SITE-SPECIFIC APPLICATION OF NITROGEN ON COTTON

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Abstract

Yield goal is often considered when choosing fertilizer rates for field crops. Spatial stability of yield exists in cotton. If the response of cotton to nitrogen rate is known, yield maps from previous seasons might be used to determine nitrogen rate and help prevent deficient or excessive applications. The response of cotton to nitrogen on the soil used in this study is well documented. In 1998, the yield of over fifty test plots was measured. In 1999, the plots were split, with one side receiving a conventional uniform nitrogen rate and the other side receiving a site-specific rate. There was no significant difference in yield between the two treatments. More research is needed to determine if yield maps may be used to determine nitrogen rate.

Introduction

The purpose of this research is to determine if cotton yield maps may be successfully utilized to improve the efficiency of nitrogen applications. In order for this approach to be successful, two things must be true:

(1) Spatial stability of yield must exist in cotton
(2) Nitrogen requirement of cotton plants must be related to yield in a predictable manner

Recently, spatial stability of yield has been shown to exist in cotton. In a central Louisiana study, over 70% of the variability in seedcotton yields in 1999 could be explained by the variability of seedcotton yield in 1998 using only spatial location of field plots.

The response of cotton to nitrogen in central Louisiana on a Norwood silt loam soil has been characterized (Moore et al., 1992, Moore and Breitenbeck, 1993; Moore, 1998). The change in nitrogen requirement related to a change in soil productivity within the Norwood series has not been measured. The present study presumes a linear relationship between nitrogen requirement and yield, although more research is needed to determine the true relationship. Successful utilization of yield maps for site-specific variable-rate nitrogen application may provide a relatively inexpensive and accurate tool for increasing efficiency.

Materials and Methods

The present study was conducted in 38-inch row spacings on a Norwood silt loam soil in central Louisiana. Yield was determined for over 80 test plots in 1998 using a bagging attachment installed in the basket of a John Deere 9910 picker to collect and weigh seedcotton. Individual plot weight and the test average yield were determined. In 1999, the plot was split and a conventional uniform rate was applied to four rows on one side and a site-specific rate was applied to four rows on the other side. The conventional rate was 100 pounds of N per acre. Site-specific N rates were adjusted for each plot in direct proportion to its yield in 1998 (e.g., if a plot had 10% above average yield in 1998, it received 10% above conventional rate of N in 1999). Nitrogen was broadcast prior to planting. The two middle 25-foot rows were picked in 1999 to determine yield.

Results and Discussion

There was no significant difference ($p=0.05$) in seedcotton yields between conventional uniform or site-specific variable N rates in 1999 (Table 1). Skips in stands were noted at harvest and may have interfered with test results; however, more research is needed to determine the viability of this approach. Research is also needed to determine the change in N requirement of cotton plants produced in different management zones within the same field.

Literature

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Table 1. Effect of conventional and site-specific nitrogen rates on seedcotton yields in 1999.

	Seedcotton Yield (LBS/A)
Conventional	3613 a
Site-Specific	3493 a
% c.v	18