NEWS & VIEWS

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Dr. Adrian Johnston, Western Canada Director

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Western Canada Research Report

READING THE NEWSPAPER these days would lead one to believe that plant nutrients have become a major environmental challenge. However, on closer examination of the scientific literature it is obvious that it is the proper management of nutrients that has allowed us to support the six billion people living on this planet. In fact, people are living longer in those parts of the world where crop yields and quality are being supported by locally developed nutrient management plans. Yes, there are site-specific problems associated with nutrient management, and they are being addressed by farmers, regulators and industry. However, let us not forget the efficiency and environmental stewardship being practiced by the vast majority of those making their livelihood from farming the land.

The summaries contained in this document represent a sampling of the excellence in research and development being conducted with fertilizer nutrients in western Canada. All of the projects focus on how to improve the returns captured by farmers in their use of fertilizer nutrients. If you have further questions after reviewing the summaries please feel free to contact either Adrian Johnston or the participating research scientist. Researchers interested in support for phosphorus (P) and/or potassium (K) management research are encouraged to submit proposals to the Saskatoon address below.

While fertilizers make up just one component of a sustainable production system, we must continue to ensure their efficient use in securing quality food supplies and viable farming enterprises.

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Alberta

Landscape Management of Agronomic Processes for Site-Specific Farming

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Precision management of agricultural land has the potential to improve crop production and environmental protection by harmonizing inputs with crop requirements at the sub-field level. Fertilizer use efficiency across a field can be quite variable. The objective of this project is to measure and model landscape dynamics for a hummocky topography in the Black Soil Zone of east central Alberta. Soil moisture and temperature dynamics were measured using automated sensors and data loggers. Soil nutrients, crop growth, and crop nutrient uptake dynamics were monitored at three landscape positions (shoulder, back slope, and foot slope positions).

This was the fifth year at this field site. Climatic conditions were slightly below normal with 9 in. of growing season precipitation, but much better than most of the province which suffered through a drought. However, when combined with low snow precipitation during the winter, moisture conditions had a significant impact on crop growth and nutrient uptake. Throughout the growing season, the highest yielding areas of the field were the lower slope positions, while the lower yields were in the upper slope positions. Nutrient analysis of the barley crop biomass indicated that by anthesis, 80-95 percent of the total nitrogen (N) at harvest was in the above-ground biomass. This compared to 50-70 percent for P, 90-100 percent for K, and 80-90 percent for sulfur (S). In addition, by anthesis the crop on the moisture limited upper slope positions had absorbed and translocated enough nutrients to satisfy the lower yield potential, while the lower slope positions were still absorbing and/or translocating nutrients well past this

stage. At harvest, the yield pattern remained the same, with highest yield and nutrient content of grain and straw in the lower slope positions. Ultimately, crop growth, soil nutrient dynamics, and crop uptake of nutrients vary with the differences in the moisture and temperature regimes among the landscape positions. The results of this study will be used to help make fertilizer recommendations based on production potential and nutrient supply of variable landscapes. *AB-19*

Development of Agronomic Practices for Chickpea Production in Alberta

Project Leader: Dr. Ross McKenzie, Alberta Agriculture, Food and Rural Development, Agriculture Centre, Bag Service 3014, Lethbridge, AB T1J 4C7, telephone: 403-381-5842, e-mail: ross.mckenzie@agric.gov.ab.ca.

Chickpea production is new to the western Canadian prairies and has been expanding consistently in the past few years. The objective of this study is to evaluate two types of chickpeas under varying management treatments in order to develop agronomic production practices for southern Alberta. Experiments evaluated chickpea response to variety, inoculant, N, P, sulfate-sulfur (SO_4^{2-}-S), seeding date, and seeding rate.

Severe drought conditions existed again in 2001 and, as a result, reduced most of the opportunity to observe response to input management in this study. It was very evident that chickpeas are a drought tolerant crop, and this year's data show that the Desi type may be more drought tolerant than the Kabuli type at all of the four test locations. There was no significant yield or bushel weight response to applied P at any of the research sites. Soil P levels were medium to high at all sites, and together with very dry conditions, there was a reduced chance of a P response. This project will continue for another year to gather more data on the nutrient requirements of chickpeas. *AB-20F*

Phosphorus and Compost on Potatoes

Project Leader: Dr. Colin McKenzie, Alberta Agriculture Food and Rural Development, Crop Diversification Centre South, Brooks, AB T1R 1E6, telephone: 403-362-1347, e-mail: mckenzic@agric.gov.ab.ca.

The potato industry in southern Alberta has expanded from about 22,000 acres in 1997 to around 43,000 acres in 2001. Soil testing laboratories and agronomists in Alberta are uncertain as to what P recommendations should be used for potatoes. Petiole testing for P has only recently been used in the area. Standards for what are adequate levels of P in petioles are not adequately defined. The objectives of this project were to examine the effect of high rates of P fertilizer on yield and quality of potatoes, determine critical soil and tissue levels at which a response to P can be expected, and to compare compost with mineral P fertilizer as a means of supplying P to potatoes.

At Brooks from 1996 to 1999, soil P and tissue P on potatoes were measured. Tissue P frequently was adequate (according to U.S. standards) in early July, but sometimes became deficient later in the season. In some cases, strips of higher rates of P were applied, with no response in yield of tubers. In 2000, three field scale experiments were conducted, two were on soils with 20 to 30 parts per million (ppm) P and the third on a soil with 57 ppm P (modified Kelowna). Two additional field trials were completed in 2001. Five rates of P and three rates of compost were applied. Tuber yield was maximized at the lowest P rate (45 lb P_2O_5/A) in both years. Petiole P levels increased with applications of fertilizer or compost. Assessment of the 2001 crop data is expected to help clarify how potato P should be assessed in irrigated fields of southern Alberta. *AB-21F*

British Columbia

Effectiveness of Applied Phosphorus for Field Corn in Relation to Cropping Practices and VAM Colonization

Project Leader: Dr. Shabtai Bittman, Agriculture and Agri-Food Canada, Pacific Agricultural Research Centre, Agassiz, BC V0M 1A0, telephone: 604-798-2221, e-mail: bittman@em.agr.ca.

Early season P deficiencies in corn seedlings grown on high P soils have been reported when starter ferilizer P is not used in the coastal region of British Columbia (BC). Corn roots have been shown to establish a strong association with vesicular arbuscular mycorrhizae (VAM) fungi. In some cases, the association of the plant with VAM increases root surface area enough to meet seedling P requirements. However, this network of VAM fungi filaments in the soil is easily disrupted with tillage or growing a previous crop that does not form an association with VAM. As a result, starter P management requires careful consideration of cropping and tillage system.

The results of this research confirm previous studies that have shown that the colonization of corn by VAM is influenced by the previous crop in the rotation. While the differences were small, the trend over several trials was that corn yields were increased and the crop matured earlier (as shown by lower percentage dry matter) when grown on corn stubble rather than after fallow or canola, even when adequate P was applied. Early season colonization of corn roots by VAM had a positive effect on seedling P concentration. This research has also found that the colonization of corn roots by VAM was not negatively influenced by side banded P application, a treatment that in most

instances improved the final silage yield and dry matter content. Side banding P fertilizer can correct for low P uptake on corn roots with poor VAM colonization. However, this still may not fully alleviate the impact of low plant P on corn silage yield and dry matter content when there is poor root colonization by VAM.

Work in this area has led researchers to two general conclusions: First, VAM has a role in early P nutrition in corn, and unmeasured differences in VAM colonization may help to explain the variable results in response to P application often encountered. The second conclusion has to do with remediation. It is impractical to test for or to inoculate with VAM, yet current knowledge of VAM needs to somehow be used to improve P recommendations. In situations such as that in coastal BC, which is typical of livestock intensive regions, increasing levels of soil P are beginning to restrict manure applications and are forcing longer hauling and expensive processing. Hence, there is substantial incentive for farmers to justify their P application based on maximizing silage yield. *BC-13*

Effect of Pulsed Applications of Phosphorus on Fruit Development of Five New Apple Cultivars

Project leader: Dr. Denise Neilsen, Agriculture and Agri-Food Canada, Pacific Agriculture Research Centre, 4200 Hwy. 97, Summerland, BC V0H 1Z0, telephone: 250-494-7711, e-mail: neilsend@em.agr.ca.

Interest in the planting of new apple cultivars as a replacement for standard varieties such as Red Delicious, Golden Delicious, and McIntosh has been growing in British Columbia and the Pacific Northwest. Horticultural management of these new cultivars is less well understood than for standard varieties. Earlier work at Summerland has demonstrated that P applications at planting, either by incorporation with the soil or by fertigation, improved first year establishment and increased bloom in the second year. However, beneficial effects of P applications beyond the establishment year have not been reported. Recent work has also shown that applications of nutrients through fertigation, including less mobile nutrients such as P and K, allow nutrients to be targeted to the root zone of young apple trees. The objective of this new project is to determine the effects of P and boron (B) fertigation, N timing, and N rate on growth, production, and fruit quality of Gala, Fuji, Cameo, Ambrosia, and Silken apple on M.9 rootstock.

The most significant effect of treatments in the first three fruiting years has been the superior cumulative yield performance of the P treatment, producing more fruit and a higher yield of fruit per tree over all five of the test cultivars. The effect of the P treatment has been to maintain high leaf and fruit P concentration. Yield has also increased with progressive additions of N, but to a lesser extent than the increases associated with the P treatment. So far, the effect of the timing of N application has had little effect on fruit yield. In 2001 the only harvest disorder seen was water core on Silken and Fuji. For both cultivars, the P treatment reduced incidence of this disorder at harvest. *BC-14*

Effectiveness of Broadcast and Fertigated Potassium-Magnesium Sulfate on Soil Fertility, Yield and Quality of Apple Fruit

Project leader: Dr. Gerry Neilsen, Agriculture and Agri-Food Canada, Pacific Agriculture Research Centre, 4200 Hwy. 97, Summerland, BC V0H 1Z0, telephone: 250-494-6377, e-mail: neilseng@em.agr.ca.

There has been a long history of magnesium (Mg) deficiency in traditional, widely spaced orchards of standard cultivars such as McIntosh and Spartan in British Columbia. Multiple Mg foliar sprays are routinely applied in some orchards. Recently, K deficiency has been identified as a potentially serious problem in drip-irrigated and N and P fertigated high-density orchards growing on coarse-textured soils. An evaluation of potassium-magnesium sulfate ($KMgSO_4$) was carried out in 15 orchards in the Okanagan Valley.

A range of leaf K concentration was observed in both the Fuji and Spartan orchards in 2000 and 2001. In five Fuji and two Spartan orchards, leaf K concentration of check trees was less than or equal to 1.3 percent and thus close to the deficiency threshold of 1.0 - 1.2 percent for apple. In the three Fuji orchards, which are strongly in biennial bearing, low leaf K concentration of check trees was observed in the heavy crop year (2000). Leaf K concentration was significantly (linearly) increased by $KMgSO_4$ in four orchards in 2000, and this effect had increased to half of the orchards in 2001. By 2001, trees grown in check treatments had the lowest leaf K concentrations in all orchards. A range in leaf Mg concentration was observed in the experimental Fuji and Spartan orchards, with three Fuji orchards having leaf Mg concentrations in the deficiency range (<0.20 percent) in at least one of the two test years. Potassium-magnesium sulfate significantly (linearly) increased fruit Mg in two orchards in 2000. This study indicates a need to monitor macronutrient and micronutrient concentrations in British Columbia orchards as a means of optimizing fruit yield and quality. *BC-15F*

Manitoba

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

Project Leader: Dr. Cynthia Grant, Agriculture and Agri-Food Canada, Brandon Research Centre, Box 1000A, RR #3, Brandon, MB, R7A 5Y3, telephone: 204-726-7650, e-mail: cgrant@em.agr.ca.

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 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, is the preferred method 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 VAM fungi, allowing it to expand its root absorptive surface area and potential P uptake. The objective of this research is to evaluate the role of preceding crop, tillage system, and P fertilization of the preceding crop in optimizing flax yield and quality.

Based on the preliminary results from this study, it appears that P nutrition of flax can be influenced by tillage system, preceding crop, residual P from fertilization of preceding crops, and side-banded P application. Therefore, it may be possible to select different P management strategies to optimize flax P nutrition and seed yield, depending on the cropping system, crop rotation used, and the equipment available. In 2001, mycorrhizal association in flax at five weeks was higher when the flax was grown after the mycorrhizal crop wheat rather than after the non-mycorrhizal crop canola. Association was also generally increased by using reduced tillage as compared to conventional tillage. Production of flax after canola appears to be a poor option, possibly because of the effect on mycorrhizal association and P nutrition. *MB-11*

Impact of Nitrogen, Phosphorus and Potassium Chloride Fertilizer Management on the Growth and Yield of Oats

Project Leader: Dr. Ramona Mohr, Agriculture and Agri-Food Canada, Brandon Research Centre, Box 1000A, RR #3, Brandon, MB, R7A 5Y3, telephone: 204-726-7650, e-mail: rmohr@em.agr.ca.

Oats grown for the milling and livestock feed markets have become a profitable crop diversification option for farmers in western Canada. Approximately 4 million acres of oats are currently grown, with acreage continually expanding. However, there is limited research available on fertilizer management. The objectives of this research are to determine the effect of N, P, and potassium chloride (KCl) on the growth, yield and quality and to determine the impact of varying combinations of N, P, and KCl on the growth, yield and quality.

Preliminary analysis of yield data from 2001 showed positive effects of N on crop biomass and grain yield. Impacts of P and KCl were less pronounced. Phosphorus enhanced early-season growth but not grain yield; KCl increased grain yield at one of two sites. Few interactions among applied nutrients were evident. Nitrogen application resulted in an overall increase in crop biomass yield at tillering and heading at both field sites. At the clay loam site, a significant N by P interaction at tillering suggested a more pronounced yield response to N where P had been applied. A similar trend was evident at heading. Grain yield increased with N applications, and P application resulted in an overall increase in plant biomass at tillering at both sites. Despite the marked early-season responses to P, application of P had no effect on grain yield at either site. Application of KCl had no effect on final biomass yield of oats at either field site, except at the clay loam site where KCl reduced biomass yield at tillering. At the loam site, KCl resulted in a small increase in grain yield, although preliminary soil tests had indicated adequate soil K levels. *MB-12F*

Assessing Nutrient Content of Crops and Nutrient Removal as Affected by Management Practices

Project Leader: Dr. Cynthia Grant, Agriculture and Agri-Food Canada, Brandon Research Centre, Box 1000A, RR #3, Brandon, MB, R7A 5Y3, telephone: 204-726-7650, e-mail: cgrant@em.agr.ca.

Current information on the nutrient removal from western Canadian soils using existing and proposed cropping systems is limited. Long-term nutrient depletion could have important negative impacts on soil productivity and long-term sustainability. Changes in farming practices over the past decade have influenced both yield potential and nutrient cycling, so past information on nutrient removal may not reflect the current situation. A study was initiated to identify mineral nutrient removal in the harvested portion of crops, to determine the impact of management practices on nutritional value and nutrient removal, and to identify management practices that can be used to optimize economic yield, functional food quality, and nutrient content of crops grown in western Canada.

Currently, grain samples are being evaluated from a number of long- and short-term management studies in Manitoba and Saskatchewan. These include flax and wheat samples from alternative input studies and wheat and canola samples from a P fertility and tillage study. Canola seed N concentration was not influenced by tillage or P rate, while grain N in wheat was reduced slightly by application

of P, possibly due to dilution with increasing grain yield. Phosphorus concentration in both canola seed and wheat grain was increased by P application. Canola seed concentration of P was higher under no-till (NT) than conventional tillage at one of the trial locations, likely because seed yield was reduced by NT. Understanding the impact of nutrient management on food quality will continue to become an important consideration of best management practices. *MB-14*

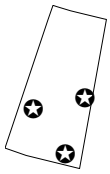
Optimizing Canola Production: Fertilization, Crop Protection, and Genetic Yield Potential

Project Leader: Don Flaten, Dept. of Soil Science, University of Manitoba, Winnipeg, MB R3T 2N2, telephone: 204-474-6257, e-mail: don_flaten@umanitoba.ca.

Canola production has become increasingly reliant on purchased inputs. With dropping commodity prices, canola, once perceived as a very profitable crop to grow, has become less appealing to Canadian farms because it is now viewed as expensive to grow. New technologies, whether they are improved genetics, crop protection, or fertilizers, all claim to provide the producer with incremental yield benefits that will help make profits for farmers. This research project tests the performance of low, medium, and high levels of fertilization, crop protection, and genetic yield potential on canola yield, quality, and profitability.

Canola yield at Brandon responded to genetic potential and fertility more than to crop protection. Minor yield loss at Brandon may have occurred due to weed competition and root maggot infestation. No significant interactions between input groups applied at medium and high levels at Brandon were recorded. Canola yield was impacted only by low fertility at the Dauphin location, where drought limited yield. Late-season flooding at Carman overshadowed treatment effects by causing low and variable canola yields, overall. For this reason, the difference between medium and high levels of inputs groups was not significant for canola yield at either Dauphin or Carman. Economic analysis suggests an interaction between yield benefit and input cost, with the increased income from using more inputs not always sufficient to cover the added cost. This interaction diminishes as canola price increases. Quality, though impacted slightly by treatments at Brandon, was not an issue in the economic calculations because levels did not exceed the Canadian Grain Commission standards. Although input costs were independent and added up in a linear fashion, input responses were interdependent and did not add up linearly. The real economic value of crop inputs within the complete cropping system was lower than the sum of the individual responses to inputs measured in the traditional fashion. This study describes only one year of data; however, it provides a glimpse of the potential importance and impact of how canola producers use crop scouting, soil testing, and inputs in general. *MB-17F*

Saskatchewan

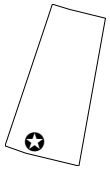


Management for Maximum Economic Yield of Open Pollinated and Hybrid Canola

Project Leader: Mr. Stewart Brandt, Agriculture and Agri-Food Canada, Box 10, Scott, SK S0K 4A0, telephone: 306-247-2011, e-mail: brandts@em.agr.ca.

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 yield relative to established open pollinated varieties. Inputs that are seen as critical to optimizing yield include seeding rate, fertility level, and fungicide use for control of white mold (sclerotinia spp.). The completion of a research project in 2001, carried out at three locations in Saskatchewan, has helped to evaluate the response of new hybrid and open pollinated canola cultivars to these three inputs on crop yield, quality, and disease response.

The summary of all eight site years of data for this project indicates that management of hybrid canola varieties is critical to improving returns to the farmer. The yield advantage of the higher yielding hybrid cultivar was 18 percent (range 2 to 54 percent) in this study and was recorded in all site-years, even the very dry year 2001. Low seeding rates reduced the harvest index as the plant expended its resources on filling in a thin crop canopy. Responses to fungicides for white mold control were only recorded when the low seeding rates were used. In addition, capturing the maximum yield of both the hybrid and open pollinated cultivars required the use of recommended to above recommended seeding rates and nutrient inputs. At high canola prices (C$ 8/bu), maximum economic yield (MEY) of both hybrid and open pollinated cultivars was recorded with the highest seeding rate and highest fertility inputs. At C$ 6/bu canola prices, the only factor that changed was that the soil test recommended fertility would be selected. This study supports the use of high yielding hybrid canola cultivars as a means of achieving MEY. *SK-24*



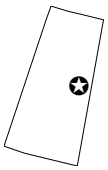
Optimizing Phosphorus Fertilization and Inoculation in Chickpea and Lentil

Project Leader: Dr. Yantai Gan, Agriculture and Agri-Food Canada, Box 1030, Swift Current, SK S9H 3X2, telephone: 306-778-7246, e-mail: gan@em.agr.ca.

Saskatchewan is the world's largest exporter of lentils and has the fastest expanding acreage of chickpeas. These two drought-tolerant pulse crops have been integrated into the farming systems in the semi-arid regions of western Canada as a means of diversifying crop production and improving whole-farm economics. In order to expand our

knowledge with these new crops, a project was initiated at two locations in the semi-arid region of Saskatchewan, evaluating the effect of fertilizer P on crop development and grain yields for desi and kabuli chickpea and lentil grown on soils with a medium level of soil residual P.

This field study is being conducted to determine the impact of starter P (15 lb P_2O_5/A) on growth, yield, and seed size in chickpea. Preliminary data from the five site-years (1999, 2000, and 2001 at Swift Current and 2000 and 2001 at Stewart Valley) of the study showed that starter P, as compared to a zero-P treatment, did not affect plant establishment, maturity, or seed yield of either Desi or Kabuli chickpeas. However, the starter P increased the lowest pod height of Kabuli-chickpea by 0.6 inches, implying an improvement of harvestability of 6 percent. When Kabuli chickpea was seeded in mid to late May and P applied at the highest rate (30 lb P_2O_5/A), an increase in the proportion of the >9-mm (0.35 in.) diameter seeds (54 percent vs 59 percent) triggered an increase of the price premiums that would be paid for the large seed. However, this response was not observed when the crop was seeded in early May. The earlier-seeded chickpea may have developed a larger root system, increasing the uptake of nutrients from the soil and reducing the response to added fertilizer P. *SK-25F*

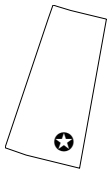


Improving Forage Production and Longevity of Alfalfa Stands with Balanced Fertilization

Dr. S.S. Malhi, Agriculture and Agri-Food Canada, Box 1240, Melfort, SK S0E 1A0, telephone: 306-752-2776, e-mail: malhis@em.agr.ca.

Alfalfa is a large consumer of P and K. In northeastern Saskatchewan, it is grown on approximately 200,000 acres for the dehydrated pellet market. Alfalfa for seed is grown on over 120,000 acres in western Canada. In the absence of nutrient inputs, it cannot maintain its original productivity after about three years of production. Improved soil fertility can help it out-compete weeds and increase the longevity of stands by several years.

This research was initiated to determine the influence of balanced fertilization on alfalfa production, seed yield, longevity of seed stands, weed populations, and disease severity. Low levels of stored soil water and very poor rainfall during the growing season left little opportunity for much of a forage or seed alfalfa yield in 2001. While none of these responses were significant (cv = 31 percent), hay yield showed a positive trend with addition of P and K, or P, K, and S. Alfalfa seed yields were not only low (<50 lb/A), but the high variability between treatments provided little information from the 2001 production year. Ratings of the stand for weed populations and disease also revealed no differences. Continued monitoring of this site will help to identify the rate of nutrient drawdown by the alfalfa and its impact on alfalfa hay and seed yield and quality. *SK-26F*

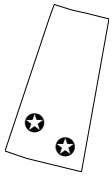


The Effect of Potassium and Sulfur on the Yield Variability of Canaryseed

Project Leader: Mr. William May, Agriculture and Agri-Food Canada, Indian Head Experimental Farm, Box 760, Indian Head, SK S0G 2K0, telephone: 306-695-4244, e-mail: mayb@em.agr.ca.

The biggest production problem faced by farmers growing canaryseed is the year-to-year variability in seed yield. The cause of this fluctuation in yield is not well understood. One aspect that has not been addressed is the effect of K and S on yield. An experiment was designed to evaluate K and S additions on the yield of canaryseed at five locations in Saskatchewan.

The effects of KCl and SO_4^{2-}-S on canaryseed yields were mixed. In 2000, yield increased as KCl was increased at two sandy loam soil locations. At a heavy clay site, the 13 lb K_2O/A rate lowered yield, and the 27 lb K_2O/A rate increased yield. The addition of S decreased yield at a heavy clay site and increased yield at a sandy loam site. In 2001 there was a significant response to KCl at both heavy clay and sandy loam sites. The greatest response occurred at the heavy clay site where an extra treatment of potassium sulfate (K_2SO_4) was added to the experiment. Unlike KCl, the K_2SO_4 did not increase yield. This may indicate that the Cl component of the KCl is increasing the yield of canaryseed in some situations. The addition of S had no effect on yield at any location in 2001. Further investigation into the effects of K and Cl on canaryseed are required to help address the yield variability of this crop. *SK-27F*



On-Farm Evaluation of Potassium Chloride Using Combine Yield Monitors

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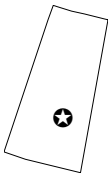
The addition of K fertilizer to starter fertilizer blends is becoming a common practice in many areas of western Canada with high soil test K levels. Specific crops, such as malting barley and high yielding spring wheat, are commonly cited as examples of crops that benefit from this starter K. However, there are no research results to support this practice or recommendation by fertilizer dealers. It is argued that this type of crop response reported by farmers and dealers indicates that the current soil testing methods may need to be reassessed on these soils. On-farm replicated strip trial projects were initiated to evaluate crop response to starter KCl application with the use of combine yield monitors.

Field trials were conducted on heavy clay soils which,

when evaluated with a variety of soil testing procedures, resulted in K recommendations of 0 to 50 lb K_2O/A. The 2001 trials were hampered by severe drought conditions at all of the locations. On one farm, where durum wheat yields of less than 8 bu/A were harvested, the largest recorded yield difference was associated with variations in the pattern of snow accumulation the winter before. Two other trials, with fallow durum yields of 20 and 50 bu/A, showed no response to added starter K. Field trials evaluating starter K will be continued in 2002. *SK-28F*



Boron Soil Tests – Understanding Boron Supply and Availability in Saskatchewan Soils

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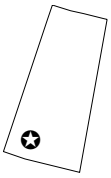
Recently, there has been considerable interest expressed by growers in managing micronutrients for maximum yield potential of higher value crops such as canola. Boron has not been studied extensively in Saskatchewan, and the current accepted soil and tissue test protocols and critical soil and plant tissue B levels were not developed specifically for this region. The objective of this project is to assess the B supply potential of selected Saskatchewan soils and relate the supply potential to crop response to applied B.

While the research activities for this new project are just beginning, they follow a growth chamber experiment that was conducted to evaluate the response of canola grown in each of the 27 soils, with and without the addition of supplemental B. Growth was monitored and plants harvested at flowering, a stage at which B uptake is typically maximized. The roots were extracted, and the aerial plant parts were separated into upper and lower plant tissues. The plant tissues are being analyzed for B concentration, and B uptake will be determined. Although the analysis of this experiment is ongoing and final conclusions are not currently available, preliminary observations point to some interesting findings. In particular, many of the soils with relatively low levels of available B did not appear to be responsive to B applications. Researchers are hopeful that B uptake data of the plant tissue will help determine why there was a lack of response to B in soils that were identified as potentially responsive on the basis of soil testing. It is believed that some of the soils used in the study may be able to mineralize or supply (via solubilization) sufficient levels of B to support adequate growth in a controlled environment. Therefore, responses (or lack of) in the growth chamber may not accurately reflect potential responses in field situations. Further research in 2002 will consider soil B release using laboratory and field assessment. *SK-29F*



Quantifying Soil Carbon Sequestration: Textural Effects

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The role of carbon dioxide (CO_2) as one of the greenhouse gases contributing to global warming is the focus of considerable research in agriculture. Soils have the potential to store atmospheric carbon (C) as soil organic matter or soil organic C (SOC). Developing an understanding of those factors which influence the capacity of a soil to store C, reducing atmospheric levels and improving soil quality, is the focus of this research. An established long-term rotation study at Swift Current was used to evaluate the impact of fertilizer management and crop rotation on SOC levels.

The evaluation of soils from this long-term experiment found that those receiving supplemental N and P fertilizer, based on soil test recommendations, significantly increased SOC in the surface 3 in. over application of P alone. Soil texture is known to influence the stability of SOC. In this study clay content was relatively uniform. Hence it did not influence SOC. The amount of sand or silt accounted for 36 percent of the variability measured in organic C. However, this influence was restricted to a few small areas where the sand or silt content of the soil reached extremely high or low values. For the majority of the trial area, it was the combination of rotation and balanced fertilization that had the greatest influence on measured SOC. *SK-30F* ■

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