Potassium Helps Put More Nitrogen into Sweetclover

WM. A. ALBRECHT, A. W. KLEEME, AND WM. MIERKE

SOME tests with sweetclover as the green manure crop in a rotation grown on Putnam silt loam on the South Farm of the Missouri Experiment Station in 1947 demonstrated that potassium as well as calcium is needed if this crop is to be a producer of considerable tonnage of vegetative bulk. Potassium also demonstrated its service in raising the concentration of nitrogen in the crop, and, presumably thereby, the fixation of nitrogen from the atmosphere.

PLAN OF THE STUDY

The sweetclover studied is the legume crop in a four-year rotation of corn, oats, wheat, and sweetclover. The soil treatments on the respective three plots include the basic addition of calcium in limestone at the rate of 2 tons per acre every 8 years. In addition, there is a superphosphate application of 475 pounds per rotation and a potash application of 475 pounds as a 0-20-20 fertilizer per rotation on this plot.

The crop harvests for forage yields were taken, and the plants divided into tops and roots with the customary "stubble" included with the tops by dividing at the soil surface line of the plants. The data for the crop weights according to soil treatments are given in Table 1. The weights of the tops and roots may well be compared by the ratios given in the table when calculated with the roots taken as unity. In order to measure the yields and concentration of nitrogen, the plant parts were finely ground in a special hammer mill and the nitrogen determination made on the oven-dry weights of the samples. The data are presented for the nitrogen in the plant tops and in the roots as total harvests in pounds per acre and also in terms of the concentration of the nitrogen in the vegetation as pounds per ton. Then there are given the ratios of nitrogen per acre in the tops to that in the roots, and the ratio of the nitrogen per ton of tops to that per ton of the roots.

RESULTS

ROOT-ROT LESS WITH POTASSIUM APPLIED

Observations made on the sweetclover on approaching maturity showed a crop of heavier stems, more dense in growth, and taller as the additional soil treatments were applied (Fig. 1). It was especially interesting to note that the nearly mature plants could easily be pulled up from the soil where lime only was used. They were pulled up with more difficulty on the plot with lime and phosphate, but it was impossible to pull them up by their roots where lime, phosphate, and potash had been used as soil treatments.

Examination of the roots led a plant pathologist to declare that the root-rot disease was prevalent on the plants grown where the potash had been omitted, but he considered very little of this disease evident on the plants grown with the added potash. Here is the suggestion that when the plant physiology was considered and provision was made for better nutrition through the addition of potassium to balance the generous application of calcium, there was little damage from the disease.

1 Contribution from Department of Soils, Missouri Agricultural Experiment Station, Journal Series No. 1119. Received for publication July 8, 1948.

2 Professor of Soils, Extension Professor of Soils, and Graduate Student in soils, respectively.