

Plant Population Effects on the Morphology of Corn Hybrids in Different Relative Maturity Groups

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INTRODUCTION

- Improvements in genetic selections and agronomic management have increased yield
- Relative maturity groups may respond differently to increasing plant populations (G x E interaction)
- Interactions could influence crop performance
 - Leaves above dominant ear shoot may influence light capture for yield production
 - Ear height and shank strength may influence disease incidence, ear orientation, and the ability to harvest mechanically
 - Stalk lodging at harvest could influence ease mechanical harvest

OBJECTIVES

- Assess plant morphology of hybrids of varying relative maturity at different plant populations to determine management effects on yield characteristics.
- Determine yield response to increasing plant population for hybrids in two relative maturity groups.

METHODS

- Field experiments conducted from 2010-2014 at Hoytville (NWARS) and S. Charleston (WARS)
- Five populations ranging from 44,000 to 124,000 plants ha⁻¹ each year
 - 44,000-104,000 plants ha⁻¹ in 2010
 - 44,000-124,000 plants ha⁻¹ in 2011-2014
- Pioneer brand hybrids evaluated (Table 1)

Table 1. Comparative relative maturity range and number of hybrids evaluated each year for each hybrid maturity category.

Year	Short-Season Hybrids		Full-Season Hybrids	
	Comparative Relative Maturity Range (d)	Number	Comparative Relative Maturity Range (d)	Number
2010	103-105	5	108-113	10
2011	102-106	5	108-114	10
2012	102-105	9	108-114	15
2013	102-106	5	108-113	10
2014	101-106	5	108-116	9

- R2: Plant and ear height, leaves above ear
- R6: Ear orientation, stalk lodging, grain yield, harvest moisture, test weight
- Data were analyzed across site-years using PROC MIXED in SAS 9.4, with means separated using LSMEANS (significant Global F-test at $\alpha=0.05$). Agronomic optimum plant populations were determined using a quadratic model (PROC REG).

RESULTS AND DISCUSSION

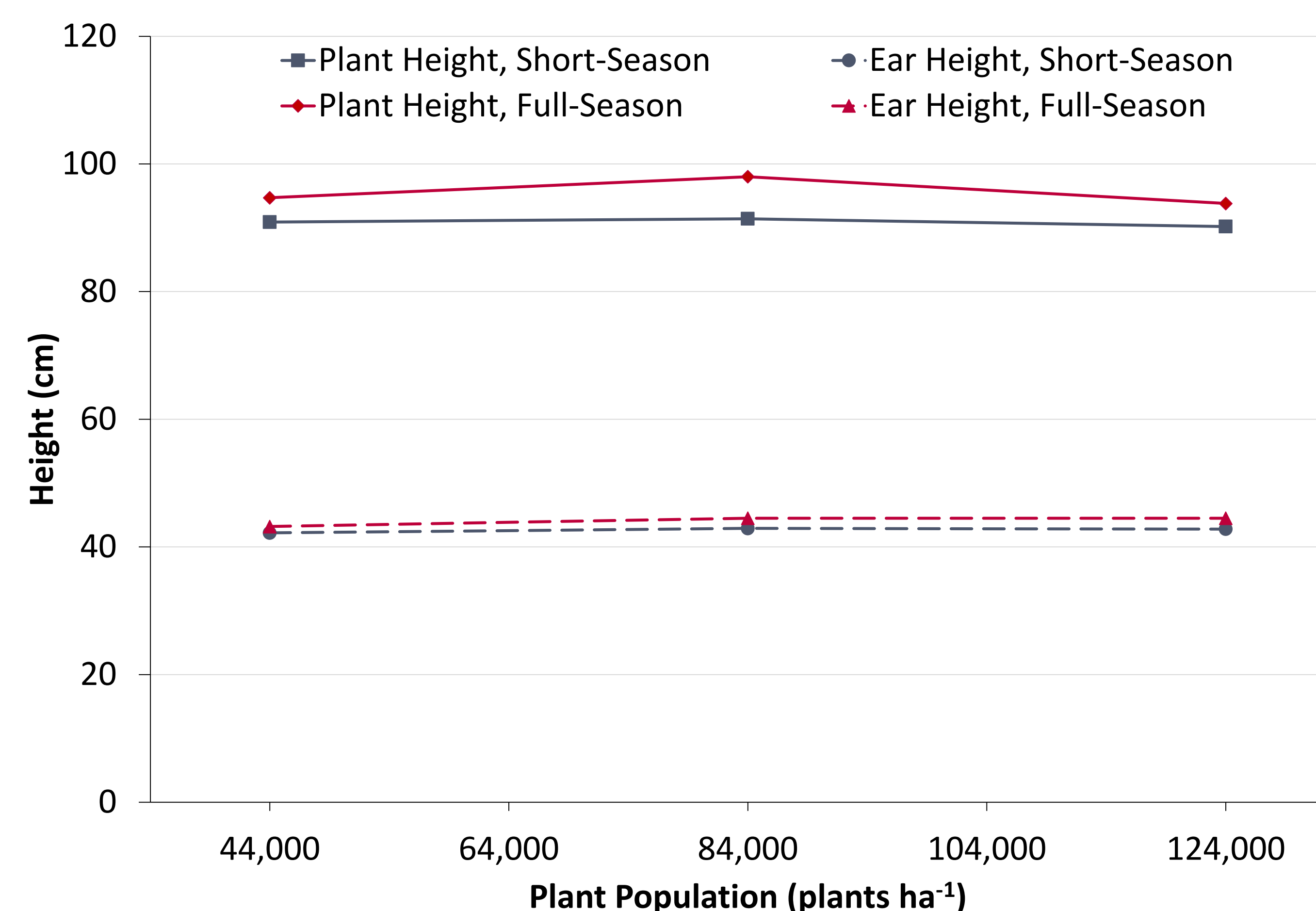


Figure 1. Plant and ear height for short- and full-season hybrids as influenced by population.

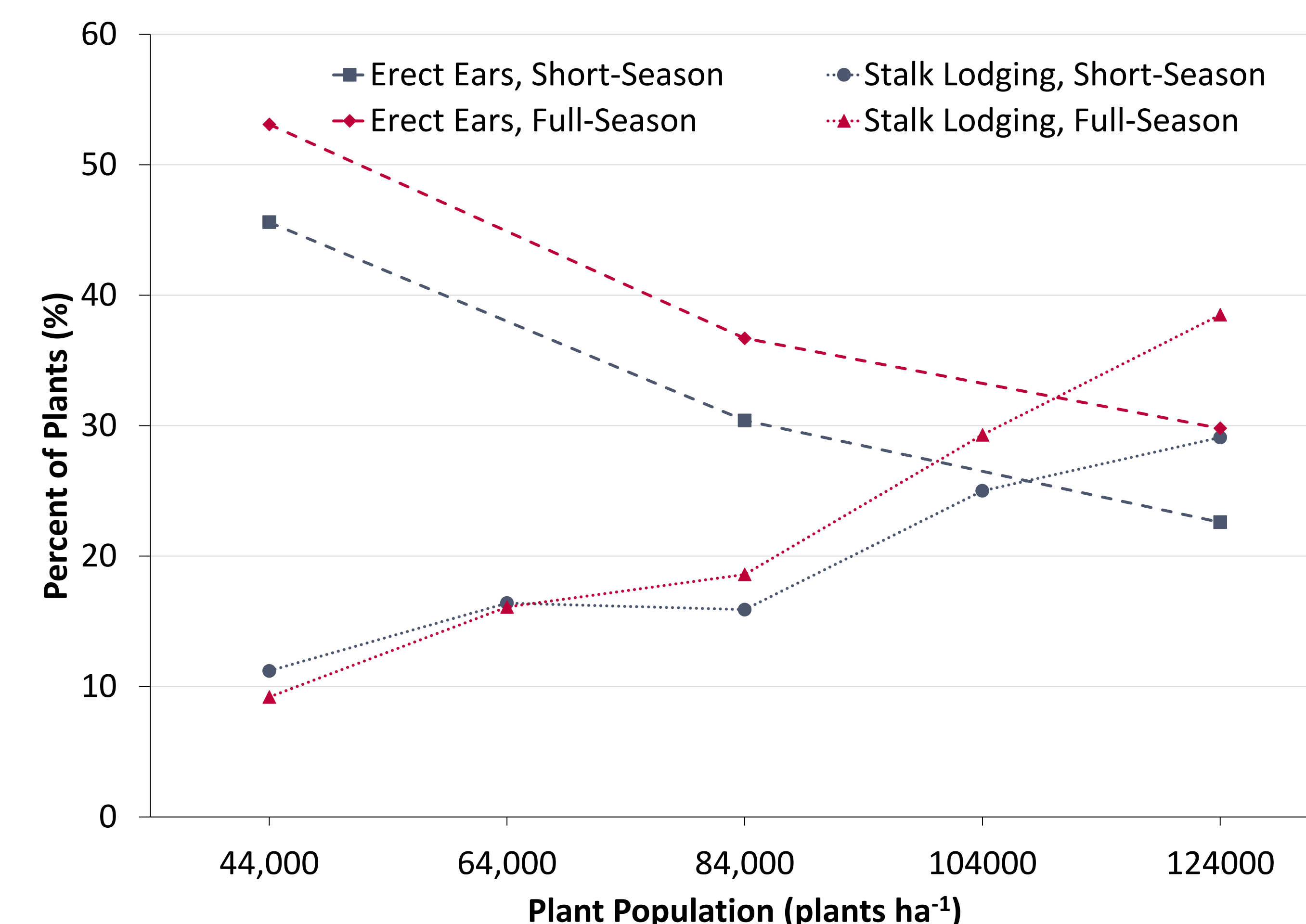


Figure 2. Ear orientation and stalk lodging as influenced by population for short- and full-season hybrids.

R2 Measurements (Fig. 1)

- Plant height and leaves above the ear were not influenced by population
- Short-season hybrids had lower ear height (4 cm) and plant height (12 cm) than full-season hybrids, but same number of leaves above the ear (6.4 leaves)

R6 Measurements (Fig. 2)

- Upright ears decreased 20% and stalk lodging increased with increasing population
- Upright ears and stalk lodging were greater for full-season hybrids.

Agronomic Optimum Plant Population (Fig. 3)

- Short-season optimum was 96,000 plants ha⁻¹
- Full-season optimum was 86,500 plants ha⁻¹
- Full-season hybrids produced 0.3 Mg ha⁻¹ greater yield at AOPP compared to short-season hybrids

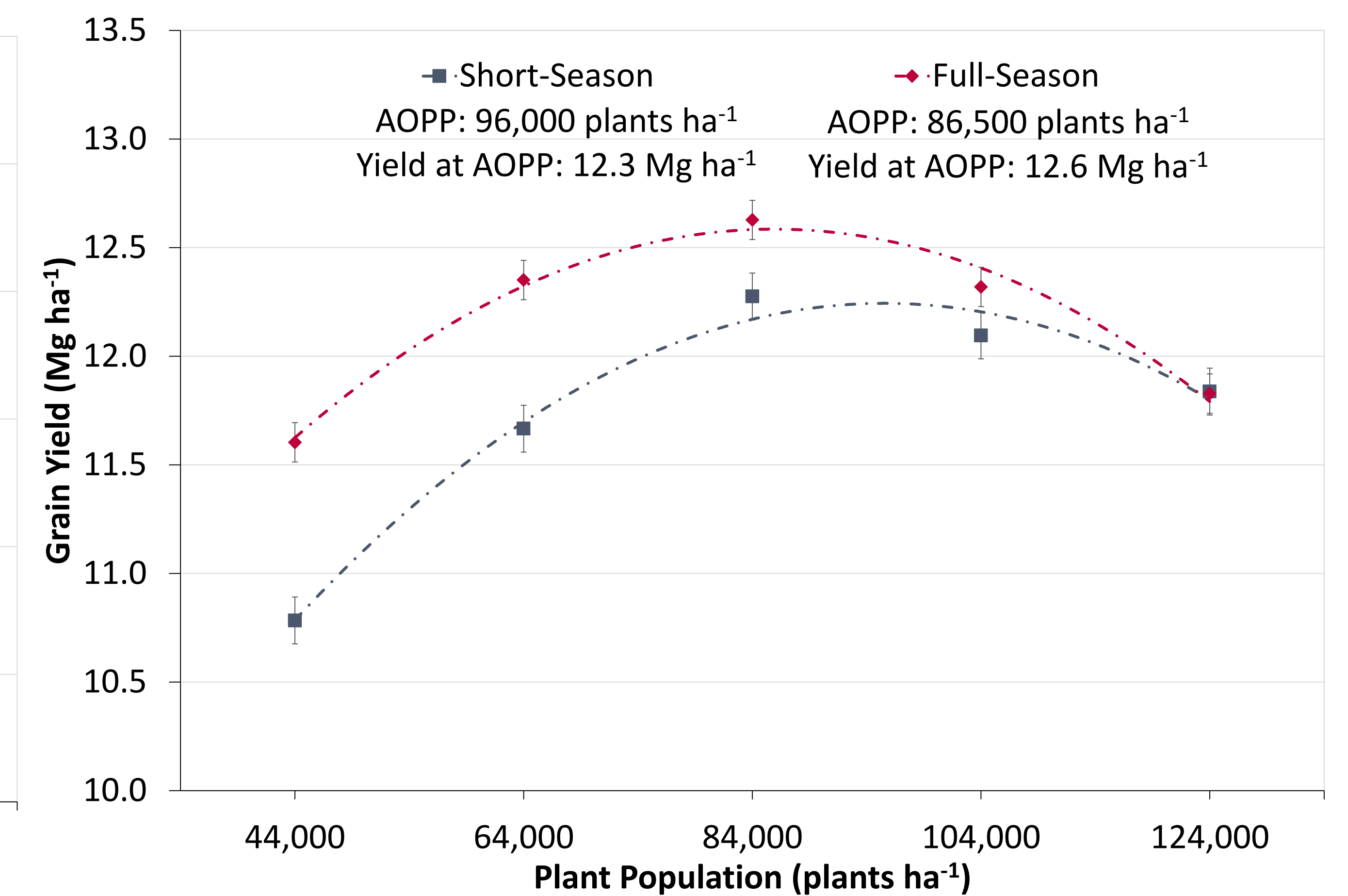


Fig. 3. Yield response to plant population across site-years for short- and full-season hybrids, and the agronomic optimum population (AOPP) and yield at AOPP across all sites and years.

Table 2. Harvest moisture and test weight as influenced by hybrid maturity and population.

Plant Population plants ha ⁻¹	Grain Moisture (g kg ⁻¹)		Test Weight (kg m ⁻³)	
	Short-Season	Full-Season	Short-Season	Full-Season
44,000	185	212	751	736
64,000	186	210	751	738
84,000	187	210	752	740
104,000	186	210	752	740
124,000	185	208	753	740

Grain Moisture and Test Weight (Table 2)

- Increasing population did not influence grain moisture at harvest or test weight
- Short-season hybrids had lower grain moisture at harvest than the full-season hybrids by 25 g kg⁻¹
- The test weight for short-season hybrids was 13 kg m⁻³ greater than for full-season hybrids

CONCLUSIONS

- Increasing population consistently influenced morphology for both relative maturity groups for all parameters except grain yield.
- Full-season hybrids produced greater yield at a lower optimum population across environments.
- The yield advantage for full-season hybrids may have been caused by the greater plant height (more efficient light capture for same leaf number), as well as increased ear shank strength (improved grain fill ability).
- Full-season hybrids also had greater moisture and lower test weight at harvest, as well as increased susceptibility to lodging.