

LAMB, JOHN A.^{1*}, GEORGE W. REHM¹, MARK W. BREDEHOEFT², STEVE R. ROEHL², and JOHN A. FISCHER², ¹Department of Soil, Water, and Climate, University of Minnesota, 439 Borlaug Hall, 1991 Upper Buford Circle, St. Paul, MN 55108, and ²Southern Minnesota Beet Sugar Cooperative, P.O. Box 500, Renville, MN 56284. **Nitrogen fertilization management and soil nitrate use for sugar beet grown in Southern Minnesota.**

Nitrogen fertilizer management continues to be paramount for efficient sugar extraction and top economic returns in Minnesota. A three year study was conducted to determine the effect of previous crop (corn or sweet corn), fall or spring N fertilizer application, N fertilizer application rates, and the use of a nitrate-N soil test for N fertilizer recommendation for sugar beet production. The study was conducted at ten locations; three in 1998, one in 1999, and six in 2000. Sugar beet root yield, sucrose concentration, and loss to molasses were measured while recoverable sucrose was calculated from these measurements. To improve the predictive ability of a nitrate-N soil test, soil nitrate-N concentrations were determined to a 120 cm depth from soil samples taken in November and April before the growing season. Residual nitrate-N to a depth of 120 cm were also taken following the sugar beet crop growth. The use of N fertilizer positively increased the yields and economic returns for sugar beet in 1998 and 1999. The use of current N fertilizer recommendations did not under fertilize sugar beets in 1998 or 1999. Residual nitrate-N after sugar beet production was not affected by time or rate of N application. The 2000 locations were harvested recently and the additional information from these location will be presented.

Objectives

1. Improvement in yield and quality of sugar following nitrogen application
2. Improvement in nitrogen use efficiency following nitrogen application
3. Reduction in nitrate-N loss following nitrogen application
4. Evaluation of soil and water conservation

Introduction

The American Beet Sugar Company (ABSC) and the Minnesota Department of Agriculture (MDA) have been working together since the early 1990's. One of the major goals of this partnership is to improve the efficiency of nitrogen fertilizer use on sugar beets. The goal is to reduce the amount of nitrogen fertilizer applied to the soil while maintaining or increasing yields and quality. This paper reports on the results of a three-year study conducted to evaluate the effect of nitrogen fertilizer application on sugar beet production and soil nitrate-N concentrations. The study was conducted at ten locations in Southern Minnesota from 1998 to 2000. The results show that nitrogen fertilizer application significantly increased sugar beet yields and quality, and also increased soil nitrate-N concentrations. However, the use of current nitrogen fertilizer recommendations did not under fertilize sugar beets in 1998 or 1999. Residual nitrate-N after sugar beet production was not affected by time or rate of nitrogen application.

Table 1
Soil Nitrate-N Concentration in Sugar Beet Production

| Year | Location | Time | Rate | Concentration (ppm) |
|------|----------|------|------|---------------------|
| 1998 | 1 | Nov | 0 | 15 |
| | | Apr | 0 | 15 |
| 1999 | 2 | Nov | 0 | 15 |
| | | Apr | 0 | 15 |
| 2000 | 3 | Nov | 0 | 15 |
| | | Apr | 0 | 15 |