NEWS & VIEWS

A regional newsletter published by the Potash & Phosphate Institute (PPI) and the Potash & Phosphate Institute of Canada (PPIC)

Dr. Adrian Johnston, Western Canada Director
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Western Canada Research Report—Some Good News

Have you read or heard a good news story about fertilizers lately? Likely not, if your main source of information is the print and TV media. However, progress in research continues to show that fertilizers play a critical role in correcting soil nutrient deficiencies, producing high yielding/high quality produce, improving the profitability of farms, helping to sequester carbon dioxide as soil organic matter, and increasing production on viable agricultural land. This, in turn, helps preserve habitat. Yes, there are problems with excess nutrients in the environment, but the vast majority of these are associated with poor industrial, human, and animal waste management. We have a good news story about fertilizers as plant nutrients...we just need to be sure and tell it.

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 welcome to contact either Dr. Adrian Johnston, PPI/PPIC Western Canada Regional Director, 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 assure their efficient use in securing quality food supplies and viable farming enterprises.

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Alberta

Development of Agronomic Practices for Chickpea Production in Alberta

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Project Cooperators: Beata Lees, Manjula Bandara

In western Canada, chickpea production area expanded rapidly in the years 1998 through 2001. 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, nitrogen (N), P, sulfate-sulfur (SO_4^{2-}-S), seeding date, and seeding rate.

While severe drought conditions limited chickpea yields in 2000 and 2001, good yields were harvested at most of the seven trial locations in 2002. However, N was the only added nutrient that had any impact on chickpea yields in 2002, with inoculation also having only limited effects. In the past three years, no significant ($p = 0.05$) grain yield responses to fertilizer P were recorded at any of the 19 field trials conducted. While soil test P was medium to high in 12 of the test sites, seven of 19 trials had soil test P of less than 27 lb P/A, a level below which consistent field pea responses were recorded in previous research in this region. These results indicate that the chickpea crop is much more efficient than field peas in taking up soil P. Chickpea seed is not as high in P as field peas, removing approximately 0.36 lb P_2O_5/bu. However, with the yields reaching as high as 60 bu/A in this study, significant removal of soil P occurs when growing the crop. Growers will have to take this into consideration if they wish to prevent soil P depletion when including the crop in rotation. *AB-20F*

Phosphorus and Compost on Potatoes

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Project Cooperator: Michele Konschuh

The potato industry in southern Alberta continues to expand to meet the needs of newly established food processors. Soil testing laboratories and agronomists in Alberta are uncertain as to what P recommendations should be used for potatoes. Standards for adequate levels of P in petioles have been used from the northwest U.S., but have not been adequately defined for the Southern Alberta region and its soils. 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.

Results indicate that increased inputs of P gave increased levels of petiole P for both mineral fertilizer and compost. Using the petiole P standards from the northwest U.S., petiole samples collected in early July, late July, and mid-August usually fell within the sufficiency ranges. There were a few instances when the lower rates of fertilizer P resulted in petiole P levels that were below the suggested range. However, none of these deficiency levels were reflected as a significant effect on potato yield. The specific gravity of potatoes was not significantly affected by P treatments. However, tubers from two sites showed slightly lower specific gravity values on treatments where compost was added. The P in the compost was found to be immediately plant-available, even in early July. Results from this trial indicate that despite increases in petiole P, there were no discernible effects on yield. Petiole P standards from the northwest U.S. will require some modification for southern Alberta soils and conditions. *AB-21F*

British Columbia

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

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Project Cooperator: Gerry Neilsen

Interest in planting new apple cultivars as replacements 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. Recent work has 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 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 P treatment continued its superior cumulative yield performance in the 4th fruiting year (1999-2002) over all five of the test cultivars. There have been differences in cumulative yield performance among cultivars over all treatments, with Silken and Cameo having high yield and Ambrosia producing the least fruit. The yield performance of Fuji continues to improve after a slow start (no fruit in second year). Pulsing P in the spring results in largest increases in early growing season leaf P, although concentrations are increased throughout the growing season for this treatment. The P treatment is also effective at increasing fruit P concentration at harvest. Water core incidence was higher in 2002, and for the second year in a row incidence at harvest was reduced in the P treatment. Continued evaluation of P fertigation is expected to establish its full impact on the production of high yielding, high quality apples. *BC-14*

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

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Project Cooperator: Denise Neilsen

There has been a long history of magnesium (Mg) deficiency in traditional, widely spaced apple 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 (K_2SO_4•$2MgSO_4$; K-Mag) was carried out in orchards in the Okanagan Valley.

In 2002, apple leaf K concentration measured in grower-fertilized (check) treatments ranged from below 1% to 1.71%. Four orchards had leaf K concentration <1.3%, the leaf K concentration considered deficient. Application of K_2SO_4•$2MgSO_4$ significantly (linearly) increased leaf K concentration in 7 of 11 orchards, including the four orchards with lowest leaf K concentrations. While application of K fertilizer usually increased leaf K above the deficiency level, leaf K concentrations in one orchard were deficient without K_2SO_4•$2MgSO_4$ fertilization, and remained deficient even after annual application of 214 lb K_2O as K_2SO_4•$2MgSO_4$. Applications of K_2SO_4•$2MgSO_4$ fertilizer were generally effective at improving tree K nutrition. Three successive years of K_2SO_4•$2MgSO_4$ fertilization successfully increased soil K status in 10 of 12 orchards. In 2002, leaf Mg concentrations in check treatments, which did not receive Mg fertilization, ranged from a low of 0.24% to a high of 0.41%. Only 2 of the 12 orchards were at Mg concentrations below adequate levels (<0.26%). In general, leaf Mg concentrations were high in 2002 for most orchards when compared to 2001. It has been well documented that application of K fertilizer at rates, as in this study, between 107 to 214 lb K_2O/A, usually decreases apple leaf Mg concentration. This generally was not observed after application of 214 lb K_2O/A as K_2SO_4•$2MgSO_4$ since leaf Mg was not decreased in 10 of 11 orchards when K fertilizer is being applied. *BC-15F*

Manitoba

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

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Project Cooperator: Marcia Monreal

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. In the absence of specialized seeding equipment to place the fertilizer P in a side band, some farmers have resorted to increasing the P application in preceding crops, building soil residual P for use by the subsequent flax crop. Flax has been shown to have good association with arbuscular mycorrhizae (AM) fungi, increasing 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.

The major factor influencing flax yield was the preceding crop, with seed yield being much higher after wheat than after flax. The effect was evident from crop emergence, through early season growth, to final straw and seed yield. Seed yield was higher when flax was grown after wheat rather than canola at both locations. When averaged over the three years of the study, seed yield was 9.8% higher after wheat than after canola at the Research Centre site and 22% higher after wheat than after canola at the zero-till farm site. The effect may be due to a number of factors, including some degree of allelopathy from canola residue, early season competition from volunteer canola plants or restriction in mycorrhizal colonization after canola. The AM association in flax at five weeks was higher when the flax was grown after the mycorrhizal crop (wheat) than after the non-mycorrhizal crop, in this case canola. Association between the flax and AM 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 suppressed AM association with canola and the resulting reduction in soil P uptake by flax. *MB-11*

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

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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 of oats.

In the final year of this study, preliminary analysis of yield data showed positive effects of N and P on crop biomass and grain yield at both of the field sites, but no significant effect of KCl on either biomass or grain yield. No interactions among nutrients were evident for these yield parameters. Nitrogen application increased crop biomass yield at tillering and at heading, with yields typically levelling off at higher N rates. Preliminary analysis indicates that optimum grain yields were achieved with N applications of 35 to 70 lb N/A. Phosphorus application resulted in an overall increase in plant biomass at tillering and at heading at both sites in 2002. In contrast to previous years, P application also significantly increased grain yield at both sites. Cold, dry soil conditions early in the growing season may have contributed to the observed P responses in 2002. *MB-12F*

Impact of Production System and Nutrient Addition on Grain Quality in Long-term Rotation Studies in Western Canada

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Project Cooperator: Stewart Brandt

The role that crop rotations and production inputs play in the removal of nutrients from the soil is critical to maintaining soil productivity. An alternative management project at the University of Manitoba is using cropping diversity and level of external inputs to assess crop production. The three rotations included annual crops alone, annual crops with a forage green manure, and annual crops with two years of alfalfa hay. Input levels included a factorial arrangement of with and without herbicides and fertilizers. Flax grain, the final crop in the four year rotation, was analyzed after the first and second rotation cycles to determine how rotation and input management influence crop nutrient uptake.

Nitrogen, P, and K nutrient removal in flax was strongly influenced by rotation and weed control. Forage based rotations had higher nutrient removal than the annual crop rotation. In the absence of weed control, fertilizer additions did not increase grain nutrient uptake, reflecting on the nutrient tie-up in weed growth. In fact, weed control proved to be far more important than fertilizer addition in achieving high grain yields in this study. After eight years (two rotation cycles), weed suppression in the alfalfa based rotation improved crop nutrient uptake. These results clearly show that both crop rotation and input system play a major role in the removal of nutrients by flax. In the absence of fertilizer additions, soil supply of nutrients like P and K could limit crop production. Balancing nutrient inputs with removals will be critical to the long-term productivity of each production system under evaluation. *MB-13*

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

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Project Cooperators: Brian Marchylo, Eugene Gowalko, Stewart Brandt, Martin Entz, Byron Irvine, Doug Derksen, Debbie McLaren

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.

Nutrient analysis has been completed on samples from a range of studies evaluating N, P, and S management. Macronutrient application influenced the concentration of certain other nutrients. For example, application of N fertilizer tended to reduce concentration of copper (Cu) in wheat grown on soils low in Cu, but increased concentration and uptake of zinc (Zn) and calcium (Ca) in wheat grain on two soil types. Phosphorus fertilizer application reduced the measured wheat grain concentration of Zn. As has been observed in other studies, wheat grain Zn concen-

tration decreased and cadmium (Cd) concentration increased with application of monoammonium phosphate fertilizer. Understanding the impact of nutrient management on food quality will continue to become an important consideration of best management practices. *MB-14*

Impact of Long-term Phosphate Application and Level of Fertilizer Cadmium on Crops and Soils

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Project Cooperators: R. Garrett, Sebastien Sauve, Don Flaten

Public concern regarding the transfer of Cd from fertilizer P products to soils and uptake by crops has increased interest in evaluating the true impact of fertilization practices on food nutrient content. Field studies were initiated at seven sites across the western Canadian Prairie Provinces to evaluate the effect of long-term applications of monoammonium phosphate fertilizer containing varying concentrations of Cd. Rates of P application were 0, 45, 90, and 180 lb P_2O_5/A and the three concentrations of Cd in the fertilizer ranged from trace to approximately 150 parts per million (ppm).

The objectives of the study are: 1) To determine the cumulative impact of applications of P fertilizer varying in Cd concentration on grain yield and micronutrient concentration, total soil Cd, phytoavailable Cd, and grain Cd concentration, on a range of soil types. 2) To determine the impact of soil characteristics on availability of native soil Cd and Cd added with P fertilizer. 3) To determine the effectiveness of several soil testing methods in predicting availability of native and applied Cd across a range of soil types and environmental conditions. The new study will continue through a four-year crop rotation. *MB-16*

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

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Project Cooperators: Craig Linde, Byron Irvine, Rob Park

Canola production has become increasingly reliant on purchased inputs. 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 in 2001 responded to genetic potential and fertility more than to crop protection. The factorial analysis also demonstrated that no significant interactions between factors occurred. At Brandon in 2002, grain yield responded to fertility and crop protection. These two factors also interacted and demonstrated that the yield response to fertility was dependent on the level of crop protection. At Dauphin and Carman in 2001, poor growing conditions overshadowed treatment effects by reducing the yield potential at these sties. At Carman in 2002, grain yield did not respond to the factors, possibly due to a late season infestation of flea beetles and high temperatures during flowering. Therefore, at these three sites, the difference between medium and high levels of inputs was not significant. Also, at all sites, yield responses to genetics appeared to be stable and generally did not interact with fertility or crop protection. The 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 potential for negative margins diminishes as canola prices increase. Cutting rates of one input effectively reduces the yield potential of the crop, thus reducing the potential return on investment for those inputs kept at a high level. *MB-17F*

Saskatchewan

Optimizing Phosphorus Fertilization and Inoculation in Chickpea and Lentil

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Project Cooperators: Fernando Selles, Brian McConkey, Bix Biederbeck, Bob Zentner

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 semiarid regions of western Canada as a means of diversifying crop production and improving whole-farm economics. In order to expand our knowledge of these new crops, a project was initiated at two locations in the semiarid 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 residual P.

Field trial data collected from six site-years of the study showed that starter P, as compared to a zero-P treatment, did not affect plant establishment or maturity of either Desi or Kabuli chickpeas. In only one of the six site years did starter P increase seed yield over the zero-P treatment, with

a response of 5.4% for Kabuli chickpea and 6.1% for lentil. However, starter P was found to increase the lowest pod height of Kabuli chickpea by 0.6 in., implying an improvement in harvestability of 6% for this crop species. When Kabuli chickpea was seeded in mid to late May (late seeding), and P fertilizer 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% vs. 59%) triggered an increase of the price premiums that would be paid for the large seed. However, this response was not observed with early seeding of the crop (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

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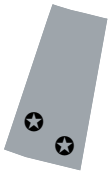
Project Cooperator: Clayton Myhre

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, alfalfa 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 project was plagued with drought again in 2002, resulting in reduced hay yields, and a seed crop failure. As a result, forage yields were low, with high variability among treatments minimizing any potential significant responses. While not significant ($p = 0.10$), alfalfa yield was higher with P and K (29%; 0.65 t/A), and with a blend of P, K, and S (32%; 0.73 t/A). The project is scheduled to continue for an additional two years, during which time forage and seed yields will continue to be assessed relative to annual fertilizer applications. *SK-26F*



On-farm Evaluation of Potassium Chloride using Combine Yield Monitors

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The addition of K 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. 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. In all trials, we compared 20 lb K_2O/A applied in the seed row at seeding to a no K check. While drought hampered the collection of meaningful data in both years of this study, results from six field trials were collected for statistical analysis. There was no grain yield response to added KCl at any of the trial sites in either 2001 or 2002. Field assessment of crop emergence with the added KCl also indicated no negative impact on germination on these clay soils. None of the farmer cooperators reported any visual differences in the treatments during the growing season. These results indicate that soil K supply was sufficient to meet crop requirements, and recommendations for added K did not result in crop yield responses. *SK-28F*

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

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Project Cooperator: Rigas Karamanos

Recently, there has been considerable interest expressed by growers in managing micronutrients for maximum yield potential of higher value crops such as canola. While B has not been studied extensively in Saskatchewan, limited research suggests that our inability to detect B responses may be related to field research designs that deal with relatively high variability of plant available soil B. Ultimately, the spatial variability of B availability limits its detection in a randomized complete block design experiment. 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.

Trials were carried out in 2002 using a transect design across two commercial fields in the Grey soil zone to assess the variability of plant available soil B and determine canola response to granular and foliar B application. While the soils at one site were above the critical B limits for canola plant growth, a yield response to B of 19 to 23% over the check was recorded when the overall yield response was assessed across the entire transect. However, responses to B along the transect were highly variable, suggesting that only portions of the field were B responsive. Soil pH has been shown to be one of the primary factors

controlling B availability, and at this study site, canola biomass and seed yields typically decreased with increasing pH. A positive linear relationship ($p = 0.01$) was recorded between soil pH and the yield increase over the check for the foliar B treatment. As expected, hot water soluble (HWS) B was positively correlated to organic matter content and average yields, indicating that organic matter is the primary source of B in these soils. Given the minor differences in soil texture found along the sampling gradient, no significant relationship was recorded between texture and HWS B. These results indicate that soil B deficiencies can limit canola yield in parts of Saskatchewan, and support the need to evaluate crop responses to nutrients using an alternative experimental layout other than a randomized complete block design. *SK-29F*

Factors Affecting the Concentration of a Nutraceutical Lignan in Flaxseed

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Project Cooperators: Alister Muir, Guy Lafond, William May, David McAndrew, Byron Irvine, Cynthia Grant, Steve Shirtliffe

Lignans are a class of naturally occurring plant phenolics with hundreds of structural variations being reported. The predominant lignan in flax seed (*Linum usitatissimum*) is secoisolariciresinol diglucoside (SDG). While the presence of SDG in flaxseed has been known for almost 50 years, the biological activity of SDG has been mainly studied during the last 10 years. Today, SDG is of interest as it has shown some potential therapeutic benefits in some cancers, heart disease, diabetes, and lupus nephritis.

Samples of flaxseed from co-operative evaluation trials in several locations in Manitoba and Saskatchewan have been analyzed for 11 years. In these trials, no added nutrients were applied. It was determined SDG concentrations in fat free meal varied between 0.9 and 3.1% by weight. Variety accounted for most of the variability observed, year was the next factor with less variability associated with location. As SDG is made from an amino acid, phenylalanine, it was of interest to determine if added nutrients could increase the concentration of SDG in flaxseed. Flaxseed samples were obtained from existing field studies with added P (five rates, two years), N, (four rates, three varieties), N and P (four rates of each) and one study with N, P, K, and S (three years, two locations). In all studies there were no statistical differences in SDG concentration noted with any of the added nutrients. Where there was more than a single variety or there were multi-year studies, some differences were observed for either variety or year. *SK-31*

Improving the Quality and Profitability of Durum Wheat through Nutrient and Disease Management

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Project Cooperators: Guy Lafond, Fernando Selles, Myriam Fernandez, Brian Marchylo

Optimizing yield and quality of durum wheat is key to making it a profitable crop in the semiarid regions of western Canada. While many growers are increasing the N used on their durum crops, they often use only minimal rates of P, increasing concern that they are not making full use of the N applied. Grain protein is one of the most important factors determining durum wheat quality, and durum markets consistently demand a protein content of 13% or higher, for which industry pays a premium. The objective of this research is to develop knowledge that will permit durum producers to implement crop and soil fertility management strategies geared to maximizing production, improving grain quality and grain protein, and achieving a higher grade for the grain they produce.

Growing season conditions were good in 2002, with trial yields ranging from 45 to 50 bu/A. Increasing N rate up to the soil test recommended rate resulted in positive yield responses. While additional N did not lead to further increases in grain yield, it did increase grain protein. Wheat seedling tissue samples collected at the 4 to 5 leaf stage showed a positive response to P fertilizer application. While application of KCl had no impact on seedling tissue K content, it did increase tissue chloride (Cl) levels. However, there was no yield response to application of either P or K fertilizer in the first year of this trial. This project will be continued in 2003. *SK-32F*

Evaluation of Agronomic Practice and Quality Parameters of Timothy Hay

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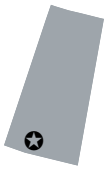
Project Cooperators: Dave Christenson, Vern Racz, Randy Pastl

Production of compressed timothy hay for the export market has been a major growth industry in western Canada over the last 10 years. Yields of 4 to 6 tons/A under irrigation and 2 to 4 tons/A under dryland have been obtained in provincial trials. The effect of annual maintenance applications of K and S on timothy yield, persistence

and quality, and the effect of Cu applications on hay color is an area that requires supporting data for growth of the industry. In addition, information on the role of P for maintaining the productivity of irrigated timothy is lacking. The objective of this study is to determine how important maintenance fertilizer management is to maintain timothy yield and quality.

Drought conditions prevented the establishment of field plot trials in 2002 as part of the proposed research. Preliminary results from strip trials laid out on established irrigated timothy hay fields indicate that there were some positive yield responses to application of monoammonium phosphate fertilizer. Detailed evaluation of the tissue sample data collected will be required to establish the impact of both N and P applied in this nutrient source. *SK-33*



Phosphorus Fertility of Alfalfa Hay Stands in Southwest Saskatchewan

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Alfalfa grown alone, or in mixtures with grasses, is a common feed source for beef cattle producers in the semiarid region of western Canada. These forage stands are usually established with the intent of harvesting for five or more years. In general, very few of these forage lands are fertilized, as decisions regarding production are based on stand and yield decline. This study was initiated to evaluate the response of alfalfa grown alone, or in mixtures with Russian wild rye grass, to fertilizer additions either once at the start of the study, or applied annually. Fertilizer P as 0-45-0 was in-soil banded using a disc coulter either annually at rates of 0, 9, 18, or 36 lb P_2O_5/A, or as a pre-plant application at rates of 18, 36, or 72 lb P_2O_5/A. Forage yields were harvested for five years (1998-2002), with one cut taken most years, two cuts taken in years with above average precipitation.

While no difference in forage yield was observed between the alfalfa and alfalfa-grass mixture in the first two years of the study, alfalfa yields when seeded alone exceeded the mixture in the final three years. Cumulative forage yield over the five years was 0.8 t/A greater for the alfalfa alone versus the mixture. Highest forage yields were achieved with annual applications of 36 lb P_2O_5/A, followed by the pre-plant banded treatments at 36 and 72 lb P_2O_5/A. The results of this study indicate that building soil P through one-time or annual applications of P fertilizer were required to support the maintenance of high forage crop yields. *SK-34F* ■

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