Research Projects Sponsored in part by PPI/PPIC/FAR in Manitoba

The Effect of Tillage System and Preceding Crop on Phosphorus Response of Flax

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Flax is a major oilseed crop grown on the western Canadian prairies, with the majority of the production exported into the industrial oil market. Phosphorus (P) fertilization of flax is a challenge as the crop is very sensitive to seed-placed starter P. Banding fertilizer P either below, or below and to the side of the seed row, are the preferred methods of application with flax. In the absence of specialized seeding equipment, some farmers have resorted to increasing the P application in preceding crops, an attempt to supply residual P to the subsequent flax crop in rotation. Flax has been shown to have good association with vesicular arbuscular mycorrhizae (VAM) fungi, allowing it to expand its root absorptive surface area and potential P uptake. Growing flax after a mycorrhizal crop, and using no-till seeding systems, may help the flax rapidly establish an association with VAM and improve its ability to access soil residual P. This newly initiated research project will evaluate the role of preceding crop, tillage system, and P fertilization of the preceding crop in optimizing flax yield and quality.

In 1999, wheat and canola crops were grown at two test locations using various rates of fertilizer P, under both conventional and no-till seeding. Responses to fertilizer P additions were recorded on canola at both locations and wheat at one location. In 2000, tillage treatments will be carried out and flax will be seeded into the canola and wheat stubble blocks. Flax will be evaluated for its response to residual fertilizer applications and preceding crop through an assessment of early season P accumulation, VAM infection, and crop yield and quality.

The Influence of Fertilizer Placement on Crop and Weed Ecology in Direct-Seeding Systems

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The rapid expansion of no-till seeding in western Canada has increased demand for information on how time of fertilizer application and placement methods influence the yield response of both wheat and canola. In addition, the amount of soil disturbance associated with fertilizer application and seeding can have a profound effect on the stimulation of weed growth and resulting crop competition. Results from the project indicate that little difference in final grain yield was observed whether fertilizer N was fall or spring band applied. However, sideband application of N at wide (12") row spacing was found to have a detrimental effect on the establishment of both wheat and canola, and the yield of wheat, at two of the 3 trial locations. This research will be concluded in 2000.

An associated project with this study evaluated the impact of phosphorus (P) and potassium (K) placement on wheat and flax yield response, and competitive ability with weeds. Side band application of P and K fertilizer resulted in higher wheat and flax yields, and lower wild oat growth and dockage, when compared with seed row application. This advantage of side band application indicates that crop response to P and K fertilizer placed in a narrow band with the seed can limit its competitive ability with weeds early in the growing season. Both field and greenhouse studies revealed that wild oat had a much greater ability to take up both P and K than did wheat or flax. This weed response to fertilizer has resulted in additional research, which will evaluate how various weed species respond to both specific nutrients and how these nutrients are applied.

Wheat Cultivar Response to Chloride Fertilizer (Multi-Regional Project)

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Understanding the genetic variability in spring wheat cultivar response to chloride (Cl) fertilization is going to be of great importance to farmers attempting to optimize crop yield response to fertilizer additions. As part of a Great Plains project evaluating winter and spring wheat variety responses to Cl, spring wheat cultivars common to western Canada were evaluated on two soil types over four years near Brandon, Manitoba.

Averaged across the 15 spring wheat varieties the Cl fertilization provided a 2 bu/A yield response. The variability in the data was recorded across both the sandy loam and clay loam soil types, between years and between cultivars. While soil Cl levels were determined as low to moderate, the sandy loam soils provided a more consistent response to pre-plant band applications of Cl fertilizer (3.3 bu/A vs 1.3 bu/A for clay loam). The high yielding Canada Prairie Spring white wheat cultivar Karma provided the best yield response, averaging 7 bu/A over the study. The hard red wheat cultivar AC Barrie, currently grown on 70% of all wheat acres in western Canada, showed a 7 bu/A yield response on the sandy loam soil, however, a minor (1.3 bu/A) yield reduction on the Clay Loam soil. It would appear that those cultivars with the highest yield expression were most likely to respond to Cl, and that the Sandy Loam soil was more likely to be the responsive sites. The influence of Cl application on plant disease rating was minimal at most of the trial sites and years. While disease suppression with Cl was noted in certain trials and cultivars, it did not correlate well with grain yield increases. While the lack of consistency in the results makes crop responses hard to predict, there were some trends in the data collected in both Canada and the US Great Plains. Soil Cl levels below 30 lb/A are a good indication of a need for added Cl, and plant tissue Cl% that was 0.10-0.12% at the late-boot to heading phase indicates a crop responsive situation. Chloride is an essential nutrient for crop growth, development and yield formation. This research has provided the basis to assist farmers in identifying those situations where the addition of Cl will optimize wheat grain yield.

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