

CHRISTENSON, DONALD R.* , AND G. M. ZINATI. Crop and Soil Sciences Department, Michigan State University, East Lansing, MI 48824. - Nitrogen uptake by sugar beets from various depths in the soil.

Sugar beets (Beta vulgaris L.) obtain mineral N (NO_3 and NH_4) from depths of one meter in the soil or more. Formulating N recommendations based on soil tests for mineral N requires an understanding of the relative quantity of N which can be extracted by the sugar beet crop from the sub-soil. It is also important to understand at what time during the growing season the roots intercept this N. This research was undertaken to evaluate 1) at what time during the growing season sugar beets remove mineral N from various depths and 2) to estimate how much of the nitrogen taken up by the plant is removed from each depth. The experiment was conducted on two sites in each 1989 and 1990. The soil series were Parkhill loam and Saginaw silty clay. The experiment was designed with depth of application as the treatment. At 5-6 weeks after planting ^{15}N was placed at 30 cm intervals from the surface to 150 cm. A surface application was included to estimate the amount of N obtained from the applied fertilizer. Soil samples were taken during the growing season to estimate the enrichment of the layer with ^{15}N . Leaf disks were removed every 14 days after application and analyzed for the isotope. Presence of the isotope in the youngest leaf blade on a given date indicated that the root had begun to remove nitrogen from the given treatment depth. Whole plants were harvested in September and analyzed for the isotope and total N after determination of dry weight. Uptake from a given depth was calculated from soil and plant ^{15}N atom excess. Sugar beets removed N from the 90 cm depth within 9 weeks after planting, 120 cm within 11 weeks and 150 cm within 12 weeks irrespective of soil series or year. The amount of N removed from fertilizer ranged from 15 to 54% with the amount being less on the Parkhill than the Saginaw soil. The amount removed from each depth was averaged across all experiments and were as follows: 14, 11, 10, 9 and 9 for the 30, 60, 90, 120 and 150 cm depths, respectively. The amount obtained below 60 cm was fairly constant across years and experiments. These data suggest that sugar beets obtain most of the nitrogen from fertilizer and the surface 60 cm of soil. It appears that a soil test for mineral N to this depth should be adequate for sugar beet production.