ASSOCIATED with the normal Webster soils of Iowa are numerous small areas of soil which contain 10 to 30% of Ca and Mg carbonates. Owing to their limited extent, these soils are included with those of the Webster series, but commonly they are referred to as high-lime soils to distinguish them from the normal soils of this series which are neutral or only slightly calcareous. Corn makes good growth and excellent yields on normal Webster soils. On high-lime soils, however, this crop exhibits marked K-deficiency symptoms and gives large responses to K fertilization.

The causes of this K deficiency in corn have been studied in some detail by Allaway and Pierre (1), Stanford, et al. (13), and Kelly (10), largely by comparing the chemical composition of the soil, the soil solution, and the corn plants in high-lime and adjacent normal soil areas. The results of these investigators show that, although normal soils usually contain more exchangeable K, the high-lime soils, in many instances, contain as much as 175 to 200 pounds per acre (2,000,000 pounds of soil) of this element in exchangeable form, which amounts are ordinarily considered sufficient for corn on acid soils. Furthermore, their studies show that the soil solution and the corn plants in high-lime soil areas contain unusually high amounts of Ca and Mg as well as low amounts of K, and that the Ca and Mg to K ratios of the soil solution and corn plants are much larger in high-lime than in adjacent normal soil areas. It was also shown that the high Ca and Mg contents of corn on high-lime soils were decreased by the application of K fertilizer. In view of these findings, as well as others (2, 7, 11) concerning the effects of high concentrations of Ca and Mg on plant absorption of K from culture solutions, these investigators were led to believe that the high Ca and Mg contents of the soil solution of high-lime soils have a repressive effect on K absorption by corn. Pierre and Bower (12) have suggested that this repressive effect is probably accentuated by the high NO₃-N contents and high pH values of these soils.

While K deficiency in corn grown on high-lime soils is usually extreme, it is only rarely that deficiency symptoms are noted in crops which absorb large amounts of Ca and Mg in relation to K, such as sweet clover. This observation suggests that the repressive effects of high concentrations of Ca and Mg on K absorptions by different crops varies according to the amounts of Ca and Mg which they absorb in relation to K. To test this hypothesis, the K response of seven different...