THE EFFECT OF SOIL SPECIFIC SEEDING RATES ON WATER STRESS AND COTTON YIELD

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Abstract

Precision management of cotton production can increase profitability by decreasing inputs. Reducing seeding rates while maintaining production potential will decrease input costs and may improve lint quality in drought-stressed soils. The overall objective of this project is to improve cotton production profitability by minimizing seeding rates, maintaining maximum yields, and improving lint quality potential in water-limited soils. The specific objectives of this study were to 1) quantify the effectiveness of reduced seeding rates on cotton lint yield and quality, and 2) determine a relationship between plant available water, seeding rate, and cotton lint yield and quality. The site selected was the Texas A&M University IMPACT center, which is located in the Brazos River floodplain and thus, has high soil variability. For the 2008 and 2009 growing seasons, 27 measurement locations were selected in production-sized, irrigated fields, which were under a cotton-corn rotation, and planted in DPL164 RRFBGII (Round-Up Ready Flex, Bollgard II). The sites were selected based on soil electrical conductivity (EC_a) values (3 zones), classified using an unsupervised fuzzy k-means method. Three seeding rates (30,000, 40,000, and 50,000 seeds $acre^{-1}$) were established in each of the three EC zones with three replications. In 2009, an additional seeding rate was added, 20,000 seeds $acre^{-1}$, which also increased measurement sites to 36. At each measurement location, soil texture, plant available water, soil moisture (weekly), lint yield, and quality (HVI) were measured. An additional replication for each EC zone and seeding rate was selected for lint quantity and quality (HVI) measurements. The EC_a measurements were indicative of soil textural and water holding capacity changes across the fields in both years. As EC Zone increased, clay content and water holding capacity increased. Although textures and water holding capacities varied, plant available water amounts were relatively similar across EC zones. The moisture measurements indicated that EC zones 1 and 2 used water at the same rate when compared to EC Zone 3. Seeding rates did not significantly affect the amount of plant available water used, indicating some other physiological factor was driving yield. In 2008 and 2009, significant differences in overall lint yield were evident within the three EC zones alone, seeding rates did not significantly affect yield. As clay content and water holding capacity increased, an overall increase in yield was witnessed, but a relationship between plant available water and yield was not witnessed. Fiber quality factors such as micronaire, fiber length, strength, and uniformity were significantly affected by EC zone in 2008. In 2009, micronaire, fiber length, strength, uniformity, and elongation were affected by EC zone as well. Seeding rates did not significantly affect any of the fiber quality parameters in both years of the study. In conclusion, reduced seeding rates did not affect cotton lint yield or quality, and no relationship between plant available water, seeding rate, and cotton lint yield and quality was witnessed. This indicates some other physiological response (evapotranspiration, soil temperature, leaf temperature, or leaf area index) needs to be investigated to determine the yield differences seen in this study. Overall, producers could minimize seeding rates in all soil types and still achieve maximum yields and qualities.