

NEWS & VIEWS

A regional newsletter published by the
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Dr. T.W. Bruulsema,
Eastern Canada and
Northeast U.S. Director
June 1998

The Information Age... Soil Fertility Research for Production Agriculture

THE fertilizer industry is committed to the development of better crop production. This brief review of agronomic research projects in the Eastern Canada & Northeast U.S. region is a reflection of that commitment. These projects are supported by the Foundation for Agronomic Research (FAR), the Potash & Phosphate Institute (PPI) and the Potash & Phosphate Institute of Canada (PPIC), through financial and professional involvement. If you are interested in more detail, contact us for more information.

Ontario



Potassium Placement for Conservation-Till Corn Production in Ontario

*Project leader: Dr. Tony J. Vyn, Dept. of Plant
Agriculture, University of Guelph, Guelph, Ontario N1G
2W1. (519-824-4120 ext. 3397).*

Continued use of tillage practices with minimal soil disturbance can result in a stratified distribution of potassium (K) in the soil profile. Field experiments have been conducted for two years at two sites in Ontario to compare methods of K placement in combination with various tillage strategies in fields that have been in long-term no-till production. At a site where soil test K was in the medium range, corn yields responded in both years to 45 lb/A of K_2O , whether sidebanded at planting or broadcast the previous fall in no-till. For moldboard plowed corn, however, the optimum corn yield required 90 lb/A of fall broadcast K_2O supplemented by 45 lb/A of

K_2O side-banded at planting. Fall zone-tilled corn did not respond to K fertilizer placed at 6 inches depth. Soybeans following the first year's corn experiment responded strongly to the residual K fertility, both to the fall-applied and the spring-applied treatments. At the second site, soil test levels for K were in the high range and no responses occurred in either year. In all site-years so far, the early growing season weather has been wetter than normal. The project is continuing, and different results are expected in 1998 owing to much drier weather early in the growing season.



Surface Broadcast and Incorporated Lime: Impact on Soil pH, Soil pH Distribution and Soybean Yield Response to Fertilizers

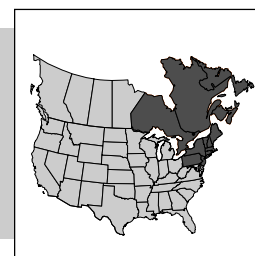
*Project leaders: Doug Young, Ridgetown College,
Ridgetown, Ontario N0P 2C0. (519-674-1631).*

*Dr. John Gaynor, Agriculture and Agri-Food Canada,
Harrow, Ontario N0R 1G0.*

In recent years, the Ontario soybean crop has expanded to exceed the acreage of corn. Yet, compared to corn, far less research has been done on its phosphorus (P) and K needs. Soybeans are more frequently planted with reduced or no tillage, and this raises further questions regarding optimum placement of P and K and its interaction with lime. The objective of this project is to determine the rate of reaction and depth of influence of lime in soil under reduced tillage systems, and to assess its effect on soybean yield response to applied nutrients. This study is being carried out with funding from the Fertilizer Institute of Ontario, the Canadian Fertilizer Institute, and three soil



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testing laboratories: Agri-Food Laboratories, Guelph; A&L Canada Laboratories East, London; and Stratford Agri-Analysis, Stratford. The project is being initiated in 1998. First results are expected in early 1999.



Potassium Sources for Soybeans

Project Leader: Dr. Dave Hume, Dept. of Plant Agriculture, University of Guelph, Guelph, Ontario N1G 2W1. (519-824-4120).

Little Ontario research has been done on soybean K needs. Recently, responses to residual K applications have been observed. In certain situations outside Ontario, some soybean cultivars have shown sensitivity to chloride (Cl). The relative Cl sensitivity of Ontario cultivars has never been tested. The objectives of this project are:

- 1) to determine whether Cl or magnesium (Mg) applied with K fertilizers influence soybean response to K.
- 2) to determine whether Ontario soybean varieties differ in response to K and sources of K.

Ten selected soybean cultivars will be evaluated for response to muriate of potash, sulfate of potash, and sulfate of potash magnesia in an on-farm trial near London. The project is being initiated in 1998. First results are expected in early 1999.



Impact of Fertilization Rates on Yield and Quality of Cabbage and Nitrate Leaching

Project Leader: Dr. Ivan O'Halloran, Dept. of Land Resource Science, University of Guelph, Guelph, Ontario N1G 2W1. (519-824-4120 ext. 2206).

This study was conducted for the last two years to assess the suitability of the current nitrogen (N), P and K fertilizer recommendations for many of the newer, higher yielding varieties of vegetable crops, such as cabbage, grown in Ontario. High rates of N increased cabbage yield economically, even though N use efficiency was low. The efficiency was improved by split application of N. Responses to P were in accord with current recommendations. Fertilizer K increased cabbage yield, at sites with soil test levels in the medium range. While current recommended rates for these sites were 45 to 90 lb/A, yield responses of about 3 ton/A required approximately 400 lb/A of K₂O. While the higher rates appeared to be economical, variability in the results led to the conclusion that further research would be required to justify changing the K recommendations.

Quebec



Soil Nutrient Buildup after Intensive Corn Production and Changes with Subsequent Corn and Soybean Production

Project Leader: Dr. A.F. MacKenzie, Professor of Soil Science, McGill University, MacDonald Campus, Dept. of Natural Resource Sciences. (514-398-7943).

Continuous production of corn can result in increased soil available P and K. The value of this increase in P and K will depend on the degree to which it becomes available to plants. This research has shown that there is considerable build-up of fertilizer P and K at high fertilizer rates (270 lb/A P₂O₅ and 360 lb/A K₂O). These very high rates have been applied each year for 13 and 9 years at two sites, in comparison with "normal" rates of 90 lb/A P₂O₅ and 150 lb/A K₂O. For the last four years, plots have been split to compare corn growing on residual fertility to that continuing to receive P and K fertilizers. Residual P and K following all fertilizer treatments was sufficient for supporting optimum corn and soybean yield even in the fourth year of drawdown. In the very high rate treatments, soil test P (Mehlich III) has declined by about 50 lb/A per year...roughly three times as much as crop removal of P. Soil test K has declined about 80 lb/A per year. In the "normal" rate treatments, four years of corn without P and K resulted in little decline in soil test P. Soil test K declined in the clay soil but not in the sandy clay loam. The results indicate that residual fertility can benefit crops for many years following buildup, but the very high rate as used in this study for many years was more than necessary, particularly for P.



Development of Plant-based Phosphorus Diagnosis in Timothy Grass

Project Leader: Dr. Gilles Bélanger, Agriculture and Agri-Food Canada, Ste. Foy, Sainte-Foy, Quebec G1V 2J3. (418-657-7985 ext 260).

Phosphorus concentrations in plant tissue can be diagnostic of fertility status, but the critical concentration varies with advancing growth and development of the plant. This project is designed to determine critical P levels for each stage of timothy plant growth, in a manner compatible with use of predictive crop growth models. Enhanced diagnosis of P deficiencies can be used as a tool to increase use of P fertilizers on grass hay and pasture crops, which are commonly underfertilized.

Prince Edward Island



Efficient Phosphorus Management for Potatoes

Project Leader: Brian Sanderson, Agriculture and Agri-Food Canada, Charlottetown Research Station, PO Box 1210, Charlottetown, PEI C1A 7M8. (902-566-6842).

Potatoes are the most important economic crop in Prince Edward Island. Phosphorus fertility is critical for both yield and quality of the crop, but a recent Round Table on the Environment questioned the sustainability and environmental impact of potato production. For these reasons, and for the health of the potato industry, it is important to document P rate recommendations and investigate methods of improving P uptake efficiency. Additionally, retailers have recently made MAP available as a P fertilizer source in addition to the traditional DAP. This project's objectives are twofold:

1. To assess the effect of P sources (DAP versus MAP), at different levels of soil pH, on P and calcium (Ca) uptake and yield of potato.
2. To evaluate the effects of placement (on the seed piece or topdressed before hilling).

This project was initiated in 1998. First results are expected to be available early in 1999.

Maine

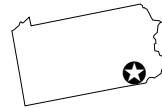


Nutrient Management Strategies for Increased Forage Production.

Project Leader: Dr. Mary Wiedenhoft, University of Maine, 5722 Deering Hall, Orono, Maine 04469-5722. (207-581-2951).

Across Eastern Canada and the northeastern U.S., more than 5 million acres of land produces mixed hay. The lost opportunities arising from under-fertilizing this crop could be in the neighborhood of \$300 million. The objective of this project is to investigate the influence of N, P and K fertilization on forage yield, persistence and quality. In particular, this study will compare manure and commercial sources of nutrients. In past years, hay yields have responded to both sources of nutrients. Yields were highest with commercial fertilizer, mostly attributable to nitrogen. However, applications of P and K have also contributed to yields, and have maintained soil fertility levels for more sustainable forage productivity.

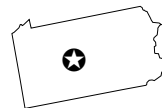
Pennsylvania



Optimum Corn Management Practices for Drought Prone Soils in Southern Pennsylvania

Dr. Greg Roth, The Pennsylvania State University, State College, Department of Agronomy, 116 ASI Building, University Park, Pennsylvania. (814-863-1018).

Drought risk is a major issue for corn producers in southern Pennsylvania. Growers often choose lower plant populations as one method of reducing the impact of drought on corn yield. The overall objective of these two studies is to evaluate hybrids, plant populations, and starter fertilizers under drought-prone growing conditions. Six commercial hybrids grown at populations ranging from 20 to 32 thousand plants per acre will be planted with and without a starter fertilizer (7-21-7). In a second study, nine different starter fertilizer treatments will be compared, each supplying 50 lb/A of phosphate (P_2O_5). This study forms one component of the Mid-Atlantic Regional Interdisciplinary Cropping Systems Project.



Phosphorus in Plant Biology: 1998 Penn State Summer Symposium in Plant Physiology.

Co-operator: Dr. Jonathan Lynch, Dept. of Horticulture, The Pennsylvania State University, University Park, PA 16802. (814-863-2256).

The 1998 Penn State Summer Symposium in Plant Physiology featured the theme "Phosphorus in Plant Biology: Regulatory roles in molecular, cellular, organismic, and ecosystem processes." This symposium, held May 28-30, 1998, in State College, Pennsylvania, served to uncover more knowledge of the role of P in plant regulatory processes. The impact of this conference will be to assemble the most recent scientific knowledge from internationally recognized researchers regarding the constraints imposed upon plant physiology by P limitations. Proceedings will be available by the end of 1998. ■

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