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Maximizing Canola Yield with Balanced Nutrition in the Saskatchewan Parkland.

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There is growing concern amongst farmers and agronomists that canola yields in the Saskatchewan Parkland may be restricted by boron (B) supply to the crop during the growing season. Issues of concern include the lack of mobility of B in the crop, its requirements during crop flowering, and its relationship to sulfur (S) additions. Canola is a key crop to farmers across western Canada and the goal of optimizing yield has seen fertilizer nitrogen (N) and S rates increase steadily over recent years. Field trails to evaluate the impact of B fertilizer additions were established on sites where soil and plant sampling indicated low B levels the previous year. A variety of N, S and B treatments were applied at each of the two trial sites, with B applied prior to seeding, at seeding and as a foliar spray.

As found in the two previous years of this project, canola responses were positive to N and S fertilizer addition at the 1999 study locations. While not significant, there were a few instances at the sandy soil trial location where the addition of B fertilizer would have provided an economic return to the farmer. However, B fertilizer additions provided no consistent yield response that would support recommendations. As a result, the researchers recommend that farmers considering the use of B either apply test strips across fields, or leave check strips when applying the fertilizer to make their own assessment of crop response. Landscape variability, and year-to-year differences in environmental conditions require that we continue to monitor the effect of B fertilizer additions on canola yield and quality. In addition, soil and plant analysis methods need to be evaluated to determine if they are accurately estimating B levels in western Canada, and that these levels confirm the presence or absence of a B deficiency.

Effect of Potassium Chloride on Physiological Leaf Spot, Grain Yield, and Quality of Winter Wheat in Saskatchewan

Project Leader: Dr. Brian Flower, Crop Development Centre, 51 Campus Drive, University of Saskatchewan, Saskatoon, SK S7N 5A8 (306-966-4944)

Winter wheat production in western Canada is dependent on the crop being seeded into standing stubble and trapping an insulating layer of snow to prevent winter injury of the crop. The acreage of winter wheat is increasing steadily, and new semi-dwarf cultivars have been developed with high yield potential. Some of these new cultivars have been found to show strong physiological leaf spot symptoms when grown under favorable environmental conditions. Research in other areas of the Northern Great Plains has found that additions of potassium chloride (KCl) can help to suppress physiological leaf spot symptoms and improve grain yield response.

In this final year of the project, a combined analysis of the four years of data found that additions of KCl suppressed the leaf spot damage in all trials where symptoms were recorded. While the average grain yield response to KCl additions in this study was only three percent, sites which also had a higher incidence of root rot showed grain yield increases of up to 13%. In addition, KCl applications were found to improve both kernel weight and grain protein yield, important quality characteristics for marketing of the crop. It is important to note that in this study there was no interaction between KCl and cultivars, indicating that where responses to KCl were recorded they were found on all cultivars, regardless of their susceptibility to physiological leaf spot. Recommendations that farmers apply KCl to suppress leaf spotting and increase grain yield have been included in the *Winter Wheat Production Manual* produced for winter wheat growers on the Northern Great Plains. Those interested in the winter wheat production manual can check it out at www.usask.ca/agriculture/plantsci/winter_wheat.

Management for Maximum Economic Yield of Open Pollinated and Hybrid Canola

Project Leader: Mr. Stewart Brandt, Agriculture and Agri-Food Canada, Box 10, Scott, SK S0K 4A0 (306-247-

2011).

Hybrid varieties of canola are new to farmers in western Canada, and there is a lack of understanding as to the level of management and inputs required to optimize production relative to established open pollinated varieties. Inputs that are seen as critical to optimizing yield include seeding rate (crop establishment), fertility level (N,P,K and S) and fungicide use for control of white mold (sclerotinia spp.). Research is currently being carried out at three locations in Saskatchewan to evaluate the response of new, hybrid and open pollinated canola cultivars to varying these three inputs on crop yield, quality and disease response.

In this initiation year each of the project sites experienced above normal precipitation and below normal air temperatures, leading to excellent growing conditions for canola. Canola grain yields showed a positive response to increasing fertilizer rates, with the hybrid cultivar having a minor yield advantage to the open pollinated cultivar. The heavier crop canopy with increasing fertilizer application on the hybrid canola resulted in a higher incidence of white mold at one of the test locations. In general, where white mold infection was low there was no response to the application of a fungicide. However, at one location maximizing grain yield response to increasing fertilizer application rates was achieved only with the use of a fungicide. Similarly, increasing seeding rate above the currently recommended level also improved the canola crop response to a higher fertilizer application rate. Continuation of this project will assist in developing recommendations for the management of high yielding canola, in particular those management inputs that are critical to improving crop response with increased fertilizer rates.

Field Crop Response to Potassium on Soils with High Extractable Potassium and Varying Soil Supply Rates of Potassium

Project Leader: Mr. Ken Greer, Western Ag Innovations, 208-111 Research Drive, Saskatoon, SK S7N 3R2 (306-978-1777)

Crop responses to potassium (K) on many western Canadian soils, even when testing high in K, has many people questioning the soil testing procedures used and/or the method by which K varies within fields. Using the Plant Root Simulator (PRS) probe, a ion exchange membrane system for measuring soil nutrient supplying rate, a project was initiated in the semi-arid region of Saskatchewan to evaluate crop responses to fertilizer K on soils which are regarded as non-responsive using traditional K extraction methods.

Using PRS probes the K supply rate of three fields were determined using grid sampling. Maps generated from this grid-sampling pattern indicate large areas of the field that were both deficient and adequate in K supply. These fields were planted to spring wheat, canola and flax in 1999 with 90 foot wide strips of 0, 19 and 37 lb K2O/A applied at seeding. Unfortunately, hail damage resulted in loss of the canola and wheat field tests. However, preliminary results from the flax field indicate a positive (+50%) grain yield response to added K relative to the check in certain landscape positions, while no response was observed in others. Further evaluation of the data will require an overlay of topographic information from the field so that specific landscape elements can be identified for their responsiveness to K fertilizer additions.

Use of Potassium Chloride to Counteract the Negative Effects of Side-Banded Urea on Plant Establishment

Project Leader: Dr. Guy Lafond, Agriculture and Agri-Food Canada, Indian Head Experimental Farm, Box 760, Indian Head, SK S0G 2K0 (306-695-5220)

The application of potassium chloride (KCl) fertilizer in bands with urea has been suggested as an effective means of reducing urea toxicity from the accumulation of both ammonia and nitrite in the soil. Accumulations of free ammonia in the soil can be very toxic to the roots of newly developing seedlings. Creating an acidic (low pH) environment in the vicinity of a urea band will temporarily reduce the process of urea hydrolysis, allowing seedling germination in the absence of free ammonia. With the rapid expansion of no-till seeding systems in western Canada, many farmers are now applying all of their urea fertilizer in a side band close to the seedrow at seeding. There are several reports from research trials that even when side-banded away from the seed, stand reductions occur with the application of high rates of urea. This new two-year project was established to evaluate the impact of urea side-banded with KCl on the establishment of spring wheat and flax seedlings in no-till production systems.

Results from the first year of this study show that increasing side-banded urea N rates resulted in a significant reduction in flax establishment, while the impact on wheat was minor. Increasing the urea band separation from 1" side x 1.5" below to 1" side x 3" below reduced the negative effects on the flax. While the addition of KCl to the urea bands did not reduce the negative effect on flax or wheat seedling establishment, it did improve flax grain yield by 19% at a sandy loam trial location. A review of soil samples from the location revealed that while K levels were high, Cl levels were well below the sufficiency range. A second year of data collection is planned for 2000.

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