EFFECT OF PLANTING DATE AND SEEDING RATE ON GROWTH AND DEVELOPMENT OF COTTON IN THE TEXAS HIGH PLAINS

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Abstract

Rising seed costs associated with new herbicide and pest technologies have made cutting seeding rates a common way to cut input costs easily and effectively. However, it is important to determine the impact reduced seeding rates have on maturity, a key in this short season environment, and yield. Previous research has generally resulted in little yield response to seeding rate, while the percent survival, or stand establishment as a percent of seed planted increases as seeding rate decreases (Keeling et al., 2007; Keeling et al., 2005; Boman et al, 2003). An additional complication is the harsh conditions that are frequently present during cotton planting in the Texas High Plains, commonly resulting in delayed planting due to excess or lack of moisture, or replant scenarios due to injury from hail or blowing sand. This leads to a prolonged planting window lasting from early May into mid- to late-June in some years. The objectives of the current study were to determine the impact of seeding rate and planting date on maturity and lint yield of two widely grown varieties in the high plains. The trial was conducted at the Texas A&M AgriLife Research and Extension Center in Lubbock, TX during the 2017 growing season. The two varieties planted included the early-mid maturing NexGen 3406 B2XF (NG 3406), and the mid-late maturing Deltapine 1646 B2XF (DP 1646). Three seeding rates of 62k (low), 86k (medium), 111k seeds ha^{-1} (high) were included. The two varieties were planted at all three seeding rates on May 12th, May 31st, and June 9th 2017. There were 4 replications of each variety and population combination planted at each date. Each plot consisted of four rows, with the center two utilized for data collection and harvest. Each date was managed independently, and received 2 furrow irrigation applications according to crop growth stage and environmental conditions. To quantify crop establishment, stand counts were taken at the 1st true leaf stage, while node of first fruiting branch (NFFB), node of uppermost harvestable boll (NUHB), total nodes, and total number of harvestable bolls (open and un-opened) were quantified when majority of plants reached 50-60% open bolls to determine development and maturity characteristics. Heat unit accumulation (DD60s) was recorded from planting to harvest. Plots were harvested, individually bagged, and weighed on November 15, 2017. Approximately 1000g from each plot was ginned at the Texas A&M AgriLife Research Gin on December 8, 2017.

Heat unit accumulation was found to be the driving factor for plant maturity. There was only a 343 DD60 difference across the dates, but the May 12 planting date accumulated 537 more DD60s from early bloom to harvest than the June 9 planting. This resulted in more total nodes, a lower NFFB, and a wider range of nodes that produced harvestable bolls in the earliest date compared to the latest. At each date, higher seeding rates increased plant population per hectare, but reduced the total number of bolls per plant. Lint turnout at the gin was found to have been impacted by planting date as turnout percentage dropped with each successive planting (31, 28, and 26% at May 12, May 31, and June 9 plantings, respectively). Lint yield was influenced by all three treatments. The overall trend was reduced lint yield with each successive planting, with average lint yields of 1,519 kg ha^{-1} at May 12, 978 kg ha^{-1} at May 31, and 689 kg ha^{-1} at June 9. Earlier planting dates showed greater response to population and variety differences, while no differences between variety and seeding rate combinations were present at the latest date. At the May 12 planting, it was found that the lowest yielding treatment (DP 1646 1,333 kg ha^{-1} at 111k seed ha^{-1}) was not significantly different from the highest yielding treatment in the May 31 planting (DP 1646 1,201 kg ha^{-1} at 62k seed ha^{-1}). The lowest yielding treatment in the May 31 planting (DP 1646 805 kg ha^{-1} at 86k seed ha^{-1}) was not significantly different from any yield in the June 9 planting.

In summary planting date was primarily responsible for differences in maturity, gin turnout, and lint yield, although seeding rate and variety resulted in some differences across each date. The effect of planting date is highly related to DD60 accumulation, particularly during the effective bloom period. Plant population had minor effects on yield across dates due to the fact that cotton compensated for reduced populations by producing more bolls per individual plant. The effects of seeding rate, planting date, and variety will need to be evaluated further to provide exposure to year to year climate variations to determine potential risks and benefits associated with these management decisions.

References

Boman, R., T. Doederlein, J. Farris, M. Stelter, and M. Kelly. 2003. Replicated dryland cotton seeding rate and planting pattern demonstration. Texas A&M AgriLife Extension Service publication. Available online at http://lubbock.tamu.edu/files/2011/10/07_agcares.pdf.

Keeling, W., J. Bordovsky, R. Boman, and J. Everitt. 2007. Cotton variety performance as affected by sub-surface drip irrigation (SDI) levels at AG-CARES, Lamesa, TX 2007. Agricultural Complex for Advanced Research and Extension Systems 2007 Annual Report.

Keeling, W., J. Bordovsky, R. Boman, and J. Everitt. 2005. Variety and seeding rate performance of large scale SDI cotton production. Helms Research Farm Summary Report 2005. Available online at http://agrilife.org/lubbock/files/2011/10/varseedingrate05.pdf.