ON-FARM EVALUATION OF THE POTENTIAL OF RANK GROWTH AS INFLUENCED BY SEEDING RATE AND SOIL TYPE IN GEORGIA

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Abstract

Rank growth - tall and excessive vegetative growth – makes cotton plants more susceptible to boll rot and late-season insects, delays maturity and is more difficult to defoliate. Most agricultural fields in Georgia have inherent in-field spatial soil variability and managing cotton growth across the whole field, considering this spatial variability, is important for growers to maximize yield potential within the field. Seeding rate influences plant to plant spacing which further affects cotton growth and development regarding competition, canopy coverage (sunlight penetration), and yield. The main objective of this on-farm study is to determine how seeding rate can influence rank growth in different soil types across the field and to evaluate the potential of if seeding rate can be varied spatially by soil type such as application of variable-rate seeding to manage cotton growth within a field.

These experiments were conducted in two fields in southwest Georgia in the 2021 growing season. Field 1 was a 68-acre field located in Colquitt County, GA and Field 2 was a 30-acre field located in Dougherty County, GA. The study layout and methods were the same for both fields. Management zones were created using three spatial layers: soil type, previous year's crop health, and previous year's yield. The layers were combined using SMS Advanced to create two zones - zone 1 being the historically higher yielding area in both fields. Cotton cultivars DP 2012 B3XF and DP 2038 B3XF were planted in Field 1 and Field 2, respectively. Three different seeding rates of 21.5, 25.5 and 29.5 ksds/acre were planted in each field where 29.5 ksds/ac being the grower nominal. Each treatment was replicated three times across the field with nine randomized passes. All treatments were planted with a 12-row John Deere planter at 36 in. row-spacing. Crop emergence, plant heights and node counts were collected in randomly selected locations in the center six rows of each replication and each zone while spatial yield data was collected at harvest. All data were analyzed using two-way ANOVA method and comparison of means at $p = 0.10$ in JMP Pro 15.

Results showed that Field 1 had a higher emergence percentage in zone 1 (loamy sand) at 95% than zone 2 (clay) at 82%. In zone 2, the seeding rate of 21.5 ksds per acre had a better emergence response in this soil type at 89% compared to a 78% emergence for the two higher seeding rates. Plant heights and node counts for zone 1 were also higher than zone 2. While the plants were taller in zone 1 (130 cm), they were not excessively vegetative. Zone 2 is an area of poor production in this field, so the plants were much shorter (105 cm) compared to zone 1. The yield for field 1 shows no statistical difference between the three seeding rates. This would allow the grower to reduce the seeding rate from the grower nominal to save money on inputs while maintaining the same yield. In Field 2, the emergence in zone 1 (well-drained sandy loam) was lower than zone 2 (poorly drained sandy loam) with 76% and 83% respectively. This response is due to the dry planting season, zone 2 had more water available for the plants to establish. Zone 1 had shorter plants and less nodes than zone 2. The higher two seeding rates in zone 2 did have rank growth. The yield for field 2 was higher in zone 1 for all three seeding rates. Overall, the study suggested that both seeding rate and soil type had an influence on plant growth. For field 1 the seeding rate could be reduced from the grower nominal as no yield impact was observed. In zone 2 in field 2, the higher two seeding rates forced cotton plants into rank growth and yield was negatively impacted. Zone 1 in field 2 yielded highest with the grower nominal seeding rate, while the lowest seeding rate in zone 2 performed best. These studies will be conducted again in 2023 to better understand the relationship between seeding rate and plant growth as well as to explore the potential of variable-rate seeding and variable-rate plant growth regulator application by management zones.