ULTRA-NARROW ROW COTTON PERFORMANCE UNDER DROUGHT CONDITIONS

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Abstract

The development of new transgenic weed control technologies using plant resistance to Roundup®, Buctril®, and Liberty® herbicides are powerful new tools that enable us to rethink the way we grow and manage cotton without cultivation to maximize the use sunlight and water for crop production. Ultra narrow systems (i.e., row spacing less than 20 inches) can increase cotton production beyond that of traditionally spaced cotton in 30 and 40-inch rows. Previous studies at the Blackland Research Center in Temple have shown that ultra narrow row systems can increase cotton yield from 40 to 100%, compared to narrow row systems. However, this yield advantage of ultra narrow row systems is dependent on the presence and availability of water and the length of the growing season. Ultra narrow row systems may shorten the time from planting to harvest. This is important, since it can substantially lower costs associated with late season insect control and reduce over-wintering boll weevil populations for the coming year. Physically, ultra narrow row systems enable the crop to intercept more sunlight for growth, better utilize rainfall, and escape damaging pests by reducing the time from planting to harvest than conventional or narrow row spacing. Experiments were conducted in 1998 in the Central Texas Blackland Prairie to: (1) To determine if ultra narrow row cotton production can more effectively and efficiently utilize environmental resources, resulting in increased yield compared to traditional row spacing systems; and (2) To evaluate cotton growth habit and plant density interaction on earliness, yield, and fiber quality grown in ultra narrow row systems.

The 1998-growing season in central Texas Blacklands began with excellent soil moisture and with soil and air temperatures above the seasonal norms. The warmer temperatures persisted throughout the growing season. The 1998 average monthly maximum and minimum air temperatures recorded in April through August at the Blackland Research Center (Temple) were 3 to 5 °F higher than those recorded over the previous 12-year period. In addition, most areas in the region received only 20 percent of the normal monthly and seasonal rainfall in 1998. Planting occurred at the usual time (early to mid-April) in the central and southern Blacklands, but was delayed in some instances by spring rain in the northern Blackland region. The high temperatures and dry condition greatly accelerated development of the 1998 crop relative to normal years, with harvest occurring in early to mid-August in the central and southern Blacklands. Crop growth was greatly reduced with plant height averaging 12-15 inches, the height to node ratios of 1-inch, and boll size of 3 g or less. The 1998-dryland cotton production in central Texas was approximately one-third to one-half of normal yield and staple lengths were 1-inch or less for many cultivars.

Cotton production was evaluated for three row spacing systems (7.5, 15, 30 and 38-inches) with seeding rates from 60 to 180-thousand seed per acre. Four experiments were conducted under dryland conditions in Williamson County (at the Stiles Farm Foundation, Thrall, TX), in north Texas (at the Texas A&M Agricultural Research and Extension Center, near Dallas, TX), and central Texas (Hill County near Abbott, TX). With exception of the Hill County Demonstration, our findings confirm the results obtained in 1996 and 1997—that ultra-narrow row cotton (UNRC) systems produce substantially higher yield without sacrificing fiber quality in the central Texas Blacklands. Yield increases associated with UNRC ranged from 15 to 113 percent. The higher yields found in UNRC systems resulted from higher boll numbers per acre, which was achieved by increasing the plant population. However, the optimum population for UNRC systems cannot be established from these data or from that we've obtained to date. The fluted-feed grain drills used in our studies did not allow sufficient control of plant populations to replicate treatments in time or space (e.g., from year to year or from location to location) over the 3-year period. These drills are difficult to calibrate and do not provide the accurate seed placement (e.g., depth and within the row) necessary to ensure reliable and uniform plant establishment. Yield increases associated with UNRC systems are highly correlated with the plant population and seed costs are rapidly increasing, especially for the new transgenic cotton varieties with herbicide resistance. It is important, therefore, that we identify the populations that maximize yield with minimum cost and maximum profit for the producer. We intend to correct his problem and obtain this information. We recently purchased a JD 1700 series *MaxiEmergePlus* vacuum planter that will allow us to attain accurate seed placement for reliable and uniform plant establishment in future UNRC research.

Acknowledgments

Financial support from Cotton Incorporated is gratefully appreciated. We also appreciated the support of John Deere, Inc. and BASF for loan of seeding equipment for planting this study.

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 1:581-581 (1999)
National Cotton Council, Memphis TN