NITROGEN FERTILIZATION OF ULTRA-NARROW ROW COTTON

J. Scott McConnell and Robert C. Kirst, Jr.[1]

RESEARCH PROBLEM

Ultra-narrow row (UNR) cotton (*Gossypium hirsutum* L.) represents a unique development in cotton production for Arkansas. It is a drill-planted, stripper-harvested, nonirrigated, low-input production system designed to maximize economic returns. Research that provides information on production parameters is scant. Optimum nitrogen (N) fertilization rates and how UNR cotton utilizes N are unknown. The objective of this pilot study was to gain experience with UNR cotton production and to determine how UNR cotton would respond to N fertilization.

BACKGROUND INFORMATION

Recently, interest in UNR cotton production has increased. It has long been known that plants grown in very narrow rows intercept and utilize sunlight more efficiently. Potential benefits of UNR cotton production include reduced production costs (irrigation, insecticide application, and harvest equipment), use of poorer soils, decreased soil erosion, and utilization of the same equipment for cotton, soybeans, and cereal crops. Potential drawbacks of UNR cotton include increased weed pressure in low stand areas, different equipment is required (precision drill planter, finger-stripper harvester), and lint quality may decline. Variety differences, fertility requirements, effect of planting date, and many other production parameters for optimum growth and yield of UNR cotton grown in Arkansas are unknown.

RESEARCH DESCRIPTION

A block of UNR cotton was drill-planted (John Deere 750 drill) on 19 May 1997 at the Southeast Branch Experiment station at Rohwer for a pilot study of UNR cotton response to N fertilization. Fertilizer treatments of 100 lb urea-N/acre, 100 lb Meister-N/acre, 50 lb urea-N/acre, and 0 lb N/acre were strip applied with a fertilizer buggy just prior to squaring. The test was expanded in 1998 to include N-rates of 0-, 25-, 50-, 75-, 100-, and 125-lb urea-N/acre. The test design was randomized complete block. N-treatments were applied as the crop reached the two true leaf stage. Measurements taken included seedcotton yield, plant height, plant population, boll load, and boll weight. All data were analyzed using the Statistical Analysis System (SAS).

---

[1] Associate Professor and Research Specialist, Department of Crop, Soil, and Environmental Sciences, Southeast Research and Extension Center, Monticello.

F-tests and least significant differences were calculated at the α=0.05 level of probability.

RESULTS

Pilot Study - 1997

UNR cotton fertilized with either 50 or 100 lb N/acre, regardless of N source, did not differ in yield (Table 1). Cotton receiving no N fertilizer was significantly lower yielding than cotton that received N fertilizer. The tallest plants were found in plots receiving 100 and 50 lb N/acre. The unfertilized cotton was shortest while the 100 lb Meister-N/acre was intermediate in height. Although plant populations were found to differ by as much as 32,000 plants/acre, no significant differences were found as a function of N treatment. Boll load and boll weight were both greatest and not significantly different for the fertilized UNR cotton, and lowest for the untreated cotton.

N-Rates Study

The results of the first year of the study correlate well with the results of the pilot study. The N fertilization rate necessary to produce maximum yield in 1997 was 50 lb N/acre (Table 1) and there was a similar trend in 1998 (Table 2). Although a trend of higher yield was observed with greater N rates, the differences were not significantly different from the 50-lb N/acre treatment. Plant height increased with increasing N fertilization up to 100 lb N/acre. No significant differences in plant population were found as a function of N treatment. Boll load and boll weight were found to follow similar trends in response to N fertilization as lint yield. The 50-lb N/acre treatment maximized boll load and boll weight. Additional N did not significantly increase either boll load or boll weight.

PRACTICAL APPLICATION

The results from this test are preliminary and final conclusions should not be drawn from these data. The response of UNR cotton to N fertilization treatments indicate that the N required for maximum yield will be less than for cotton grown in conventionally spaced rows. Yields were not found to increase with N rates above 50 lb N/acre in two different tests. Additionally, the 50-lb N/acre treatment was found to maximize both the boll load and boll weight. The parameters measured in this study indicate that the growth and management of UNR cotton may be substantially different from conventionally grown cotton.

Table 1. Seedcotton yield, plant height, plant population, boll load, and boll weight of cotton grown in ultra narrow rows with 0, 50, and 100 lb urea-N/acre and with 100 lb Meister-N/acre at the Southeast Branch Experiment Station near Rohwer, AR in 1997.

N-Rate	Seedcotton Yield	Plant Height	Plant Population	Boll Load	Boll Weight
lb N/acre	lb/acre	in.	plt/acre	boll/acre	g/boll
100(M)	2938	24.9	115,360	393,675	3.36
100	3008	31.3	140,368	392,869	3.44
50	3333	29.9	108,099	416,263	3.58
0	1529	20.4	118,587	242,820	2.87
LSD (0.05)	1099	6.1	NS	119,875	0.38

Table 2. Lint yield, plant height, plant population, boll load and boll weight of cotton grown in ultra narrow row with 0, 25, 50, 75, 100, 125 lb urea-N/acre at the Southeast Branch Experiment Station near Rohwer, AR in 1998.

N-Rate	Lint Yield	Plant Height	Plant Population	Boll Load	Boll Weight
lb N/acre	lb/acre	in.	plt/acre	boll/acre	g/boll
125	1060	27.5	153,074	349,710	3.31
100	1033	30.5	168,199	327,928	3.39
75	1034	26.3	160,334	341,844	3.30
50	899	24.4	175,460	321,273	3.12
25	745	20.4	177,275	278,921	2.93
0	468	19.9	171,225	191,796	2.84
LSD (0.05)	153	4.2	NS	48,066	0.28