THE UPTAKE OF NATIVE AND APPLIED PHOSPHORUS BY CORN CROPS GROWN ON CERTAIN KENTUCKY SOILS

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The application of liming materials and phosphate fertilizer is perhaps the most important farm practice in maintaining and increasing crop yields on the poorer soils in Kentucky. Their use has not only caused a marked increase in yield, but also has caused a considerable increase in the phosphorus content of the crop. Recent investigations (4, 5) indicate that phosphorus is one of the elements associated with the quality of the corn crop, and the phosphorus supply in the soil should be of special interest to the farmer. Previous work from the Kentucky Agricultural Experiment Station has shown that the growth and mineral composition of the corn crop are influenced by the phosphorus supply in the soil (3, 6). A correlation between uptake of this element and growth and quality of the crop was indicated. The degree of this correlation is, of course, dependent on the amount of phosphorus available to the crop, whether other elements besides phosphorus are limiting, and the effect of these other elements on the availability and utilization of phosphorus by the plant. Seasonal or climatic factors seem to have an important influence in this uptake.

It is the purpose of this investigation to point out the relationship between the phosphorus supply in the soil and the uptake of phosphorus by a number of corn crops grown on two of the Kentucky soil experiment fields.

MATERIALS AND METHODS

Samples of several corn crops grown on differently treated plots at the Berea and Campbellsville soil experiment fields were used in this study. Data from the 1938, 1939, and 1941 crops of the Berea field and all crops from 1937 to 1941, inclusive, of the Campbellsville field are reported. The data for the 1940 crop at Berea are not included because part of the samples from this field for that year were damaged and lost. Previous to 1940, two adapted varieties of corn, one a hybrid and the other open pollinated, were grown on each plot at both fields. The Ky. D-69 hybrid variety was used exclusively at both fields in 1940 and 1941.

All plots were sampled at harvest time according to a definite plan. The same number of stalks were taken from each plot, tied into loose bundles, and dried thoroughly in a well-ventilated room. Grain and stover (including cobs) were then separated and the whole sample of each was ground in a small hammer mill with an 0.8-mm screen. These samples were mixed and a portion stored for analysis.

Phosphorus content of grain and stover of each variety for all crops was determined after extraction with 0.05 N sulfuric acid, and is expressed on the air-dry weight of wheat grain.

The effect of soil and season on yield and phosphorus content of corn grain and stover is shown in Table 2. Yields on the Berea field are lower and somewhat more variable than those at the Campbellsville field. This is due partly to season but mainly to the fact that drainage is much poorer on the Berea field than at Campbellsville; in spite of this, the field has been tile drained. The phosphorus content of the crops is not greatly different between the two fields and is not as variable from year to year.

At the Berea field yields were best in the second season and poorest in 1939. The rainfall during the second season was 2 to 3 inches below normal, whereas in 1939 the rainfall was slightly above normal. For the years 1938, 1939, and 1941, yields on the Berea field were 20, 90, and 90, and on the Campbellsville field 80, 100, and 100, respectively. Phosphorus content of grain and stover of each variety for all crops was determined after extraction with 0.05 N sulfuric acid, and is expressed on the air-dry weight of wheat grain.

YIELD AND PHOSPHATE CONTENT OF CORN Grain and stover were analyzed for total phosphorus by the method of Gieseking, Snider, and Getz (2). Values were accepted that checked within 2.5% of the original treatment. The phosphorus content of the crops is not greatly different between the two fields and is not as variable from year to year.