



Cor4-2011 - Building the Corn – Phosphorous Database

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Ontario Soil and Crop Improvement Association
And other Agricultural Organizations and Businesses

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Building the Corn – Phosphorous Database

Purpose:

The purpose of this project was to gather all previous Ontario based research that examined corn response to applied phosphorous fertilizers and develop a database. Phosphorous (P) fertilizer recommendations and strategies in Ontario could then be evaluated by the acquisition and analysis of these research trials.

Methods:

The results from 113 Ontario public research trials evaluating corn yield response to phosphorus fertilizers from 1967 to 2010 were entered into the database. Of the 113 trials, there were 71 trials which had multiple rates of phosphorus fertilizer where the maximum economic rate of phosphorus (MERP) was calculated. The other trials evaluated single application rates, multiple fertilizer products and/or placement options against a zero P control.

Results:

The analysis suggests that corn yield and economic return potential is currently not limited by phosphorus availability when following OMAFRA phosphorus fertilizer rate recommendations. Ontario P rate recommendations are often more than adequate for the current year's grain corn production requirements, particularly when soil tests are in the range of 6 to 12 PPM. (Note: all references to soil test P refers to the OMAFRA accredited sodium bicarbonate phosphorous soil test.)

Adjustment of MERP based on changes in the phosphorus: corn price ratio was determined to be relatively insignificant. For example, in the event that corn price doubles from \$4.50/bu to \$9.00/bu for a given P fertilizer price, the optimum P recommendation increases by about 9 lb/ac of P₂O₅. Adjustments in phosphorus fertilizer rates based on soil test results will have a much larger impact on net returns than attempting to make the minor rate adjustments associated with changes in corn prices and phosphorus fertilizer costs.

Application of seed-placed fertilizers at P₂O₅ rates between 11 to 18 lbs/acre increase overall profits about 50% of the time. The likelihood of observing an economic yield response to seed-placed starter fertilizer was relatively unaffected by soil-test P levels. For example, a profitable seed-placed P fertilizer response was almost as likely to be observed at a soil test of 25 PPM as it was at 10 PPM.

Applying P fertilizer in a 2 X 2 inch band (2 inches below and 2 inches to the side of the seed) was associated with significantly larger increases in yields and profitability when compared to broadcast-applied phosphorus (Table 1). Direct comparisons of banded and broadcast phosphorus fertilizer rarely occurred in the same trial. However trials with phosphorus applied in a 2 X 2 starter band tended to have larger yield increases compared to trials with broadcast-applied P when soil tests were within the range of 8 to 30 PPM.

Table 1. Comparison of average yield and economic responses to banding and broadcasting phosphorous fertilizer across 137 sites from 1970 to 2010.

	Banded	Broadcast	
Average Rate (lb-P/ac)	55 lb-P/ac	55 lb-P/ac	115 lb-P/ac
Average Yield Increase (bu/ac)	+10	+4	+2
Net Profit [†] (\$/ac)	\$14	-\$14	-\$54
Soil-test P (ppm)	15	17	16
Soil-test K (ppm)	125	135	132
Number of Sites	40	60	37
Corn Price \$4.50/bu; P Cost: \$0.55/lb P			

Next Steps:

The OMAFRA Field Crop unit will continue to use this database and work with other industry stake holders to improve P recommendations in the province to improve economic and environmental sustainability.

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