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Soil Sampling in Reduced Tillage

Studies on no-till corn compare various sampling procedures for evaluating extractable P and K levels on a fertilized soil.

The objective in our research was to compare various sampling procedures for evaluating extractable P and K levels on soils having P and K either not applied or applied at 100 lbs/A P_2O_5, plus 50 lbs/A K_2O. Three NPK infurrow combinations were also applied at planting. No tillage corn had been grown in a chemically killed wheat cover crop on a Loring silt loam the three previous growing seasons.

Experimental design

A randomized complete block with split-plot arrangement was used for fertilizer placement combinations. Main plots were non-broadcast or surface broadcast at the rate of 50 (K_2O) + 100 (P_2O_5) lbs/A. NPK infurrow subplot treatments were either not applied or applied at 10 + 30 + 10 lbs/A and 10 + 30 + 0 lbs/A. The P_2O_5 and K_2O rates were applied about two weeks before planting. In-furrow treatments were applied at planting. All plots were fertilized with 150 lbs/A of nitrogen as UAN, placed two inches deep and two to four inches to the side of the planted row.

Soil samples were collected in late March after three corn crops. Sampling positions compared were: 1) row, 2) interrow (middle), 3) equal-sample volumes combined from row and interrow, and 4) random sampling. For random sampling, an attempt was made to obtain samples without regard to the row in which the fertilizer was band-applied, although no surface spatial randomizing pattern was used. Soil was sampled with a 0.75 inch diameter soil tube at three depths: 0 to 3, 3 to 6. and 0 to 6 inches.

Sampling results

Extractable P and K levels were significantly affected by sampling position and surface fertilizer applications at all three soil depths. The in-furrow applications affected extractable levels at all depths, except the K level at 0 to 6 inches. Extractable P was affected by sampling position at all depths. Row sampling at 0 to 3-inch and 0 to 6-inch depth resulted in higher levels of P, followed by row + interrow, random, and interrow sample positions.

Random sampling was the best procedure for estimating extractable P after 30 lbs/A of P_2O_5 were applied in-furrow for three consecutive years for both surface broadcast rates. It also appeared to be a satisfactory sampling procedure for evaluating extractable K. However, in this study, horizontal stratification of K accumulation with the row had occurred and prevented an accurate estimate of soil test K.

Sample position did not have an effect on P extracted from the 0 to 3-inch depth when P_2O_5 was not applied in-furrow. Extractable P averaged 7 and 29 lbs/A (four sampling positions) in non-banded plots having either no application or receiving broadcast applications of 100 lbs/A of P_2O_5.

Extractable P in the 0 to 3-inch row samples averaged 36 and 53 lbs/A, respectively, when 30 lbs/A of P_2O_5 were applied in the furrow in conjunction with either no broadcast application of P or broadcasting P_2O_5 at 100 lbs/A. Variations in P concentration of row sampling from banded plots were greater than those observed for the interrow sampling positions.

The row sampling position was located using the residue remaining from the previous no-till crop, which was also used as a guide at planting. Assuming the row samples allowed evaluation of total P_2O_5 applied in the band, extractable P in the row was increased an average of 29 (36-7) lbs/A when no P was applied and 24 (53-29) lbs/A when 100 lbs/A of P_2O_5 were applied.

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