

Field Pea and Lentil Relay Performance on Subsequent Wheat

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A two year study was established in the spring of 2012 to evaluate the influence of a legume cover crop following a legume cash crop on the subsequent crop. To begin with, field peas, barley, and lentils were planted in blocks as the main plot effect for the trial. In the fall of 2012, each crop was bulk harvested and a cover crop was seeded as a subplot effect. Field peas were planted on field pea ground, lentils planted on lentil ground and both field peas and lentil were planted on barley ground as cover crops. Within the respective field pea and lentil ground, four populations of the cover crop were established, ranging from 0 to 2x. For peas the 1x population was 300,000 plants/ac and the lentil was 520,000. On the barley ground, only the 1x population of both field pea and lentil was evaluated. In the spring 2013, spring wheat was planted to the entirety of the trial. Each of the 2012 cover crop plots was split in half and supplemental nitrogen was applied to one half (up to 150 lbs N) at planting and the remaining half of the plot was left nontreated to create two additional sub-subplots. Wheat yield and quality was measured. The size of the sub-subplot was 12 by 25 ft. The study was arranged in a split-split-plot RCBD with four replicates. The base nitrogen level for the trial was, on average, about 75 lb/ac.

The wheat in the study was harvested fairly wet this year. This was partially due to the very apparent differences that occurred based on previous crop. In each area that had barley prior to the wheat, the moisture was roughly 10 percent higher (Table 1). This is contrary to what would be expected. More typical was that when supplemental nitrogen or any cover crop was utilized it increased the moisture content in wheat.

Table 1. Performance of wheat based on fertility, past cover crop and previous crop as separate effects.

Treatment Structure	Moisture	Test Weight	Yield	Protein
	%	lb/bu	lb/a	%
Fertility				
Supplemental N				
yes	24.8	59.8	43.5	14.35
no	21.7	59.4	42.4	13.2
LSD (0.05)	1.3	NS	1	0.48
Cover Crop				
Relative Population				
1x	24.4	59.9	42.8	13.86
0.5x	23.5	59.5	42.6	13.87
2x	23.4	59.5	42.8	13.69
No CC	21.8	59.4	43.5	13.68
LSD (0.05)	1.8	NS	1.4	NS
Previous Crop				
Field Pea	21.2	59.8	44.1	13.77
Barley	30	58.8	41.3	13.67
Lentil	18.6	60	43.5	13.88
LSD (0.05)	1.6	0.6	1.2	NS

The previous crops of field peas and lentils increased the test weight of spring wheat (Table 1). No other factor affected the wheat test weight. Wheat yield was influenced by each factor alone except for

cover crop. Adding nitrogen increased yield, albeit very slightly, as well as planting either lentil or field pea prior to wheat. Meanwhile, protein was only influenced by fertility.

When evaluating only cover crop and previous crop, any treatment combination that contained barley as a previous crop performed toward the bottom in wheat yield (Table 2). The greatest numerical combination was field pea followed by (fb) no cover crop. The next best performers were lentils fb a 1x lentil cover crop and field peas fb a 2x field pea cover crop. In this study, a 1x field pea cover crop was not very effective, nor was planting no cover crop (with the exception of field pea fb no cover crop).

Table 2. Evaluation of the interaction between cover crop and previous crop on the performance of wheat.

Cover Crop Relative Population	Previous Crop	Moisture %	Test Weight lb/bu	Yield lb/a	Protein %
1x pea	Field Pea	21.2	60.1	41.4	14.01
1x pea	Barley	32.5	68.7	41.4	13.61
1x lentil	Barley	30.6	59	40.2	13.49
1x lentil	Lentil	19.4	61	45.6	13.95
0.5x pea	Field Pea	21	59.7	43.6	13.79
0.5x lentil	Lentil	19.3	60.2	44.1	13.98
2x pea	Field Pea	20.9	59.9	45	13.71
2x lentil	Lentil	18.7	59.7	43	13.87
No CC	Field Pea	21.7	59.7	46.5	13.56
No CC	Barley	26.7	59.3	42.4	14.01
No CC	Lentil	17	59.3	41.6	13.74
LSD		3.2	1.2	2.4	NS

In table 3, each component of the experiment is evaluated together, which resulted in an inflated LSD value for the data. Due to this only two true differences were discovered. Barley followed by (fb) lentils with no fertility added, and lentils fb no cover crop and no fertility were poorer than the best treatment combinations in the trial. Adding supplemental fertilizer did not influence yield outside the aforementioned variables, likely due to the fairly high base nitrogen level and continued degradation of nodules in plots with a legume history.

Table 3. Comparison of the interaction between fertility, previous crop, and previous fall cover crop on the performance of wheat.

Previous Crop	Moisture		Yield	
	Supplemental N		Supplemental N	
	Yes	No	Yes	No
Field Pea				
1x pea	23.8	18.6	41.1	41.7
0.5x pea	24.7	17.3	43.9	43.3
2x pea	22.1	19.7	45.5	44.5
No CC	22.3	21	46.6	46.4
Barley				
1x pea	32.8	32.3	42	41.7
1x lentil	31.6	29.6	41.3	39.2
No CC	27.8	25.6	43.3	41.4
Lentil				
1x lentil	20.6	18.3	46.7	44.5
0.5x lentil	21.6	17	44.8	43.5
2x lentil	20	17.3	42.2	43.8
No CC	18.1	15.7	43.3	39.9
LSD (0.05)	6.2		5.8	