2001

Lime Rates and Sources

Carroll Olsen
Iowa State University

Bernard J. Havlovic
Iowa State University, bhavlovi@iastate.edu

Lime Rates and Sources

Abstract
A lime rate and source study was implemented in 1996 at the Armstrong Research Farm to observe liming practices in no-till situations. The addition of lime to raise pH to 6.5 for row crops has been a long-standing recommendation. Those recommendations have included thorough mixing of the lime material with the soil which might be expected from normal tillage practices. This study will measure any corn and soybean yield changes, and the possible stratification of soil pH over time using no-till production practices.

Disciplines
Agricultural Science | Agriculture

Lime Rates and Sources

Carroll Olsen, extension crops specialist
Bernie Havlovic, superintendent

Introduction

A lime rate and source study was implemented in 1996 at the Armstrong Research Farm to observe liming practices in no-till situations. The addition of lime to raise pH to 6.5 for row crops has been a long-standing recommendation. Those recommendations have included thorough mixing of the lime material with the soil which might be expected from normal tillage practices. This study will measure any corn and soybean yield changes, and the possible stratification of soil pH over time using no-till production practices.

Materials and Methods

A study was initiated in 1996 to study the effects of pH on yield in a corn-soybean rotation using no-tillage. All weed control is accomplished through the use of chemical applications. A randomized complete block experimental design was used. Eight treatments, including a check, were made in the spring of 1996. Rates of agricultural lime on a per acre calcium carbonate equivalent (CCE) were 500 pounds, 1,000 pounds, 2,000 pounds, 4,000 pounds and 6,000 pounds per acre. Pell lime was applied at calcium carbonate equivalent (CCE) rates of 250 pounds and 500 pounds per acre. All treatments were broadcast and no tillage was used to incorporate the product. Treatments were replicated three times. The area was field cultivated in the fall of 1995.

Six inch soil samples were taken prior to the 1996 material application. Individual plot pH averages varied from 5.65 to 6.80. Soil samples at the 0-3 inch depth and 4-6 inch depth have been taken in the fall of 1996, 1997, 1998, 1999 and 2000 to check for stratification, including phosphorous and potash.

One hundred and forty pounds of actual liquid nitrogen was broadcast on the 1997 corn crop, and 150 pounds of actual nitrogen was injected pre-plant for the 1999 corn crop. No other fertilizer has been applied to the plot because the phosphorous and potash levels were in the optimum to excessive ranges for a Marshall soil.

Results and Discussion

As noted in Table 1, there has been no difference in yield between treatments. This is consistent with current research that says soybean yields will not be depressed at a pH above 5.8, and corn yields will not be depressed at a pH of 6.0 or above. We would not expect the pH to be lowered rapidly because nitrogen has only been applied one time over the three-year period. There is a trend toward higher pH as application rates are increased.

Stratification of pH will also be followed over the next several years. Table 2 shows the soil sample results at the 6 inch depth prior to the study and the 0-3 inch depth and the 4-6 inch depth in the first fall of the plot, 1996, and for 2000. All treatments, including the check, show some stratification between the two sample depths. The stratification of the check treatment probably is related to residue and past tillage. The addition of residue to the soil surface tends to concentrate calcium and magnesium, and tillage, such as field cultivating or disking, does not thoroughly mix the soil to dissipate the concentration of calcium and magnesium in the upper soil area.

Time, as well as amount of liming material, is an important element affecting pH changes. The pH difference between the two sampling depths has remained relatively stable since the first split samples were taken in the fall of 1996.