THE COMPOSITION OF CORN, OATS, AND WHEAT AS INFUENCED BY SOIL, SOIL TREATMENT, SEASONAL CONDITIONS, AND GROWTH

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In recent years, the chemical composition of farm crops has come to have increasing importance. The reasons are numerous; some are of immediate economic importance, while others are primarily of academic interest at the present time.

Most of the results reported here were obtained in a study begun in 1936 with the object of determining the effects of soil, soil treatment, seasonal conditions and growth upon the chemical composition of farm crops. This paper deals mainly with the composition of corn, oats, and wheat. In order to include a wide range in soil characteristics, a field of high and one of low productivity were used. The soil of the field at Aledo, Illinois, is in early maturity as to stage of development, and is highly productive. That of the field at Toledo, Illinois, was old before it was ever cultivated, and has low productivity. On each of these fields, crops were grown with various fertility treatments, particularly to study the influence of lime, phosphorus, potassium, and legumes. Seasonal effects were shown by continuation of the study through the growing seasons of 1936, 1937, and 1938.

The soil at Aledo is Grundy silt loam, more grayish in the B horizon than typical areas. It is high in organic matter, and productive, but somewhat in need of limestone. The grain crops were grown in a four-year rotation of corn, corn, oats (hubam clover green manure), and wheat (sweetclover green manure). The productivity of the Toledo field, located on Cisne silt loam, is low due to several reasons. The soil is in a very advanced stage of development, lies level, is poorly drained because of a highly impervious claypan, highly acid, low in organic matter content, and deficient in available potassium, phosphorus, calcium and nitrogen. The rotation used is corn, oats, mixed hay, and wheat residues, limestone, rock phosphate, phosphoric acid (RLrPK).

The years covered in this study varied remarkably as to weather conditions during the growing season. The summer of 1936 was very hot with little rain. For 14 consecutive days in July the maximum daily temperature was 100° or higher, with two exceptions of 98° and 99°. Twenty-four days of this month the maximum temperature was 90°. August of 1936 had a less severe hot period. The summers of 1937 and 1938 were more favorable to crop growth in regard to temperature and fall distribution. This was especially true for corn.

Corn yields (Fig. 1) reflect directly these weather conditions. In 1936, at Aledo, the yield was just 50% of the 3-year average; in 1937, the most favorable year of the three studied, the yield was from 11 to 24 bushels per acre greater than the average and may be considered an approximately normal year for corn production. The yields were very close to those of the 3-year average.

At Toledo, also, the yields were low in 1936. It is interesting to note that on the poor soil of this field the corn yield on the completely fertilized (RLrPK) plot, while below the average for the field, equalled that of any of the plots at Aledo that year. Years 1937 and 1938 produced yields

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