The Effect of Rate of Nitrogen Application Upon the Weight and Nitrogen Content of the Roots of Sudan Grass

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The importance of the roots of various cultivated crops in the maintenance of soil organic matter has received increasing emphasis in recent years. In our own work it was found that, under greenhouse conditions, where five successive crops (four of Sudan grass and one of wheat) were grown on the same soil, its carbon content was increased about 30% over the control by the use of an abundant supply of nitrogen. In these experiments the root residues were the only source of added carbon. Usually any change in growth conditions or treatment that increases the yield of the above-ground portion of the crop will also increase the quantity of roots produced but not necessarily proportionately. There is much information now available, which need not be reviewed here, that gives the average percentages of the total dry weights of various plants that are present in the roots. It is also known in a general way that the top-root ratio of a given crop may change with the age of the plants, rate of nitrogen application, abundance of phosphorus, length of day, degree of soil aeration, and other factors. There is, however, only a limited amount of information concerning the effect of these variables upon the root weights and nitrogen contents of any given crop. In connection with work already reported in part and other work in progress, it was desirable to have quantitative information upon the proportion of the total dry weight and protein of Sudan grass that is present in the roots harvested at various stages of maturity. An experiment designed to obtain these data is reported here.

EXPERIMENTAL

The experiment was conducted in the greenhouse using 2-gallon glazed pots that held 20 pounds of Evesboro loamy sand. This soil was limed to a pH of approximately 6.5 and 2 weeks later a basal application of 1,000 pounds per acre of a 0-15-6 fertilizer was made to all pots which were then planted to Sudan grass. This was done in order to remove most of the available soil nitrogen prior to starting the main experiment. Both the tops and roots of the grass were removed when the crop was about 2 feet high. The soil from all of the pots was then mixed together and repotted. A second application of 1,000 pounds of the 0-15-6 fertilizer was added to all pots, together with an adequate supply of boron, copper, zinc, manganese, molybdenum, and magnesium. In addition, nitrogen in the form of urea was added to the various pots to furnish from 0 to 200 pounds of nitrogen per acre, as shown in Table 1.

All treatments were in duplicate and provided for harvests at three stages of maturity. The pots were arranged in randomized blocks and were rotated within

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