REPORT OF PROGRESS
to the
POTASH AND PHOSPHATE INSTITUTE
and
FOUNDATION OF AGRICULTURAL RESEARCH

Spatial Variability of Choride
Project ND-8F

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Introduction

This is a report of progress for the first two years of a three year study on the soil variability of choride. Although most Northern Plains producers soil sample for NO_3-N, chloride is an important component of sampling. Current sampling guidelines for composite soil sampling may overestimate the amount of nutrients in a field, leading to under-fertilization of nutrients, including chloride. The objectives of this study are to determine how chloride varies across fields and determine whether sampling strategies directing NO_3-N represent chloride levels as well.

Methods

Samples were obtained in a 110 foot grid from three forty acre fields and part of an 80 acre field. The rest of the 80 acre field was sampled in a 150 foot grid. These field had also been sampled the previous year in the same grid. Sample cores were separated into a 0-6 inch depth and a 6-24 inch depth. Chloride was analyzed on each depth. Topography was measured using a laser-leveling device for relative elevation.

Results

Chloride was variable at all sites in all years. The chloride levels were related to landscape position, with upland positions generally lowest and depressional positions highest. A comparison of chloride sampling using a 220 foot grid or topography-based sampling showed that topography-based sampling was equal to or superior to the 220 foot grid sampling. Topography-based sampling would reduce expenses necessary to variably sample for within-field chloride, and the method has also been found to be appropriate for NO_3-N sampling, allowing both nutrients to be sampled for without additional sampling.

Publications

Two significant publications have been presented as a result of this work.

Franzen, D.W., A.D. Halvorson, V.L. Hofman, and L.J. Cihacek. 1998. Variability of soil pH, chloride and zinc in the Northern Plains. *In* 1998 Great Plains Soil Fertility Conference Proceedings, A.J. Schlegel (ed), 2-4 March, 1998, Denver, CO., P&PI, Brookings, SD.

and

Franzen, D.W., L.J. Cihacek, V.L. Hofman, and L.J. Swenson. 1998. Topography-based sampling compared with grid sampling in the Northern Great Plains. J. Prod. Agric. 11:364-370.

A publication dealing with the effect of rotation and topography on soil nutrients, including chloride is in review with the Journal of Precision Agriculture.

Summary

In the first two years of the three year study, chloride has been related to topography at all sites through the rotations at each site. The third year will further define the relationship, as well as offer more information regarding the influence of year and rotational crops. Support for this effort from FAR has been appreciated. Additional support for this project has been received from a USEPA 319 Water Quality grant, Agrium, the Sugarbeet Research and Education Board of Minnesota and North Dakota, and the Soil Conservation Districts of Wild Rice, Cass and Stutsman counties.

Plant Available Potassium in Eastern South Dakota Soils

In 1997, a survey of K deficient fields in eastern South Dakota was implemented. This survey was prompted because of increased reports of K deficiency under reduced till planting systems. Since then, K deficiencies have been noted in conventionally tilled soils as well. The survey to date shows that bulk density may have an inverse effect on plant K uptake, but this effect could be masked by the fact that some corn hybrids are much more efficient at mining soil K. Also, the current chemical predictor of plant K (ammonium acetate) is not doing an adequate job under certain soil conditions, and that other extractants may prove more successful. Other research have shown that reduction events can lead to an increase in fixed K, and possibly reduce the potential for plant K uptake. In a greenhouse study we found that reducing eastern SD soils results in a slight increase in plant available K. This result was not expected and efforts are currently underway to explain these results.