

NITROGEN SOIL TEST FOR CORN IN ONTARIO¹
E.G. Beauchamp, R.G. Kachanoski, T.E. Bates²

INTRODUCTION

It is generally believed that for high yielding crops such as corn, the N requirements are much larger than variations in the N supplying capacity of soil. In Ontario, fertilizer N recommendations are based on the requirements of the crop and, for some crops, the expected yield goal. Nitrogen credits are given for past management such as manure application and legumes in rotation. The credits are deducted from the economic rate of N.

In a recent analysis of all existing fertilizer N crop response trials in Ontario, a high negative correlation was found between check yield and most economic rate of nitrogen. This suggested that the N supplying power of different Ontario soils is sufficiently different that it cannot be ignored in determining the recommended rate of N fertilizer. More research is needed on estimating the N supplying capacity of Ontario soils.

In the absence of a soil test to estimate the soils N supplying capacity there seems to be little hope in refining the recommended rate of N. The fact that residual N from a previous years application of fertilizer may affect the yield response to applied N on the same plots in Ontario also suggests N carry-over from year to year. If N carry-over is occurring to the extent that it is affecting N response curves, than it should be possible to measure this carry-over with some sort of soil test.

The objective of this study was to determine the relationship between a spring $\text{NO}_3\text{-N}$ test (time of planting) and the response of corn to N fertilizer.

METHOD

Field studies were carried out on a total of 23 small plot and field plots during the 1986, 1987 and 1988 growing seasons. Each site had at least 5 rates of N fertilizer to determine the grain corn yield response to added N fertilizer. A least squares quadratic equation was fit to the yield response at each site, and the most economic rate of N fertilizer determined.

At each site, the soil was sampled at the time of planting at the 0-15 cm, 15-30 cm, and 30-45 cm depths. The soil samples were frozen shortly after they were taken and subsequently analysed for $\text{NO}_3\text{-N}$.

RESULTS AND DISCUSSION

The results of 23 plot years obtained from 1986 to 1988 are shown in Figure 1. They indicate that the maximum economic rate of N (MER N) determined from the corn yield response to applied fertilizer N was significantly correlated to the amount of $\text{NO}_3\text{-N}$ present at the time of planting.

¹Presented at the Nineteenth North Central Extension Industry Soil Fertility Workshop Nov. 8-9, 1989.

²Professor, Assistant Professor, and Professor, Dept. Land Resource Science, Univ. of Guelph, Guelph, Ontario, Canada N1G 2W1.

The data were obtained from trials representing different soils and climatic conditions and they provide optimism for the further development of a useful N soil test for corn. The relationship should enable us to objectively predict the quantity of N fertilizer to apply as a sidedressing for corn. Other limited field studies with potatoes and tomatoes have not shown as clear a relationship yet as that for corn.

It is recognized that more research is required to obtain further support for this relationship. It is also acknowledged that the practical implementation of this soil test is difficult logistically. For example a relatively large number of samplings and analyses would be required within a normally busy 2-3 week period so that additional N might be applied before corn plants attain the 8-10 leaf stage. Research is needed to determine the feasibility and development of a rapid, accurate N soil test.

ACKNOWLEDGEMENT

The contributions of John Heard (OMAF), Ed Tomescek (OMAF) and Sam Squires (OMAF) are acknowledged in these studies.

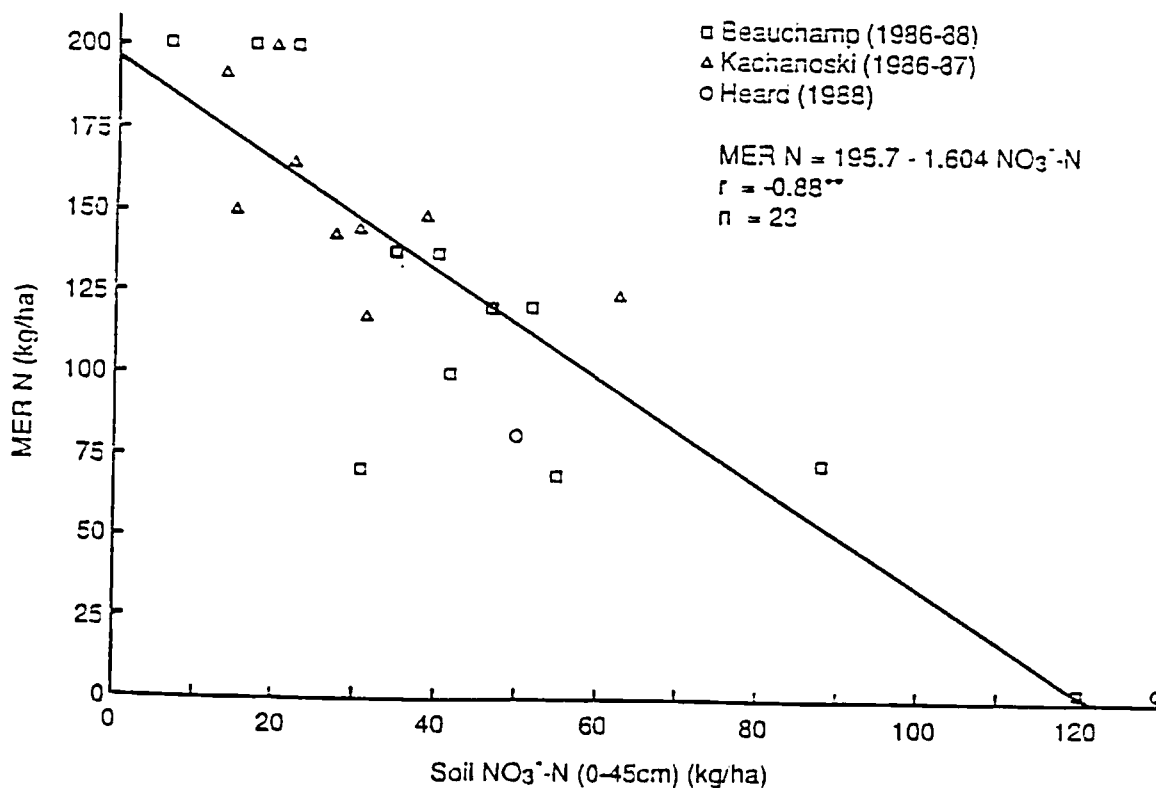


Figure 1: Maximum economic rate of N fertilizer (MER N) versus the amount of Soil NO₃-N present at time of planting.

PROCEEDINGS OF THE NINETEENTH
NORTH CENTRAL EXTENSION - INDUSTRY SOIL FERTILITY CONFERENCE

November 8-9, 1989, Holiday Inn St. Louis Airport
Bridgeton, Missouri

Volume 5

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Department of Agronomy
University of Illinois
Turner Hall
1102 S. Goodwin Avenue
Urbana, IL 61801