

NITROGEN MINERALIZATION IN ELMORE COUNTY SOILS GROWING SUGAR BEETS

M.M. Seyedbagheri and Jim Torell

INTRODUCTION

Nitrogen, an element used by plants in relatively large quantities, is essential for attaining maximum economic return from sugar beet crops. Optimizing economic return from nitrogen in sugar beets is complex because the price received for the crop depends on yield as well as sugar content. Nitrogen in sugar beets must be managed to provide adequate nitrogen for early crop growth while ensuring that excess nitrogen does not reduce sugar percentage later in the season. One of the factors affecting nitrogen management is mineralization, the microbial process of releasing inorganic nitrogen from organic matter in the soil. To better understand the quantity and time course of nitrogen mineralization under Elmore County's conditions, the Elmore County extension staff conducted an experiment to determine nitrogen mineralization.

METHODS

Nitrogen mineralization was determined by the buried bag method. In the buried bag method, a representative soil sample was taken from the field on May 19, 1995 at 0-12" and 12-24". An initial sample was analyzed immediately for ammonium (NH_4^+) and nitrate (NO_3^-), the inorganic forms of nitrogen that are available to the plant. Two 10" bags were placed back in the field vertically at their respective depths. Bags were retrieved monthly and analyzed for NH_4 and NO_3 to determine the amount of additional nitrogen made available by mineralization.

Two sugar beet fields were studied, designated as site 1 and site 2 for this report. Site 1 was in silt loam soil with a pH of 8.0. No crops were planted in 1993 and 1994. Site 2 was in loam soil with a pH of 8.1. Previous crops were wheat in 1993, and sugar beets in 1994. Both fields were sprinkler irrigated and neither had received manure in the previous two growing seasons.

Mineralization was calculated by subtraction from the initial sample. Soil nitrogen supply was calculated according to Stieber et al 1994 by adding initial nitrogen to nitrogen mineralized during the growing season. (both in lbs./Acre).

Presented at DEQ Non Point Source Pollution Conference, Boise, ID, 1999.

RESULTS AND DISCUSSION

The data in table 1 indicate that a modest, but discernible, amount of nitrogen was mineralized, mostly from mid-summer through early fall. During this important time in sugar beet production, the sugar is translocated from the leaves to the roots. The data have important implications for N management since nitrogen applied after July 1 may lower sugar content with little increase in yield.

LITERATURE CITED

T. Steiber, C. Shock, E. Fribert, M. Thornton, B. Brown, W. Cook, M. Seyedbagheri, and D. Westermann. Nitrogen mineralization.

Table 1. Nitrogen Mineralization during 1995

Site #	Depth	Initial N Level ¹	JUNE	JULY	AUGUST	SEPT.	OCT.	SOIL N SUPPLY ²
pounds of N per acre								
#1	0-12"	52.0	- 8.0	16.0	28.0	28.0	28.0	80.0
	12-24"	108.0	-20.0	-16.0	20.0	- 8.0	36.0	144.0
	TOTAL	160.0	-28.0	0.0	48.0	20.0	64.0	224.0
#2	0-12"	72.0	- 4.0	32.0	48.0	4.0	28.0	100.0
	12-24"	72.0	-20.0	28.0	20.0	- 8.0	24.0	96.0
	TOTAL	144.0	-24.0	60.0	68.0	- 4.0	52.0	196.0

¹ Initial N = NH₄-N + NO₃-N

² Total soil N supply = initial soil N + mineralization N