

Project Title: Phosphorous Fertilizer for Pea, Lentil, and Chickpea

Principle Investigators and Cooperators:

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Objectives:

- 1). Investigate fertilizer P response in pea, lentil, and chickpea in central and north central low P soils.
- 2). Investigate fertilizer P effects on spring type pea, lentil, and chickpea seedling vigor and seed quality.
- 3). Investigate Fertilizer P effects on winter type pea and lentil winter survival and seed and hay quality.

Materials and Methods:

In the spring of 2003, spring pea, lentil, and chickpea cultivars were planted at two locations at the Central Agricultural Research Center (CARC) near Moccasin and in a farmer's field near Cutbank, MT. Three varieties for each species were selected and direct-seeded (no-till) into spring wheat at four P fertilizer levels (0, 15, 30, and 45 lbs P₂O₅/acre). The phosphorus fertilizer source was triple super phosphate (0-45-0). At WTARC additional 30 lbs/acre KCl was applied. The fertilizers were applied with the seed at planting. The experiment had a randomized complete block design with four replications. Plots were planted with a no-till nursery planter at 12" row spaces. Plot size was 6ft x 25ft at WTARC and 5ft x 20ft at CARC. At WTARC, Spartan herbicide was applied preplant on the chickpea and pea area while Prowl herbicide was incorporated with a harrow on the lentil area. Grassy weeds in the plot area were treated with Poast. At CARC, preplanting Roundup was applied and Assure II was used to control grassy weeds. The experimental plots were harvested in July.

In the fall of 2003, three cultivars of winter pea and lentil were direct-seeded into winter cereal stubble at CARC. The fertilizer P levels and experimental design were the same as above. The plants had good emergence.

Project Results and Relevancy to Montana:

Due to the summer drought this year, like other spring crops, pea and lentil and chickpea yielded lower than normal years and fertilizer P effects on yield was minimal under such conditions. Further study is needed to test yield response to fertilizer P in central Montana in normal climatic conditions.

Accomplishments by Objective:

Objective 1: Results are shown in Table 1 and 2 for WTARC and CARC, respectively. A noticeable P response was noted in June, but drought conditions during July and August (no significant precipitation was measured) prevented the response from being measured. All seed yields were disappointing, average yields for chickpea, lentil and pea were 661, 770, and 1042 lbs/acre at WTARC and 449, 926, and 1427 lbs/acre at CARC. There were differences among the varieties, but the difference in yield was due to the different responses of varieties to drought conditions instead of fertilizer phosphorus (the interactions between variety and phosphorus were not significant).

Objective 2: No measurable difference in seedling vigor was found in the spring pea, chickpea, and lentil. Since there was no yield response to fertilizer P, seed quality was not measured.

Objective 3: Three varieties of winter pea and lentil have been planted at CARC in September of 2003. All varieties had very good emergence. Seedling winter survival will be evaluated in the spring of 2004. Yield and quality data will be reported in the winter of 2004.

Future Plan:

This project was originally planned to run for two years. Due to the severe summer drought, the seed yield of legumes in this study was much lower than previous studies. The terminal drought aborted flowers and adversely affected seed filling. This study will be repeated in 2004 to test the P response in normal year. The winter pea and lentil trials have been planted at Central Ag. Research Center. We expect to see P effects on seedling vigor and winter survival of winter pea and lentil seedlings, which could also contribute to seed yields. We acknowledge the funding support from Montana Fertilizer Advisory Committee.

Table 1. Effect of phosphorus fertilizer on Chickpea, Lentil, and Pea. Western Triangle Ag. Research Center, Conrad, MT. 2003

Chickpea		Lentil		Pea	
Treatment	Seed Yield	Treatment	Seed Yield	Treatment	Seed Yield
Variety (P rate)		Variety (P rate)		Variety (P rate)	
lbs P ₂ O ₅ /acre or lbs/acre					
Myles (0)	747	Brewer (0)	816	Delta (0)	1044
Myles (15)	747	Brewer (15)	711	Delta (15)	1111
Myles (30)	792	Brewer (30)	787	Delta (30)	1209
Myles (45)	683	Brewer (45)	732	Delta (45)	1137
Chico (0)	719	Richlea (0)	736	Majoret (0)	954
Chico (15)	679	Richlea (15)	796	Majoret (15)	1151
Chico (30)	775	Richlea (30)	728	Majoret (30)	1059
Chico (45)	675	Richlea (45)	781	Majoret (45)	1050
Yuma (0)	507	Vantage (0)	769	Mozart (0)	869
Yuma (15)	561	Vantage (15)	838	Mozart (15)	1051
Yuma (30)	514	Vantage (30)	747	Mozart (30)	936
Yuma (45)	536	Vantage (45)	804	Mozart (45)	969
Phosphorus Summary					
0	658	0	772	0	956
15	662	15	782	15	1091
30	693	30	754	30	1068
45	632	45	773	45	1051
P-value	0.4003	P-value	0.893	P-value	0.3857
LSD (0.05)	NS	LSD (0.05)	NS	LSD (0.05)	NS
Variety Summary					
Myles	742	Brewer	761	Integra	1126
Chico	712	Richlea	760	Majoret	1047
Yuma	530	Vantage	790	Mozart	967
P-value	0.0000	P-value	0.578	P-value	0.1002
LSD (0.05)	63	LSD (0.05)	NS	LSD (0.05)	NS
Statistical Summary					
Mean	661	Mean	770	Mean	1042
Interaction	NS	Interaction	NS	Interaction	NS
CV (%)	13.2	CV (%)	11.8	CV (%)	20.5

Table 2. Effect of phosphorus fertilizer on Chickpea, Lentil, and Pea. Central Ag. Research Center, Conrad, MT. 2003

Chickpea		Lentil		Pea	
Treatment	Seed Yield	Treatment	Seed Yield	Treatment	Seed Yield
Variety (P rate)		Variety (P rate)		Variety (P rate)	
lbs P ₂ O ₅ /acre or lbs/acre					
Myles (0)	696	Brewer (0)	952	Delta (0)	1552
Myles (15)	674	Brewer (15)	863	Delta (15)	1290
Myles (30)	699	Brewer (30)	886	Delta (30)	1572
Myles (45)	673	Brewer (45)	915	Delta (45)	1575
Chico (0)	563	Richlea (0)	899	Majoret (0)	1251
Chico (15)	567	Richlea (15)	893	Majoret (15)	1313
Chico (30)	605	Richlea (30)	937	Majoret (30)	1350
Chico (45)	620	Richlea (45)	912	Majoret (45)	1172
Yuma (0)	77	Vantage (0)	970	Mozart (0)	1453
Yuma (15)	63	Vantage (15)	952	Mozart (15)	1392
Yuma (30)	75	Vantage (30)	1007	Mozart (30)	1567
Yuma (45)	73	Vantage (45)	931	Mozart (45)	1632
Phosphorus Summary					
0	445	0	940	0	1419
15	435	15	902	15	1332
30	459	30	943	30	1496
45	455	45	919	45	1460
P-value	0.78	P-value	0.54	P-value	0.169
LSD (0.05)	NS	LSD (0.05)	NS	LSD (0.05)	NS
Variety Summary					
Myles	685	Brewer	904	Integra	1497
Chico	589	Richlea	910	Majoret	1272
Yuma	72	Vantage	965	Mozart	1511
P-value	0.0000	P-value	0.06	P-value	0.001
LSD (0.05)	46	LSD (0.05)	55	LSD (0.05)	134
Interaction Summary					
P-value	0.938	P-value	0.75	P-value	0.281
Interaction	NS	Interaction	NS	Interaction	NS
Overall mean	449	Overall mean	926	Overall mean	1427
C.V. (%)	62.2	C.V. (%)	8.6	C.V. (%)	15.3