

NEWS & VIEWS

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Dr. Terry L. Roberts,
Western Canada Director
July 1999

Western Canada Research Report

WHERE would agriculture be without research? Just look at what's happened in the last 20 years. Direct seeding systems have been developed. We have dozens of better varieties of wheat, barley and canola. New options in seed and fertilizer placement allow us to apply all our fertilizer requirements at seeding. We have herbicide tolerant canola, soybeans, and within a few years...wheat. We can pinpoint our exact location in a field and measure yields at that and every other spot in the field. We can vary seed, fertilizer and herbicide rates on-the-go and can diagnose crop problems from space. That's just a sampling of the advances that have been made in our industry because of research.

Presented here are brief summaries of research PPI/PPIC and the Foundation for Agronomic Research (FAR) helped support this past year in western Canada. Feel free to contact the project leaders directly if any projects are of special interest.

British Columbia



Effect of Potassium Fertilization, Nitrogen Fertigation, and Crop Load on Potassium Nutrition and Fruit Quality of High Density Apples under Atmometer Scheduled Irrigation

Project Leader: Dr. Denise Nielsen, Agriculture and Agri-Food Canada, Pacific Agriculture Research Centre, Summerland, BC V0H 1Z0 (250-494-7711).

Agriculture and Agri-Food Canada researchers have been studying ways to optimize nutrient and water management in the root zone of high density apple orchards. They've successfully developed an atmometer

(instrument that measures water loss by evaporation) based drip irrigation scheduling technique that helps manage nitrogen (N) inputs. They've also shown, in other studies, that drip irrigation in their high density plantings causes potassium (K) deficiency in coarse textured soils and that it can be treated with fertigation.

This new project will investigate the use of atmometer-based irrigation scheduling to improve the management of K fertigation. When applying K to apples, care must be taken not to over-supply K because too much can exacerbate calcium (Ca) related storage problems.



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 Agriculture Research Centre, Agassiz, BC V0M 1A0 (604-796-2221).

Corn may suffer from phosphorus (P) deficiency, even on soils testing high in P, if vesicular arbuscular mycorrhizal (VAM) fungi are not present in their roots, and they are not supplied with starter P. The filaments of VAM attach to young corn roots, forming a beneficial association where the fungi supplies the roots with P and other nutrients in return for a small amount of sugar.

This project has shown that excessive, pre-seeding tillage, previous crop, and even fallowing can decrease VAM in young corn plants, resulting in severe P deficiency. It has also shown that starter P can alleviate the problem and ensure increased production. British Columbia corn growers now understand why they need to apply starter P in some cases when their soil test P is high.



Note: Dr. Terry L. Roberts, who served as Western Canada Director of PPI since 1989, is moving from Saskatoon to the PPI headquarters office in Norcross, Georgia. He will be assuming new duties related to PPI international programs in Latin America, as well as responsibilities with FAR. Dr. Roberts can be reached by phone at (770) 825-8071 or by e-mail: troberts@ppi-ppic.org or troberts@ppi-far.org.

Effective September 1, Dr. Adrian Johnston, currently with Agriculture and Agri-Food Canada, will assume responsibilities as PPI Western Canada Director.



Influence of Mineral Nutrition, Aluminum, Carbohydrate Metabolism, and Plant Hormones on Cranberry Flower Induction and Alternate Bearing

Project Leader: Dr. David McArthur, Department of Plant Science, Suite 248-2357 Main Mall, University of British Columbia, Vancouver, BC V6T 1Z4 (604-822-4384).

The public closely scrutinizes British Columbia cranberry growers because cranberry bogs are located in some of the most environmentally sensitive areas in the province. Growers must constantly defend their use of fertilizers and are looking for ways to improve nutrient management.

This project is investigating the role of mineral nutrition in flower induction and bud formation. Surveys from growers fields suggest flowering is related to fertilizer application rates. Fertilizer management is complicated because the wetlands where cranberries are planted are very acidic and contain high levels of aluminum (Al), which interferes with P availability. Studies have been initiated to evaluate slow-release fertilizers, blends with different N:P ratios, and various rooting mediums (e.g. peat-sand, soil-sand, peat-soil). Results show slow-release fertilizers increase root growth more than soluble fertilizers, but the response is related to rooting medium.

fertilization results in a more uniform stand with healthier alfalfa compared to non-fertilized stands.



Site-Specific Management of Potatoes

Project Leader: Dr. Colin McKenzie, Alberta Agriculture, Food and Rural Development, Crop Diversification Centre, SS #4, Brooks, AB T1R 1E6 (403-362-1300).

This project, now in its third year, is investigating the use of global positioning system (GPS) technology and yield monitoring in irrigated potato production in southern Alberta. Improving fertilizer management is a key part of the study. Yield maps are demonstrating how variable potato yields may be, and GPS has allowed soil and petiole concentrations of N, P and K to be intensively monitored. Phosphorus deficient tissue samples are routinely appearing, despite recommended P fertilizer application. Alberta farmers do not normally monitor tissue P or K, but interest is increasing because of this project.

Alberta's potato industry is expected to double its acreage by the year 2000, which means many fields with low P fertility will be coming into production. This project is providing growers with valuable information related to P management and could serve as a basis for increasing Alberta's P recommendations.

Alberta



Nutrient Requirements of Mixed Forages

Project Leader: Mr. Jerome Lickacz, Alberta Agriculture, Food and Rural Development, 2nd Floor, Agronomy Centre, 6903-116 Street, Edmonton, AB T6H 4P2 (403-427-7098).

Western Canada has more than 10 million acres of forage crops, much of which are mixed forage stands. Only 25 percent of the forage acreage is fertilized, and then it is usually with low rates of fertilizer.

This study, now complete, investigated N and P fertility of mixed forage stands at two locations in Alberta. Four years of data show a consistent response to N fertilization, but P response has mainly been limited to one site. At that site P increased total forage yield by more than 20 percent over the check treatments in 1998. This project has successfully demonstrated the importance of fertilizing mixed stands with both N and P for optimum yield and stand quality. Visual observations indicate that balanced

Saskatchewan

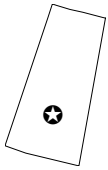


Maximizing Canola Yield with Balanced Nutrition in the Saskatchewan Parkland

Project Leader: Dr. S.S. Malhi, Agriculture and Agri-Food Canada, Box 1240, Melfort, SK S0E 1A0 (306-752-2776).

This research has been evaluating the influence of boron (B) fertilizer on yield and quality of canola when used in a balanced fertilization program for the past two years. Trials were conducted at two locations in northeast Saskatchewan at sites testing low in soil B in 1998. Canola yields responded positively to N and sulfur (S) fertilization, but additional yield increases from B fertilization were not observed. However, moisture stress limited yields at the site with the lowest soil test B levels and likely masked any potential response that might have occurred.

Canola is a high user of plant nutrients and is known to be sensitive to B. Last year 13.4 million acres of canola were seeded in the Canadian prairies, and B nutrition may be an important management tool for growers.

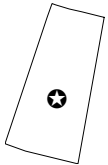


Effect of Potassium Chloride on Physiological Leaf Spot, Grain Yield, and Quality of Winter Wheat in Saskatchewan

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

Winter wheat production has been increasing in Saskatchewan in the last few years, largely due to the release of the high yielding, semi-dwarf winter wheat cultivars. Under favorable growing conditions, these cultivars will often show strong physiological leaf spot symptoms. The addition of potassium chloride (KCl) fertilizer has been shown to suppress these symptoms in other areas of the Northern Great Plains, but research in Saskatchewan has been limited.

This project has been looking at the influence of KCl on the expression of physiological leaf spot, agronomic performance and grain quality of several winter wheat cultivars common to Western Canada. Physiological leaf spot symptoms were seen at all three study locations in 1998. The KCl suppressed the leaf spot damage in all trials where symptoms were recorded and increased yields an average of 4 percent. It also increased grain test weight and kernel size by about 1 percent. The study will continue for one more year, but already the *Winter Wheat Production Manual* is recommending KCl to suppress leaf spotting and increase yields.



Availability of Phosphorus Contained in Pulse Crop Residues to a Subsequent Crop

Project Leader: Dr. Jeff Schoenau, Department of Soil Science, 51 Campus Drive, University of Saskatchewan, Saskatoon, SK S7N 5A8 (306-966-6844).

Pulse crops are becoming increasingly important in the Canadian prairies. Last year, the region seeded 2.6 million acres of peas and almost 1 million acres of lentils. Pulses use a lot of P and K and provide beneficial effects to following crops.

This study, now complete, has been investigating P availability to wheat seeded in pulse stubble. Pulse stubble types do not appear to differ in effect on soil P supply or plant P uptake. However, wheat yields and P uptake are greater following peas as compared to fallow. Wheat grown on pea stubble was shown to have greater infection of VAM fungi. The VAM are known to increase the plant's ability to take up P. Pea crop residues were also found to increase water-soluble soil P more than wheat residues because they break down rapidly in the soil. This project has demonstrated that pulses can have a positive impact on P supply to following crops.



Agronomic and Economic Assessment of Variable Rate Fertilization

Project Leader: Dr. Dan Pennock, Department of Soil Science, 51 Campus Drive, University of Saskatchewan, Saskatoon, SK S7N 5A8 (306-966-6852).

Farmers in the Canadian prairies are interested in variable rate fertilizer application, but don't know the best way to manage it. The rolling topography typical of the prairies lends itself to variable rate technology because the re-distribution of water results in variable crop yields on upper, mid, and lower slope soils. The researchers in this study have developed tools using digitized black and white aerial photos to separate soils into management units based on topography. These management units have been tested with wheat and canola using prescription fertilizer applications for 3 years.

Sub-optimal growing season conditions limited yields in 1998, but small differences in fertilizer response in the various management units occurred. Both canola and wheat had small yield increases in mid and lower slope positions when N rates were increased, and canola yields increased in response to adding more P in the lower slope positions. Results have been variable in this study, depending on the growing season, but generally have shown that the wetter, lower slope soils need more N and P than drier soils in upper slope positions.

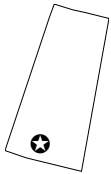


Impact of Zero-Tillage on Soil Quality Changes under Crop Rotations and Fertilizer Treatments in a Black Soil

Project Leader: Dr. Con Campbell, Agriculture and Agri-Food Canada, Soil Biochemistry, Central Experimental Farm, Ottawa, ON K1A 0C6 (613-759-1536).

The objective of this study was to determine how six years of zero-tillage management and cropping practices have affected potential soil fertility and surface soil structure in a 40-year crop rotation study. Results have shown the upper 3 inches of soil depth have been affected by zero-tillage and fertilizer treatments. Organic carbon and microbial activity have increased due to N and P fertilization. Fertilization has also increased the amount of N that is easily released from decomposing soil organic matter and the amounts of readily available soil P.

Results emphasize the importance of fertilization in zero-till production systems and demonstrate the positive effect fertilization and zero-till management can have on soil quality.



**Increasing Flax Yields:
A Closer Look at Fertilizer Utilization
and Weed Management**

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

Farmers have traditionally applied little fertilizer to flax because past experience has shown the seed is very sensitive to fertilizer. However, new placement options are available today, which may allow yields to be increased. The final year of a three-year project looking at improved fertilizer management in flax has been completed. An effort was made to find ways to improve P response by looking at several placement options (in-row, side-band, and pre-plant band). Where P response occurred, placement option had little effect, but response tended to be favored when P was side-banded with N. This project confirmed that care must be taken to minimize damage from fertilizer to a flax crop and that dual banding N and P is likely the best method of fertilizer placement.

Manitoba



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

Project Leader: Dr. Doug Derkson, Agriculture and Agri-Food Canada, Box 1000A, R.R. 3, Brandon, MB R7A 5Y3 (204-726-7650).

Time of fertilizer application and type of placement can increase the crop's ability to compete with weeds. A prairie-wide study is comparing spring and fall fertilizer application and herbicide rates in wheat and canola. Results show that herbicide rates can be reduced when used with N fertilization without reducing crop yields.

A subset of the above study has been evaluating the effect of P and K on the competitiveness of spring wheat and flax against wild oats for two years. No particular rate or placement has given a competitive advantage to the crop. Wild oat appears to have a greater ability to take up P and K than either wheat or flax. In this study flax has not been responsive to P or K. Wheat yields increased with high rates of P. Potassium increased wheat yields when soil K was low, but tended to depress yields when soil K was high. The negative impact may have been due to the particular variety of wheat used in the study.



**Chloride's Role in Maximizing
Wheat Variety Performance
(Multi-Regional Project)**

Project Leader: Dr. Cindy Grant, Agriculture and Agri-Food Canada, Box 1000A, R.R. 3, Brandon, MB R7A 5Y3 (204-726-7650).

Not all varieties of spring and winter wheat are sensitive to chloride (Cl) deficiency. Some respond to applied Cl while others do not. The problem is, it is not known which varieties are responsive. This study has been part of a large North American Cl trial investigating varietal response to Cl fertilization.

Fifteen varieties of spring wheat were sown with and without Cl at two locations on two different soil types in Manitoba for the past three years. Chloride fertilization increased grain yields on both soils, but response patterns were not the same from year to year or between locations. Several varieties responded on a clay loam soil, but not on a fine sandy loam, even though the latter had lower soil Cl levels. Chloride increased yields of one variety in five of six site-years and several others responded frequently. The inconsistencies observed in this study make general predictions of Cl response a challenge. However, it has made more farmers aware of the potential for Cl fertilization.



**Fertility Management of
Winter Wheat Grown after
Alfalfa**

Project Leader: Dr. Martin Entz, Department of Plant Science, University of Manitoba, Winnipeg, MB R3T 2N2 (204-474-8563).

Winter wheat is often planted into no-till alfalfa stubble. Its ability to effectively capture over-winter moisture helps offset the negative impact alfalfa can have on soil moisture. Alfalfa depletes the soil of moisture and plant nutrients, particularly P and K. However, many believe it contributes substantial N to subsequent crops.

This project is investigating the N requirements of winter wheat following alfalfa. Because winter wheat is often susceptible to Cl deficiency, the effects of Cl fertilization are also being evaluated. Initial results confirmed the beliefs that additional N was not required. Similarly, Cl fertilization did not increase yields in the first year of the study in 1997. The 1998 winter wheat crop did respond to N, but due to a mix-up, the Cl treatments were not applied. The study will be repeated for another year to generate additional Cl data. ■