

OPTIMIZING MAIZE HYBRID PERFORMANCE WITH AGRONOMIC MANAGEMENT

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OBJECTIVE: Assess yield variation among commercial maize hybrids and their responses to different levels of agronomic management including row spacing, population, fertility, and foliar protection.

INTRODUCTION

- Hybrid selection is one of the most important management decisions maize (*Zea mays* L.) growers make annually, and improving the synergy between hybrid selection and management practices holds considerable potential for increasing grain yield.
- The application of fertilizer and foliar protection (fungicide with insecticide) enhances maize growth by improving plant health, extended leaf area duration, and protecting the plant against fungal diseases and insect feeding.
- Optimizing the potential of plant population and row spacing is crucial for maximizing light interception, nutrient uptake, and overall yield potential.

MATERIALS AND METHODS

- The experiment consisted of 6 trials across 3 environments (Nashville 38° 19'17"N, 89° 20'15"W; Champaign 40° 03'50"N, 88° 24'34"W; Yorkville 41° 35'02"N, 88° 24'34"W) in Illinois, United States, and two years (2022 and 2023) in maize-soybean rotation using conventional tillage. The trials differed in the commercial maize hybrids used within environments. All environments would be considered adequate in their soil P and K test values.
- Experimental units consisted of plots, two rows wide and 5.3 m long, arranged in a split-plot design with four replications at each location (Figure 1). Row spacing was the main plot and combinations of hybrid and management levels as sub-plots arranged in a randomized complete block design (Table 1).
- Ten management treatments consisted of twenty commercial maize hybrids (32 total hybrids across all trials) with relative maturities ranging from 103-118 days. Each hybrid was evaluated in a 76 cm row for response to plant population (84,000 or 104,000 plants per hectare), broadcast fertility (none or 89 kg P₂O₅ and 67 kg K₂O) (Figure 2), and foliar protection (none or fungicide with insecticide at the VT/R1 growth stage) (Figure 3). Response to population was also tested for response in a 51 cm row (Table 1).

RESULTS AND DISCUSSION

- Greater yields were obtained when the high population (104,000 plants/ha) was planted in 51 cm compared to 76 cm rows, averaging a 0.3 Mg ha⁻¹ increase (Figure 4a).
- When fertility and foliar protection were applied individually across sites and hybrids, the average yield was increased by 0.5 and 0.7 Mg ha⁻¹, respectively. When supplied together, their yield response was slightly additive, 0.8 Mg ha⁻¹ (Figure 4b).
- Hybrid selection resulted in the greatest variability in grain yield across the six environments, with a 2.5 to 3.8 Mg ha⁻¹ difference between the highest and lowest yielding hybrids at each site in 2022 and a 2.4 to 4.0 Mg ha⁻¹ difference in 2023 (Figure 4c). In general, the highest yielding hybrids at each site had the highest relative maturities, allowing for full utilization of the growing season (Figure 4d).

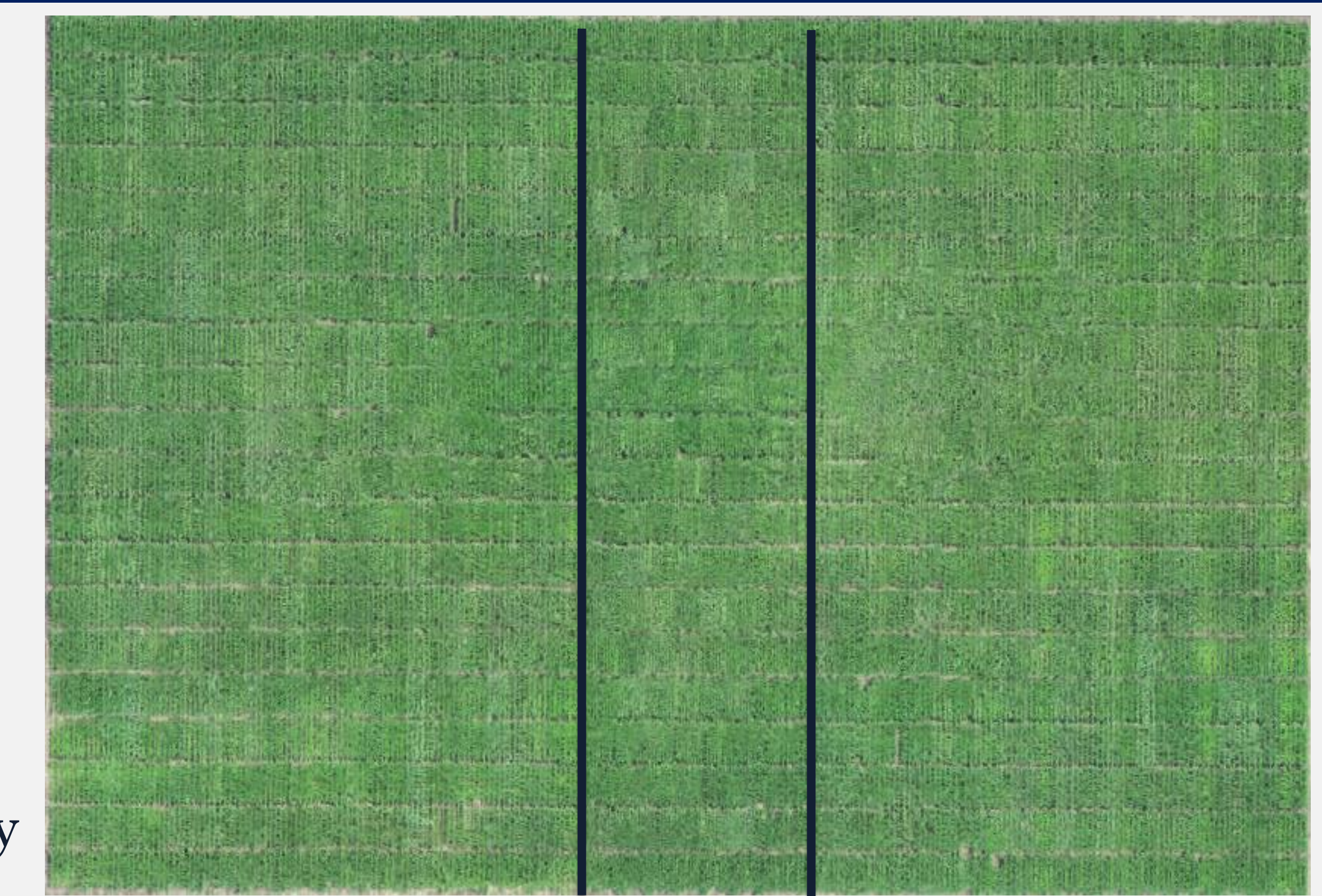


Figure 1. Split-block design utilized to assess how maize hybrids respond to different management practices. 76 cm rows on left and right with 51 cm rows in the center.

Figure 4. Average yields of maize hybrids (a) with or without fertility and foliar protection in a 76 cm row and with fertility and foliar protection in a 51 cm row across two planting populations; (b) with fertility, foliar protection, or both; (c) from lowest to highest across managements, and; (d) by relative maturity and location. Uppercase letters that differ indicate treatment mean significant differences at $P < 0.10$.

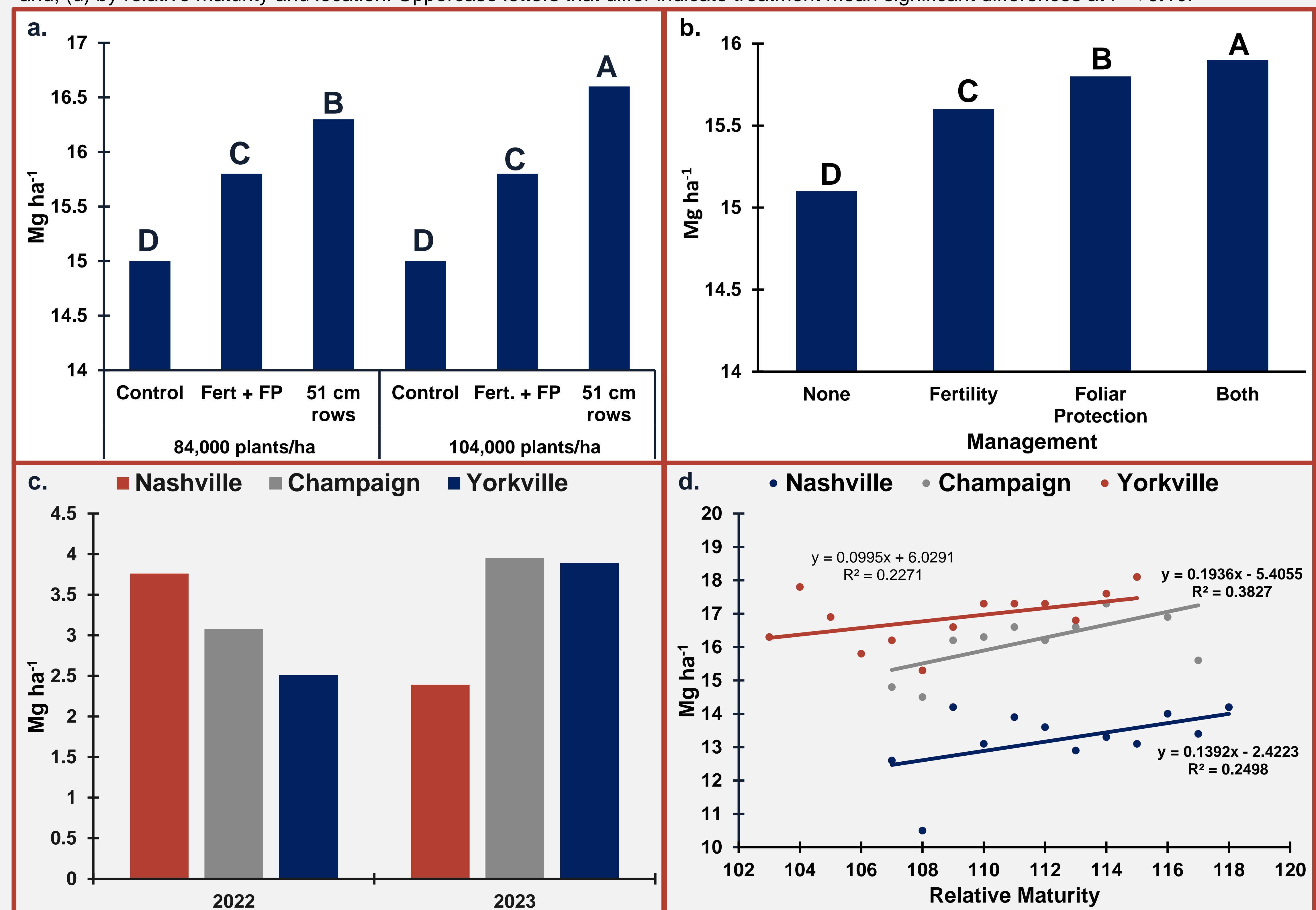


Table 1. Ten agronomic management treatments applied to maize.

Treatment Description	Row Spacing	Planting Population	Broadcast Fertility	Foliar Protection
Standard Population (SP)	76 cm	84,000	None	None
SP + Fertility	76 cm	84,000	Preplant	None
SP + Foliar Protection	76 cm	84,000	None	VT/R1
SP + Fertility + Foliar Protection	76 cm	84,000	Preplant	VT/R1
High Population (HP)	76 cm	104,000	None	None
HP + Fertility	76 cm	104,000	Preplant	None
HP + Foliar Protection	76 cm	104,000	None	VT/R1
HP + Fertility + Foliar Protection	76 cm	104,000	Preplant	VT/R1
SP + Fertility + Foliar Protection	51 cm	84,000	Preplant	VT/R1
HP + Fertility + Foliar Protection	51 cm	104,000	Preplant	VT/R1



Figure 2. Broadcast application of preplant phosphorus and potassium fertilizer immediately prior to planting followed by incorporation.

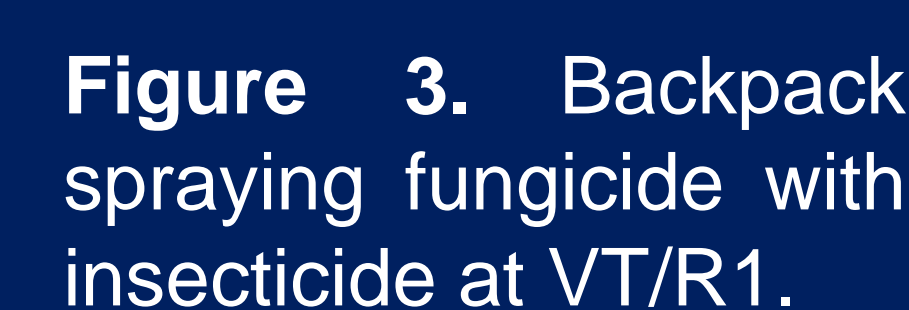


Figure 3. Backpack spraying fungicide with insecticide at VT/R1.

CONCLUSIONS

- Broadcast fertility with foliar protection tended to be additive when applied together.
- Planting at the high population in 51 cm rows led to increased yields when compared to planting in 76 cm rows.
- Hybrid selection was the factor contributing to the greatest amount of yield variability across all locations and treatments, especially when planting a hybrid with a fuller relative maturity.



Special thanks to Bayer Crop Sciences and Syngenta for supporting this research.