

Research Report

Sugar Beet Conference, Fort Collins, Colorado

February 5, 6, 1974

Prepared by J. O. Reuss, January 14, 1974

- A. Location of Project: Eastern Colorado
Colorado State University
Fort Collins, Colorado
- B. Work Reporting Unit Title: Prediction of Nitrogen Fertilizer Requirements of Sugar Beets by Soil Analysis
- C. Work Reporting Unit No.: Not applicable
- D. SMY's for Past Year at Location: Not applicable
- E. Names of Scientists in Project at Location: J. O. Reuss
A. E. Ludwick
J. F. Giles

F. Mission of Research:

To improve sugar beet crop quality through more effective management of nitrogen fertilizers, specifically by developing nitrogen fertilizer recommendations based on soil tests; to test the applicability of nitrate nitrogen soil tests for this purpose in light of previous research that gave encouraging results.

G. Objectives of Research:

To evaluate the effectiveness of nitrate nitrogen soil tests in predicting the fertilizer nitrogen requirements of sugar beets; to determine whether the predictive value of nitrate nitrogen soil tests can be improved by the inclusion of other soil parameters; to determine the effect of depth of sampling on the predictive value of nitrate nitrogen soil tests over a range of soil types and crop history situations; to determine the range of soil nitrate levels commonly encountered on sugar beet fields in Colorado.

H. Research Accomplishments:

Correlation of nitrate nitrogen soil tests with fertilizer response of field experiments demonstrates that soil nitrate measured at planting time is an effective method of predicting crop nitrogen status and fertilizer needs. Yield response to nitrogen fertilizer, sucrose content, petiole nitrate, and total plant nitrogen are all sufficiently related to soil nitrate levels to justify the use of nitrate soil tests in making fertilizer recommendations. Data from the Colorado State University Soil Test Laboratory and other sources indicate that a wide range of soil nitrates is encountered in Colorado beet fields. About

half the fields require no additional fertilizer for beet production and nitrate levels in some cases are sufficiently high that production of high quality beets is doubtful. A minority of fields will require heavy nitrogen fertilization for adequate production.

I. Impact of Research Accomplishments on Science and General Public:

The concept that nitrate nitrogen levels in soils are not a good measure of fertilizer needs has become entrenched among soil scientists to the point where it is still widely accepted. Actually, during the past few years a number of publications have appeared showing that such tests are very useful and use of these tests has progressed rapidly in the western United States. The present work has demonstrated this established concept to be false under conditions of Colorado beet production, as nitrate tests do prove effective. Sugar beet processors are presently rapidly encouraging growers to utilize these tests and in some cases are investing in sampling and analytical capability as a means of improving crop quality through nitrogen management.

J. Obstacles to Achieving Objectives:

In general, progress has been excellent and the present phase of the project is scheduled for completion by mid-1974. Some difficulty has been encountered in determining optimum sampling depths and this objective may be only partially achieved.

K. Future Plans and Needs:

At present the major uncertainty in fertilizer recommendations for sugar beets based on nitrate soil tests lies in our lack of knowledge of variability within fields. We have insufficient basis for developing recommendations for sampling procedures on a field basis. Present plans are to investigate variability in space and time in sufficient fields to serve as a basis for such recommendations.