest protein content, averaging 19.5 and 20.7% protein for dryland and irrigated sites, respectively (**Table 28**). However, when evaluating each for total protein production (protein content x dry matter production), there was no statistically significant differences among the variety and treatment plots under dryland production. Melrose Austrian winter pea mixed with Haybet barley having the most production (596 lbs/acre). Under irrigation, Haybet hay barley had the greatest protein production, but was not significantly greater than the pea/barley mixed plots. Pure dry pea stands contain a higher protein content than dry pea mixed with barley (not significant for Bozeman and Huntley; **Table 29**). However, total protein production was not significantly different among treatments under dryland and not significantly different among pure barley and dry pea mixed with barley treatment.

**FUTURE PLANS:**

Plans include continued evaluation of pea/cereal forage mix seeding techniques on forage yield and seedling vigor.

Table 24. 2001 Uniform Dry Pea/Barley Forage Trial - Characteristics and seeding rate table.

-Exp. 8701. Central Agricultural Research Center, Moccasin, MT. **{File- 870001:Character}**

Species/Variety	Treatment	Seed Size (seeds/lb)	Target Seeding Rates					
			----- Dryland -----			----- Irrigation -----		
			(seeds/ft2)	(lbs/acre)	(bu/acre)	(seeds/ft2)	(lbs/acre)	(bu/acre)
Haybet	Pure Stand	13,620	14	48	1.0	21	70	1.5
Hay-barley	Mix w/ Pea		6	20	0.4	9	30	0.6
Melrose	Pure Stand	3,830	8	90	1.5	10	115	1.9
Austrian winter pea	Mix w/ barley		6	70	1.2	7.5	85	1.6
	Pea:Barley Ratio:		1:1	3.5:1	3:1	0.8:1	2.8:1	2.6:1
Granger	Pure Stand	4,440	8	80	1.3	10	100	1.7
Austrian winter pea	Mix w/ barley		6	60	1.0	7.5	75	1.3
	Pea:Barley Ratio:		1:1	3:1	2.4:1	0.8:1	2.5:1	2:1
Sioux	Pure Stand	4,440	8	80	1.1	10	100	1.3
Austrian winter pea	Mix w/ barley		6	60	0.85	7.5	75	1
	Pea:Barley Ratio:		1:1	3:1	2.4:1	0.8:1	2.5:1	2:1
Trapper	Pure Stand	3,895	8	120	2.0	10	150	2.5
Small yellow pea	Mix w/ barley		6	90	1.5	7.5	110	1.8
	Pea:Barley Ratio:		1:1	4.5:1	3.6:1	0.8:1	3.7:1	3:1

Table 22. 2001 Uniform Pea/Barley Forage Trial - Trial site agronomy information.

-Exp. 8701. Central Agricultural Research Center, Moccasin, Montana. **{File- 870001:SiteInfo}**

	Moccasin	Bozeman	Huntley	Corvallis
Seeding	4/24	4/30	4/18	4/24
Forage Harvest				
Peas	7/05-7/14	7/13	7/02-7/05	7/03 mixed plots
Growth Stage	2-podding node		3-4 podding nodes	7/10 pure pea plots
Barley (all plots)	7/18	7/13	7/02-7/05	7/03 barley plots
Growth Stage	Early milk		Anthesis	
Tillage History	No-Till/Dryland	No-Till/Dryland	Conventional/Irrigated	Conventional/Irrigated
Previous Crop	Spring Wheat	Barley	Sugar Beet	Pea (Green Manure)
Fertilizer (lbs/acre)				
Method1/	46-0-0 (90 lbs) Po-E Broadcast	46-00-00 (176) Banded 00-18-31-11 (100) W/ Seed	50-50-00 (100) Pr-P Incorp.	52 lbs P+60 lbs K Pre-P Incorp. 90 lbs N Po-E
Pesticides (pt-oz/ac)	Roundup (10oz) Pr-P Hand Weeded	Roundup (12oz) Pr-E Hand Weeded	None	None Hand Weeded
Elevation	4300'	4780'	2990'	3590'
Precipitation2/	6.66"	6.50"	6.14" + 3 profile floods (2"per)	2.36" + 5" of irrigation

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

2/ - Precipitation from seeding to forage harvest

Table 26. 2001 Uniform Pea/Barley Forage Trial - Dry matter forage yield and canopy height summary.

-Exp. 8701. Central Agricultural Research Center, Moccasin, Montana.

{File- 870001:Yield}

	----- Dry Matter Forage Production -----						----- Canopy Heights -----			
	----- Dryland -----			----- Irrigated -----			Mocc.	Huntley	Corv.	Ave.
	Mocc.	Boze.	Ave.	Huntley	Corvallis	Ave.				
	(lbs/acre)						(inches)			
Haybet Barley	<b>4,508</b> <sup>a</sup>	<b>4,150</b> <sup>a</sup>	<b>4,389</b> <sup>a</sup>	<b>12,089</b> <sup>a</sup>	<b>9,864</b> <sup>a</sup>	<b>10,980</b> <sup>a</sup>	30.5 <sup>a</sup>	28.1	42.8 <sup>a</sup>	33.8 <sup>a</sup>
Melrose AWP	2,906	2,295	2,702	3,650	4,652	4,151	27.3	23.3	28.5	26.3
Melrose/Haybet	4,169 <sup>ab</sup>	3,203 <sup>a</sup>	3,847 <sup>ab</sup>	10,312 <sup>b</sup>	8,727 <sup>ab</sup>	9,520	29.3 <sup>a</sup>	32.9 <sup>ab</sup>	42.8 <sup>ab</sup>	35.0 <sup>ab</sup>
Granger AWP	3,007	2,534	2,849	4,059	3,078	3,569	29.5 <sup>a</sup>	24.4	32.0	28.6
Granger/Haybet	4,106 <sup>ab</sup>	3,006	3,740 <sup>b</sup>	10,586 <sup>b</sup>	8,086 <sup>b</sup>	9,336	29.8 <sup>a</sup>	<b>38.7</b> <sup>ab</sup>	39.5 <sup>ab</sup>	36.0 <sup>ab</sup>
Sioux AWP	2,469	2,141	2,360	3,460	4,551	4,005	22.3	24.2	23.8	23.4
Sioux/Haybet	3,950 <sup>ab</sup>	3,053	3,651 <sup>b</sup>	9,559 <sup>b</sup>	8,143 <sup>b</sup>	8,851	<b>36.3</b> <sup>ab</sup>	34.5 <sup>ab</sup>	41.8 <sup>ab</sup>	<b>37.6</b> <sup>ab</sup>
Trapper Yellow	3,036	1,839	2,637	4,530	3,933	4,232	29.3 <sup>a</sup>	21.3	28.8	26.4
Trapper/Haybet	3,954 <sup>ab</sup>	3,201 <sup>ab</sup>	3,703 <sup>b</sup>	9,619 <sup>b</sup>	7,888 <sup>b</sup>	8,753	30.0 <sup>a</sup>	26.2	41.3 <sup>ab</sup>	32.6 <sup>b</sup>
<b>Means (n)</b>	<b>3,567</b> <sup>(36)</sup>	<b>2,825</b> <sup>(18)</sup>	<b>3,320</b> <sup>(54)</sup>	<b>7,540</b> <sup>(36)</sup>	<b>6,547</b> <sup>(36)</sup>	<b>7,044</b> <sup>(72)</sup>	<b>29.3</b> <sup>(36)</sup>	<b>28.2</b> <sup>(36)</sup>	<b>35.7</b> <sup>(36)</sup>	<b>31.1</b> <sup>(108)</sup>
LSD (0.05 by t)	908	950	632	1,076	1,188	998	8.6	6.7	5.7	4.4
C.V. % (s/means)	17.4	14.6	16.3	9.8	12.4	14	20.0	16.3	11.0	17.5
F-Value ( <sup>(n)</sup> / <sub>(n)</sub> df)	5.3 <sup>(8)</sup> <sub>(24)</sub>	5.8 <sup>(8)</sup> <sub>(8)</sub>	9.8 <sup>(8)</sup> <sub>(40)</sub>		36.9 <sup>(8)</sup> <sub>(24)</sub>	71 <sup>(8)</sup> <sub>(56)</sub>	1.5 <sup>ns</sup>		14.3	10.2 <sup>(8)</sup> <sub>(88)</sub>

<sup>ns</sup> - Indicates no statistical significance at 0.05 level.

<sup>a</sup> - Denotes values equal to highest value (in **bold**) based on LSD<sub>(0.05)</sub>.

<sup>u</sup> - Denotes values greater than pure pea counterpart based on LSD<sub>(0.05)</sub>.

Table 27. 2001 Uniform Pea/Barley Trial - Dry matter forage production and canopy height by treatment.

-Exp. 8701. Central Agricultural Research Center, Moccasin, Montana.

{File- 870001:Yield}

	----- Dry Matter Forage Production -----						----- Canopy Heights -----			
	----- Dryland -----			----- Irrigated -----			Mocc.	Huntley	Corv.	Ave.
	Mocc.	Boze.	Ave.	Huntley	Corvallis	Ave.				
	(lbs/acre)						(inches)			
Haybet Barley	<b>4,508</b> <sup>a</sup>	<b>4,150</b> <sup>ns</sup>	<b>4,389</b> <sup>a</sup>	<b>12,089</b> <sup>a</sup>	<b>9,864</b> <sup>a</sup>	<b>10,980</b> <sup>a</sup>	30.5	28.1 <sup>a</sup>	<b>42.8</b> <sup>a</sup>	33.8 <sup>a</sup>
Pea-Barley Mix	4,064 <sup>a</sup>	3,116	3,748 <sup>a</sup>	10,020	8,211	9,115	<b>31.0</b> <sup>ns</sup>	<b>33.1</b> <sup>a</sup>	41.3 <sup>a</sup>	<b>35.1</b> <sup>a</sup>
Pure Pea	2,854	2,202	2,637	3,925	4,054	3,989	27.1	23.3	28.5	26.2
<b>Means (n)</b>	3,809 <sup>(12)</sup>	3,156 <sup>(6)</sup>	3,591 <sup>(18)</sup>	8,678 <sup>(12)</sup>	7,376 <sup>(12)</sup>	8,027 <sup>(24)</sup>	29.5 <sup>(12)</sup>	28.1 <sup>(12)</sup>	37.5 <sup>(12)</sup>	31.7 <sup>(36)</sup>
LSD (0.05 by t)	1,015	NS	670	1,079	977	931	NS	5.8	3.0	3.2
C.V. % (s/means)	15.4	14.5	14.5	7.2	7.7	10.8	1.5	11.8	4.6	12.1
F-Value ( <sup>(n)</sup> / <sub>(n)</sub> df)	8.5 <sup>(2)</sup> <sub>(6)</sub>	9.1 <sup>(2)</sup> <sub>(2)</sub>	17.4 <sup>(2)</sup> <sub>(10)</sub>	185.4 <sup>(2)</sup> <sub>(6)</sub>	112.5 <sup>(2)</sup> <sub>(6)</sub>	139.0 <sup>(2)</sup> <sub>(14)</sub>	2.07 <sup>(2)</sup> <sub>(6)</sub>	8.6 <sup>(2)</sup> <sub>(6)</sub>	84.1 <sup>(2)</sup> <sub>(6)</sub>	18.7 <sup>(2)</sup> <sub>(22)</sub>

<sup>ns</sup> - Indicates no statistical significance at 0.05 level.

<sup>a</sup> - Denotes values equal to highest value (in **bold**) based on LSD<sub>(0.05)</sub>.

<sup>b</sup> - Denotes values greater than pure pea counterpart based on LSD<sub>(0.05)</sub>.

Table 28. 2001 Uniform Pea/Barley Forage Trial - Protein content and protein yield summary.  
 -Exp. 8701. Central Agricultural Research Center, Moccasin, Montana **{File- 870001:Quality}**

	Dryland Sites						Irrigated Sites					
	--Moccasin--		--Bozeman--		---Average---		---Huntley---		----Corvallis----		---Average---	
	Protein (%)	Yield (lbs/a)	Protein (%)	Yield (lbs/a)	Protein (%)	Yield (lbs/a)	Protein (%)	Yield (lbs/a)	Protein (%)	Yield (lbs/a)	Protein (%)	Yield (lbs/a)
Barley	12.4	563	10.4	425	11.7	517	10.6		11.6	<b>1,142</b> <sup>a</sup>	11.3	<b>1,188</b> <sup>a</sup>
Melrose	<b>19.0</b> <sup>ab</sup>	551	18.5 <sup>ab</sup>	425	18.8 <sup>ab</sup>	509	16.4 <sup>b</sup>	590	16.3 <sup>b</sup>	755	16.4 <sup>ab</sup>	700
W/Barley	15.5	<b>648</b>	15.3	<b>492</b>	15.5	<b>596</b>	11.2	<b>1064</b>	12.6	1,103 <sup>ab</sup>	12.2	1,090 <sup>ab</sup>
Granger	18.5 <sup>ab</sup>	559	18.3 <sup>b</sup>	464	18.4 <sup>ab</sup>	527	18.2 <sup>b</sup>	776	15.6 <sup>b</sup>	482	16.5 <sup>ab</sup>	580
W/Barley	14.8	619	15.0	452	14.9	563	12.4	1271	13.1	1,053 <sup>ab</sup>	12.8	1,126 <sup>ab</sup>
Sioux	18.7 <sup>ab</sup>	462	<b>21.2</b> <sup>ab</sup>	452	<b>19.5</b> <sup>ab</sup>	459	<b>24.1</b> <sup>ab</sup>	978	<b>19.0</b> <sup>ab</sup>	840	<b>20.7</b> <sup>ab</sup>	886
W/Barley	15.8	623	15.0	460	15.5	568	12.8	1225	12.9	1,042 <sup>ab</sup>	12.9	1,103 <sup>ab</sup>
Trapper	18.2 <sup>a</sup>	550	18.0 <sup>b</sup>	330	18.2 <sup>ab</sup>	477	19.2 <sup>b</sup>	834	18.9 <sup>ab</sup>	740	19.0 <sup>ab</sup>	771
W/Barley	16.3	644	13.3	432	15.3	574	12.3	1157	14.4	1,129 <sup>ab</sup>	13.7	1,139 <sup>ab</sup>
Means	16.6	580	16.1	437	16.4	532	15.2	1019	14.9	921	15.0	954
LSD	2.1	184	2.8	171	1.7	126	3.8	482	2.5	151	2.2	167
C.V.	8.8	21.7	7.4	16.9	9.0	20.3	10.7	20.5	11.5	11.3	12.6	15.0
F-Value	9.4	0.9 <sup>ns</sup>	14.7	0.8 <sup>ns</sup>	17.4	1.1 <sup>ns</sup>	15.5	2.7 <sup>ns</sup>	10.2	19.4	17.9	14.8

<sup>ns</sup> - Indicates no statistical significance at 0.05 level.

<sup>a</sup> - Denotes values equal to highest value (in **bold**) based on LSD<sub>(0.05)</sub>.

<sup>b</sup> - Denotes values greater than pure pea counterpart based on LSD<sub>(0.05)</sub>.

Table 29. 2001 Uniform Pea/Barley Forage Trial - Protein content and yield summarized by treatment.  
 -Exp. 8701. Central Agricultural Research Center, Moccasin, Montana. **{File- 870001:Quality}**

	Dryland Sites						Irrigated Sites					
	--Moccasin--		--Bozeman--		---Average---		---Huntley---		----Corvallis----		---Average---	
	Protein (%)	Yield (lbs/a)	Protein (%)	Yield (lbs/a)	Protein (%)	Yield (lbs/a)	Protein (%)	Yield (lbs/a)	Protein (%)	Yield (lbs/a)	Protein (%)	Yield (lbs/a)
Habarley	12.4	589	10.4	425	11.69	535	10.6	<b>1279</b>	11.6	<b>1142</b> <sup>a</sup>	11.3	<b>1188</b> <sup>a</sup>
Mixed	15.4	<b>658</b>	14.7 <sup>a</sup>	<b>459</b>	15.13	<b>591</b>	12.2 <sup>a</sup>	1179	13.2	1082 <sup>a</sup>	12.9	1114 <sup>a</sup>
Pure Pea	<b>18.6</b> <sup>a</sup>	517	<b>19.0</b> <sup>a</sup>	418	<b>18.73</b> <sup>a</sup>	484	<b>19.5</b> <sup>a</sup>	795	<b>17.5</b> <sup>a</sup>	704	<b>18.1</b> <sup>a</sup>	734
Means	15.4	588	14.7	434	15.19	536.6	14.1	1084	14.1	976	14.1	1012
LSD	2.0	239	6.0	210	1.6	144.4	8.1	1245	2.2	98	2.04	177
CV	7.3	23.5	9.5	11.2	8.1	20.9	13.4	27	9.1	5.8	11.3	13.6
F-Value	31.0	1.0 <sup>ns</sup>	19.1	0.4 <sup>ns</sup>	48.62	1.4 <sup>ns</sup>	12.7	1.6 <sup>ns</sup>	22.3	70.1	30.8	18.9

<sup>ns</sup> - Indicates no statistical significance at 0.05 level.

<sup>a</sup> - Denotes values equal to highest value (in **bold**) based on LSD<sub>(0.05)</sub>.

<sup>b</sup> - Denotes values greater than pure pea counterpart based on LSD<sub>(0.05)</sub>.