



Mississippi Corn Promotion Board 2024 Progress Report

Project Title: Is it time to reconsider plant populations of top Mississippi Corn Hybrids?

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Project Summary (Issue/Response)

Corn grain yield has increased over time in the US, similarly, plant population has increased by an average of 400 plants $\text{ac}^{-1} \text{yr}^{-1}$. Researchers anticipate that if the past trend continues plant population will reach 45,000 by 2050, and 50,000 plant ac^{-1} by 2075, however, greater yields rely on hybrids ability to tolerate plant stresses due to increase in plant population. Moreover, hybrid yield stability and stress tolerance vary significantly by environment. Therefore, we propose to test top three hybrids identified as highest yielding from corn hybrid demonstration plots at increasing plant populations. The study will identify phenological and phenotypic traits that enable hybrid performance. Also, we identify location specific agronomic optimum plant population (AOPP) by hybrid.



Project Results/Outcomes

In this study, two hybrids 1627 and 67-44 were grown at all locations, hybrid D58VC74 was grown in the irrigated locations (Starkville and Stoneville), and the hybrid 66-06 was grown in the dryland locations (Verona and Raymond). Analysis of yield data from 2024 revealed two-way and three-way significant interactions between locations, hybrids, and plant populations (Figure 1).

When data was analyzed for 1627 and 67-44, two interactions were noted: plant population by location (Figure 1A), and plant population by hybrid (Figure 1B). Raymond did not responded to change in population from 25 to 40K, yielding 228 bu ac^{-1} when planted at 25K. In contrast, Verona and Stoneville yielded highest at 35K, with 251 and 242 bu ac^{-1} respectively, whereas Starkville yielded 235 bu ac^{-1} at 40K plant population.

Notably, yield was affected by hybrids, plant population, and location in irrigated areas (Figure 1C). This indicates that farmers who irrigate may optimize yield with correct decision making. D58VC74 yielded highest at Starkville, producing 249 bu ac^{-1} at 40K, and at Stoneville, producing 245 bu ac^{-1} at 35K.

In dryland locations (Raymond and Verona), yield was not affected by hybrid, but differences were noted with plant population (Figure 1D). This result suggests that dryland farmers should focus on selecting right plant population. At Verona yield maximized at 247 bu ac^{-1} when planted at 35K, and at Raymond, yield maximized to 236 bu ac^{-1} at 40K, which was not significantly different than 230 bu ac^{-1} at 25K. Overall, based on one year data, planting at 45K lowered yields regardless of hybrid, location or status of irrigation.



Project Results

Despite initial significant findings between locations, hybrids, and plant populations, experiments must be replicated for a second year to corroborate or refute these findings.

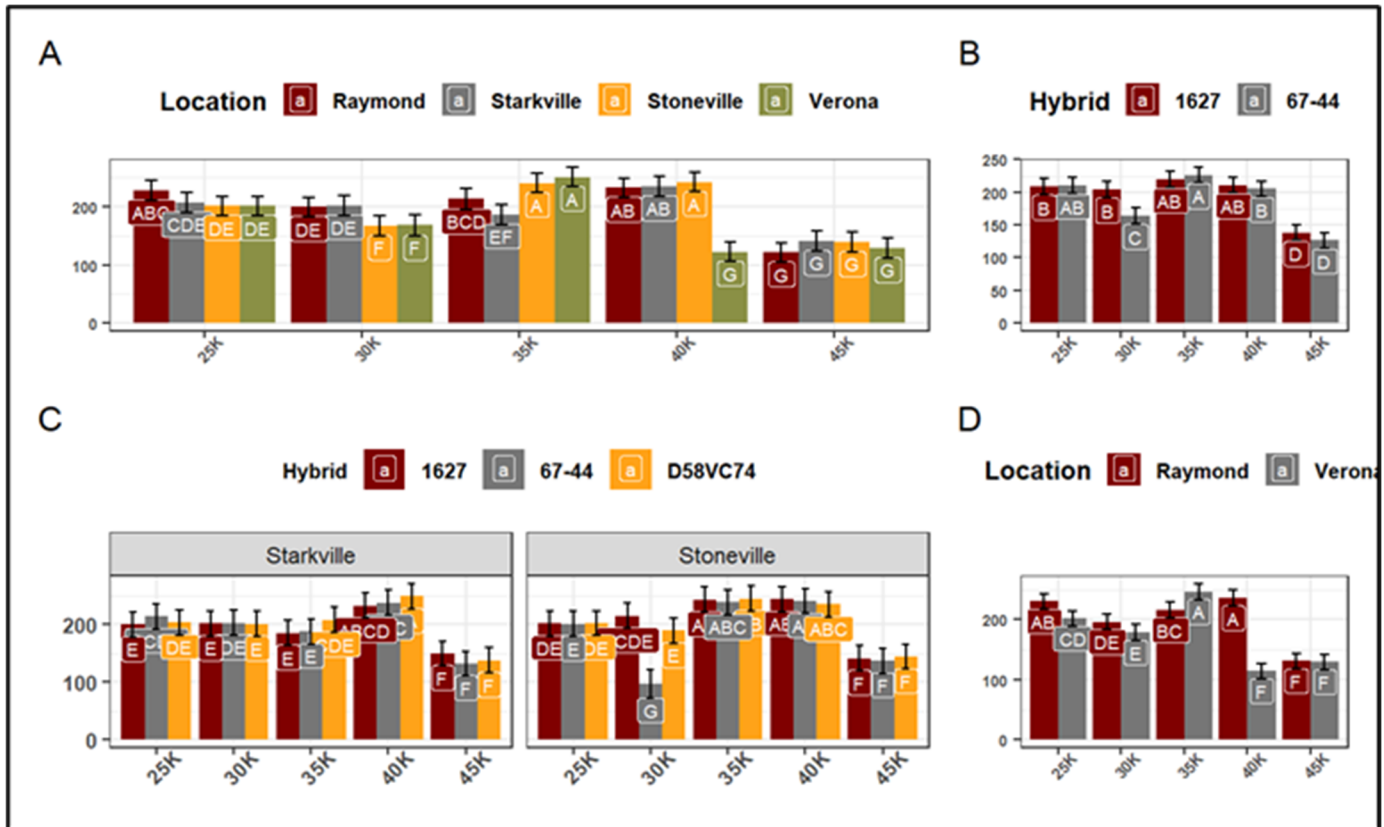


Figure 1 Grain yield ($bu\ ac^{-1}$) as affected by plant population in an experiment testing four hybrids (67-44, 66-06, 1627, D58VC74) and five plant population (25, 30, 35, 40, 45, 000 plant ac^{-1}) under dryland (Raymond and Verona) and irrigated (Starkville and Stoneville) conditions in Mississippi. Significant interactions were observed: (A) plant population by locations, (B) hybrid by location for hybrids (1627, 67-44) tested across all, (C) three-way interaction (location, hybrid, plant populations) for irrigated locations, (D) two-way interaction (location, hybrid) for dryland locations. Bars not sharing any letter are significantly different by the LSD test at the 5% level of significance.

Project Impacts/Benefits

Overall, based on this one-year data we found differences in corn yield with changes in plant population. Moreover, hybrid differences were noted only in irrigate sites but not at dryland locations. However, we request another year of funding to repeat the experiment and consolidate our findings.

Project Deliverables

- Results presented at the Agronomic Field Day, R. R. Foil Plant Science Research Center, Starkville, MS, Tuesday, August 6th, 2024
- Results presented at the Agronomic Field Day, NMREC, Verona, MS Thursday, August 22, 2024
- Results will be presented at Southern ASA in Irving, TX, Feb 2025