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DIGGING INTO RESEARCH

Reduce nitrogen fertilizer by 25% with pulses in rotation

CATEGORY **soils and fertility** | ***September 13, 2018***

Maintain canola and malt barley yield and quality with 25% less nitrogen (N) fertilizer with pulses in rotation.

A three year study at seven locations in western Canada looked at the impact of crop rotation and nitrogen rate on canola and malt barley yield and quality one and two years after a pulse crop compared to wheat. The research took place at Beaverlodge, Lacombe, and Lethbridge, AB; Indian Head, Scott, and Swift Current, SK; and Brandon, MB.

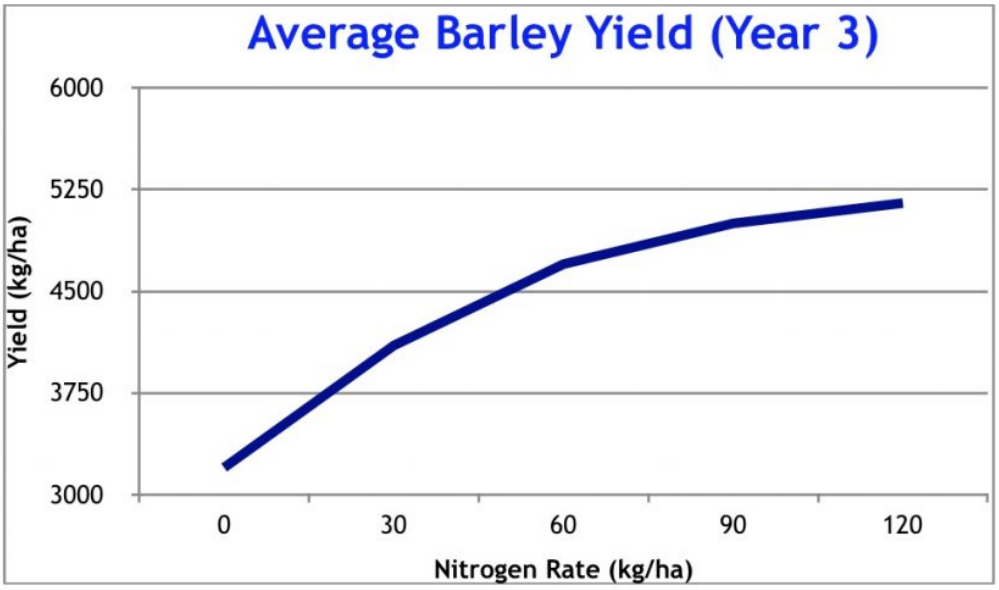
In Year 1, field pea, lentil, faba bean green manure, faba bean for seed, canola, and wheat were grown under no-till on cereal crop stubble. In Year 2, canola was grown on all plots with N fertilizer rates of 0, 30, 60, 90 and 120 kg/ha (multiply by

0.89 for lbs./ac). In Year 3, malt barley was grown with the same N fertilizer rates. Yield and quality parameters were measured to determine the impact of a pulse crop in rotation, and whether malt barley kernel plumpness and protein content were impacted.

Canola yield benefits

For canola yield in Year 2, higher yields were obtained when field pea, lentil or faba bean for green manure were the preceding crops compared to wheat. Regardless of N fertilizer rate, canola yielded higher after these pulse crops compared to wheat.

For example, averaged across all locations canola grown on pea or lentil stubble at the 90 kg N/ha rate yielded the same as canola grown on wheat stubble but at the 120 kg N/ha rate – indicating a 25% reduction in N fertilizer on pulse stubble.



Averaged over preceding crops and locations.
Source: O'Donovan et al. 2014

The research also found that at any given fertilizer N rate, canola yield on field pea was approximately four bushels per acre (228 kg/ha) higher than on wheat stubble, and four bushels per acre (232 kg/ha) higher on lentil stubble.

The results indicate that two N fertilizer strategies could be employed for canola following pea or lentil. The first strategy would be to apply less fertilizer N while still hitting the same target yield. Alternatively, a grower could maintain the N application rate normally used after a wheat crop and target a higher yield.

Barley yield benefits two years after legumes

Two years into the pulse-canola-barley rotation, the yield benefit following a pulse crop in Year 1 were still evident but at lower levels. Malt barley yield in the pulse rotation, averaged across all locations, produced six per cent higher yield after field pea and seven per cent after lentil.

Similar to canola, N benefits from pea and lentil carried over to malt barley yield. At 90 kg N/ha, barley yielded 94 bushels per acre (5060 kg/ha) after Year 1 field pea and 93 bushels per acre (5020 kg/ha) after Year 1 lentil. These barley yields were similar to when wheat was the Year 1 crop (93 bu./ac; 5010 kg/ha) but at the 120 kg N/ha rate. This is the same 25% reduction in N fertilizer observed in the Year Two canola crop.

Barley quality two years after legumes

Malt barley quality parameters were also measured in Year 3. This included plumpness, kernel protein content, and malt quality analysis including germination index, fine grind malt extract Kolbach index, wort beta-glucan, diastatic power and alpha-amylase, and friability modification.

Few if any negative effects on barley grain or malting quality were found to be associated with growing pulse crops two years prior to malting barley. The greater risk was applying high fertilizer N rates, which resulted in higher protein content in malt barley kernels and negatively affected many malt parameters, including a reduction in fine extract levels.

The results of the study suggest that canola and malt barley growers in western Canada can grow pulse crops in rotation without compromising grain or malting quality. Significantly, pulse crops preceding canola and barley may allow for a reduction in fertilizer N, which can improve economic returns.

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