A detailed investigation is being made at the Kentucky Station of the effect of long continued phosphorus fertilization and liming treatment on the chemical composition of soils and crops. For this purpose materials are available from the Kentucky soil experiment fields which include some of the oldest and most complete field experiments with phosphate fertilizers in the country. It is the purpose of this paper to give a preliminary report and part of the data obtained on the percentage of certain chemical constituents in corn crops grown on two of these fields, Berea and Campbellsville, and to indicate how the amounts of these constituents are affected by soil treatment.

A number of investigators have reported on studies of the composition of the corn plant in relation to soil treatment. The most extensive recent investigation of this relation is Wimer's (9) which was limited to a study of mature corn stover. He showed in his study of crops from twelve fields that limestone and fertilizer treatments in general affect the composition of stover directly in proportion to the amount and kind of fertilizer used. Scovell and Peter (7, 8) made an early study of this kind on a highly phosphatic "blue-grass" soil in central Kentucky. They reported considerable increase in yield especially from potash fertilizer but the composition of neither grain nor stover was consistently affected by the use of this fertilizer. Nitrogen fertilizer had less effect on yield but increased the content of this element in the plant, particularly in the stover. Phosphorus had no effect on either yield or composition. Numerous other workers have found that fertilizer treatment and liming affected the composition of grasses other than corn to a marked degree. Among those who have made recent extensive field studies with some of these grasses are Cooper, et al. (2) working with carpet grass and Pierre and Robinson (5) working with four or five different species of pasture grass.

DESCRIPTION OF FIELDS

Both the fields on which the corn for these experiments was grown are located on soils derived from sandstone and shale; the shale from which the Campbellsville soil contains considerable calcareous material. Neither of these soils has been mapped and it is not definitely known to what series they belong, though each is typical of its respective locality. Both soils are fairly well drained, the one at Campbellsville naturally so and the one at Berea has been made so by tiling. The Berea soil contains 14.0% and the Campbellsville 16.7% clay <0.002 mm. The soil of each field is low in phosphorus. Various lime, phosphorus and potash rates have been used on the plots of each field to determine the fertilizer and soil management practices are best adapted to the soils of the respective localities. Results of these experiments show that crops on both respond most markedly to limestone and phosphate fertilizers. A detailed description of this work has recently been reported by Roberts and Kinney (6).

At the Berea field, on which cropping was begun in a 4-year rotation of corn, rye, and two years of mixed grass and legume hay is used. All fertilizers are added at seeding of the corn crop. Manure is used on all but one plot, in amounts shown in tables by figures in parenthesis, and twice this rate of application. After two rounds of the rotation, fertilizer rates were reduced one-half. Further, beginning in 1930, all fertilizers were discontinued on the "a" half of each plot except on plot 2 where triple superphosphate and finely ground rock phosphate were applied to the "a" and "b" halves, respectively.

At Campbellsville, where cropping was begun in a 3-year rotation of corn, wheat, and mixed grass and legume hay is being used with fertilizers added ahead of corn. Manure is added as at Berea to all but one plot and in proportion to the crops removed. Sixteen per cent superphosphate, or 20 per cent of basic slag, was used originally on certain plots at the rate of 600 pounds per acre per rotation except where otherwise shown in tables by figures in parenthesis, and twice this amount of rock phosphate was used. Beginning in 1930, these amounts were reduced or discontinued on the plots of the larger applications (6).

Potash fertilizers have been used on several plots in each field at such a rate that these plots have received about 50 pounds of muriate of potash. Sodium nitrate was used on some of the Campbellsville plots at the rate of 50 pounds per acre per rotation, half going on ahead of corn and half ahead of wheat. In 1930 this was reduced to 30 pounds per acre in the hill at corn planting time. Limestone was applied to the limed plots in amount of 5.75 and 4 tons per acre, respectively, at Berea and Campbellsville.