

GOVERNMENT

OPTIMIZING INTERCROPS FOR THE PEACE REGION

Many studies show the advantages of intercropping or polyculture in agriculture but few have studied intercropping with cash crops such as field pea and either wheat or canola subjected to different rates of N fertilizer. This study aims to report significant findings in pea, wheat and canola yield, test weight, protein content in wheat as well as oil content in canola seed obtained from intercrop systems fed under various percentages of N fertilizer rates in comparison to monocrop yields of these cash crops fed at 100% of N fertilizer rate. Moreover, weed control is also evaluated under these intercrop systems. Moreover, weed cover is also evaluated in order to observe if more weeds are found under intercrop compared to monocrop systems and how this can be affected under different N fertilizer rates.

Yield in peas was the same across treatments compared to control (P=0.3632). In contrast, yield in wheat (P=0.0219) and canola (P=0.0003) taken from intercropped plots were less than that obtained in monocrop plots. According to LER (Land equivalent ratio) one could determine how much area is required to produce as many units of yield in a monocrop as those that were obtained in an intercrop. Our results show no difference among intercrop treatments in LER for pea, wheat or canola, but values are particularly high. Pea LER ranges between approximately 0.7 to 1.6, wheat LER varies between 0.6 to 0.7 and canola LER is plus or minus 0.7 in all treatments. Protein content in wheat (P=0.1544) and oil content in canola (P=0.0742) was the same across all treatments. Thus, there was no effect from legume intercrop addition or fertilizer application.

Yield of pea, canola, and wheat in monocrops and as part of an intercrop system

Crop	Seeding rate	Intercrop	Seeding rate	N fertilizer rate	bushels acre-1 (standard error)			Land equivalent ratio (standard error)		
	%		%	%	Pea	Wheat	Canola	Pea	Canola	Total
Pea					4.36 (0.6)					
Canola	100	.	.	100			20.37 (2.5) A			
Wheat		.				19.95 (1.7) A				
				75	5.62 (0.8)		12.58 (2.5) B	1.34 (0.6)	0.68 (0.1)	1.75 (0.1)
				50	5.83 (0.8)		14.05 (2.5) B	1.33 (0.6)	0.68 (0.1)	1.73 (0.1)
Canola			75	25	5.99 (0.8)		14.74 (2.5) B	1.41 (0.6)	0.71 (0.1)	1.87 (0.1)
				0	6.32 (0.8)		14.35 (2.5) B	0.72 (0.5)	0.72 (0.1)	1.78 (0.1)
	75	Pea		75	5.34 (0.8)	14.66 (2.0) B		1.63 (0.5)	0.66 (1.2)	2.15 (0.9)
				50	4.96 (0.6)	14.60 (1.7) B		0.68 (0.5)	0.66 (1.2)	2.28 (0.9)
Wheat			100	25	4.36 (0.6)	14.73 (1.7) B		1.30 (0.5)	0.68 (1.2)	1.89 (0.9)
				0	5.24 (0.6)	15.25 (1.7) B		1.61 (0.5)	0.71 (1.2)	2.28 (0.9)

GOVERNMENT

OPTIMIZING INTERCROPS FOR THE PEACE REGION

Percentage of weed cover found at each intercrop system composed of pea with either wheat or canola at various seeding rates

Intercrop	Seeding rate %	crop	Seeding rate	N fertilizer rate %	Weed cover (Standard error)	
Pea	100	Pea	100	100	23.06 (7.2) A	
		Wheat			18.16 (7.2) AB	
		Canola			17.09 (7.2) BC	
	75	100	Wheat	75	19.38 (7.4) AB	
					50	17.75 (7.2) B
					25	17.23 (7.2) B
		75	Canola	75	0	14.26 (7.2) BCD
					50	12.09 (7.2) CDE
					75	9.63 (7.4) DE
0	75	Canola	25	10.61 (7.2) DE		
				0	8.85 (7.2) E	

There was less weed cover in intercrop systems of canola and pea than in intercrop systems composed of wheat and peas ($P < 0.0001$). Interestingly, among the wheat-pea intercrop plots, those plots with less weeds were those with no nitrogen fertilizer added. On monocrop plots, canola has less weed cover than either wheat or pea monocrops.

Moreover, plots where fertilizer rates were adjusted to 25% of the recommended rate had more weed cover than plots where no fertilizer was added or where fertilizer was added to 75% of the recommended rate. Prominent weed cover at 25% of the recommended fertilizer rate may have occurred because a) crops did not have enough nitrogen available for uptake which was instead used by the weeds b) research has shown that adding fertilizer to intercrops with legumes may hinder legume ability to fix nitrogen from biological fixation. In turn, crops and legumes are at a loss to nutrient competition. This also means that biological fixation may be hindered even more if fertilizer rates increase. Thus, at 75% it is possible crops like canola and wheat to some extent may benefit from nutrient accessibility from fertilizer applications but not from legume planting. These crops then are able to proliferate in such a way they can compete against weeds within the same plot.

KEY POINTS:

- Despite the fact that a rate of 75% of recommended fertilizer rate may hinder some weed cover by stimulating crop growth, no rate of fertilizer is best to mitigate presence of weeds
- Ultimately, fertilizer rates in intercrop systems do not contribute to yield in much more than systems with no N fertilization added at all
 - Successful intercrop systems can be achieved with no additional N fertilizer rates, especially in the North Peace region where dry conditions are expected