RESEARCH TO IMPROVE HYBRID PLACEMENT IN NARROW-ROW CORN PRODUCTION

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Interest in corn row spacings less than 30 inches remains an area of interest for modern grain producers. Most research to date has shown very small yield responses to narrower row spacings. Since modern hybrids have been selected in 30 inch rows, this lack of response to narrower row spacings is not surprising. Anecdotal comments from growers in twin- or narrow-row corn systems are that hybrids differ in their responses to narrower row spacings. However, research to date has not documented significant or important differences in hybrid responses to row spacings (Nelson, 2007; Nelson and Smoot, 2009). Unfortunately, most of the narrow-row corn research has been conducted on a fairly narrow range of hybrids.

In a narrow-row corn system, everything from light interception and distribution in the canopy to disease pressure is different compared to a 30 inch system. So it stands to reason that hybrids with different phenotypes such as greater disease tolerance or upright leaf architecture would be more responsive to narrower row systems. In this research, we proposed to characterize the response of a wide variety of hybrid phenotypes to 15 inch row spacings and two seeding rates (30,000 and 36,000 seeds/acre). Results from this research may provide the seed industry clearer guidelines for hybrid suitability for various row spacings in corn. The objectives of this research was to characterize the response of a wide variety of hybrids to narrow-row corn production, and develop suitability guidelines for hybrids in narrow-row corn production.

Research was conducted in 2011 and 2012 at the University of Missouri Greenley Research Center (40°01'N, 92°11'W). The experiment was arranged as a randomized complete block design with five replications and 3 factors [10 hybrids (1, 2, 3, 4, 5, 6, 7, 8, 9, and 10) x 2 row spacings (15 and 30 inch) x 2 seeding rates (30,000 and 36,000 seeds/acre)]. Individual plots were 10 by 30 ft.

Corn was no-till planted in 15 and 30 inch wide rows with a John Deere 7200 planter on May 4, 2011 and planted in 15 and 30 inch wide rows with a John Deere 7200 planter following spring conventional tillage (Tilloll 2x) on April 3, 2012. The site had anhydrous ammonia at 160 lbs N/acre plus N-serve at 1 qt/acre applied on October 31, 2010 and October 31, 2011. Maintenance fertilizer was applied preplant at 35-90-100 (N-P-K) in 2011 and 17-80-120 in 2012. In 2011, plots were maintained weed-free with Princep at 1 qt/acre plus Roundup PowerMAX at 11 oz/acre plus COC at 1 qt/acre on November 10, 2010; Metal II at 2.5 qt/acre plus COC at 1 qt/acre plus Warrior at 2 oz/acre on May 12, 2011; and Callisto at 3 oz/acre plus NIS at 0.25% v/v plus 32% UAN at 1 qt/acre on June 20, 2011. In 2012, plots were maintained weed-free with Degree Xtra at 3 qt/acre on April 21, 2012 and a postemergence application of Roundup

PowerMAX at 1 qt/acre plus Callisto at 3 oz/acre plus COC at 1 qt/acre + AMS at 17 lbs/100 gal on June 4, 2012.

Stand counts from an entire row of 15 or 30 inch wide row corn was counted prior to harvest to calculate the plant population/acre. Corn was harvested with a Wintersteiger Delta and grain yield adjusted to 15.5% prior to subjecting data to ANOVA. Means were separated using Fisher's Protected LSD ($P = 0.1$). Main effects were presented in the absence of significant interactions.

Results

Precipitation from the time of planting until harvest in 2011 and 2012 (Figure 2) was 4.3 and 11.2 inches below the past decade average (21.7 inches), respectively (Nelson et al., 2010). Both years were typical for the region with relatively high rainfall in the spring followed by low rainfall through the summer months (mid-July through August) which totaled 2.8 inches in 2011 and 1.3 inches in 2012. Rooting depth can be affected by a perched water table in the spring which may be one of the reasons why corn grain yields increase up to 20% with subsurface drainage in these soils (Nelson et al., 2009).

2011. Harvested plant population was slightly greater (840 plants/acre) in 15 inch rows than 30 inch rows ($P = 0.0893$) (data not presented). The final stand was 27,000 plants/acre and 32,100 plants/acre ($P = 0.0001$) for the seeding rates of 30,000 and 36,000 seeds/acre, respectively (data not presented). This is typically an economically optimal seeding rate range for the region. Stand reductions in no-till corn were typical.

Grain moisture and test weights were similar among row spacings and seeding rates (data not presented); however, differences among hybrids were expected and observed (Table 1). Harvested plant population differences were observed with hybrids 6 and 1 having lower plant populations than the other hybrids. Hybrid 3 had 31,900 plants/acre at harvest which was 2,100 to 2,400 plants/acre greater than hybrids 5 and 10.

Grain yields ranged from 142 to 173 bu/acre in 2011 (Figure 2). Grain yields were similar between 15 and 30 inch row spacings for 8 of the 10 hybrids evaluated in this experiment. However, hybrids 5 and 10 had grain yields that were 18.4 and 18.7 bu/acre greater, respectively, in 15 inch rows compared to 30 inch rows.

2012. Plant population at harvest was 27,600 plants/acre (30,000 seeds/acre) and 32,600 plants/acre (36,000 seeds/acre), and the harvested population was greater ($P = 0.0001$) at the higher seeding rate (data not presented). There were plant population differences ($P = 0.0001$) at harvest among hybrids when pooled over row spacing and plant population, but they ranged from hybrid 1 (27,800 plants/acre, which was similar to 2011) to hybrid 10 (31,600 plants/acre). The harvested population was about 10% of the seeding rate which is typical for relatively early planting dates.

Grain moisture had a significant interaction (*P*=0.0156) between hybrid and plant population. Hybrids 6, 1, and 10 had 1.6 to 2.9% lower grain moisture at a higher population than at a lower population at harvest. No other significant differences among populations for a given hybrid were detected.

Yields ranged from 3.7 (hybrid 6 in 30 inch rows at 36,000 seeds/acre) to 53.8 bu/acre (hybrid 2 in 30 inch rows at 30,000 seeds/acre) in 2012 (data not presented). There was a significant (*P*=0.0252) main effect of row spacing on yield with 15 inch corn (28.5 bu/acre) yielding 1.7 bu/acre greater than 30 inch corn (26.8 bu/acre). There was also an interaction (*P*=0.0002) between hybrid and plant population (Figure 3). All hybrids yielded 4.7 (hybrids 3, 9, and 10) to 15 bu/acre (hybrid 2, which was the highest yielding hybrid at this seeding rate) greater at 30,000 seeds/acre compared to 36,000 seeds/acre except hybrid 8 which was one of the lowest yielding hybrids tested.

References

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Table 1. Plant population and grain moisture hybrid main effects in 2011 and 2012 at Novelty, MO. Data were averaged over row spacing and seeding rate.

	2011			2012		
					Moisture	
Hybrid	Population	Moisture	Test weight	Population	30,000	36,000
	plants/acre	%	lbs/bu	plants/acre	-------- % --------	
1	25,900	17.9	55.6	27,800	18.9	16.0
2	30,200	12.2	57.9	29,500	15.4	16.7
3	31,900	13.4	57.3	31,000	14.2	13.8
4	29,300	14.9	56.6	30,800	15.7	14.3
5	29,500	18.4	55.3	30,200	16.0	15.9
6	26,500	17.1	55.9	30,100	11.8	10.2
7	31,300	18.3	55.5	31,000	18.3	19.6
8	30,500	15.9	56.3	30,200	10.5	11.1
9	31,200	17.0	55.9	28,800	18.9	19.3
10	29,800	17.0	56.0	31,600	19.1	16.8
LSD (P = 0.1)	1,800	0.5	0.2	1,200	-------- 1.6 --------	

Figure 1A & B. Daily (bars) and cumulative (line) rainfall for 2011 (A) and 2012 (B) at Novelty, MO.

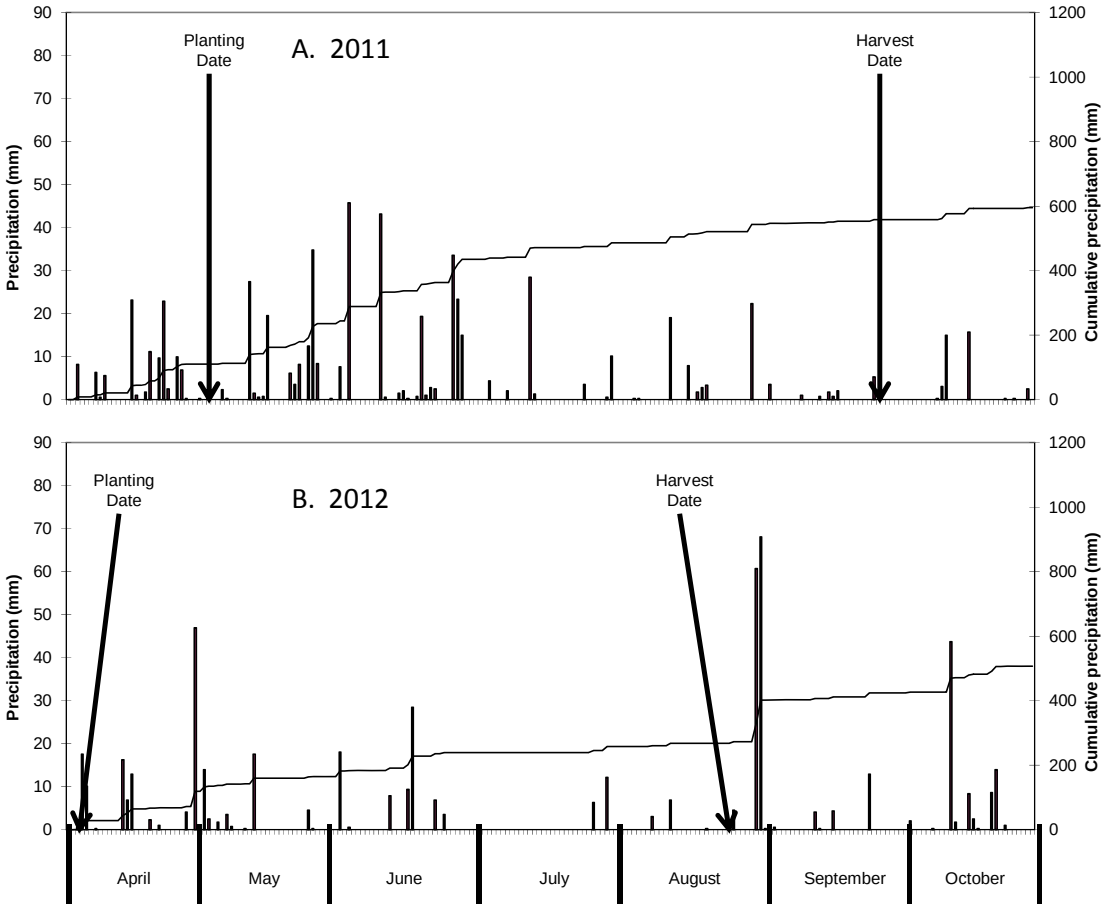

Figure 2. Corn hybrid and row spacing interaction in 2011 at Novelty, MO. Data were averaged over seeding rates. LSD ($P = 0.1$) = 15.

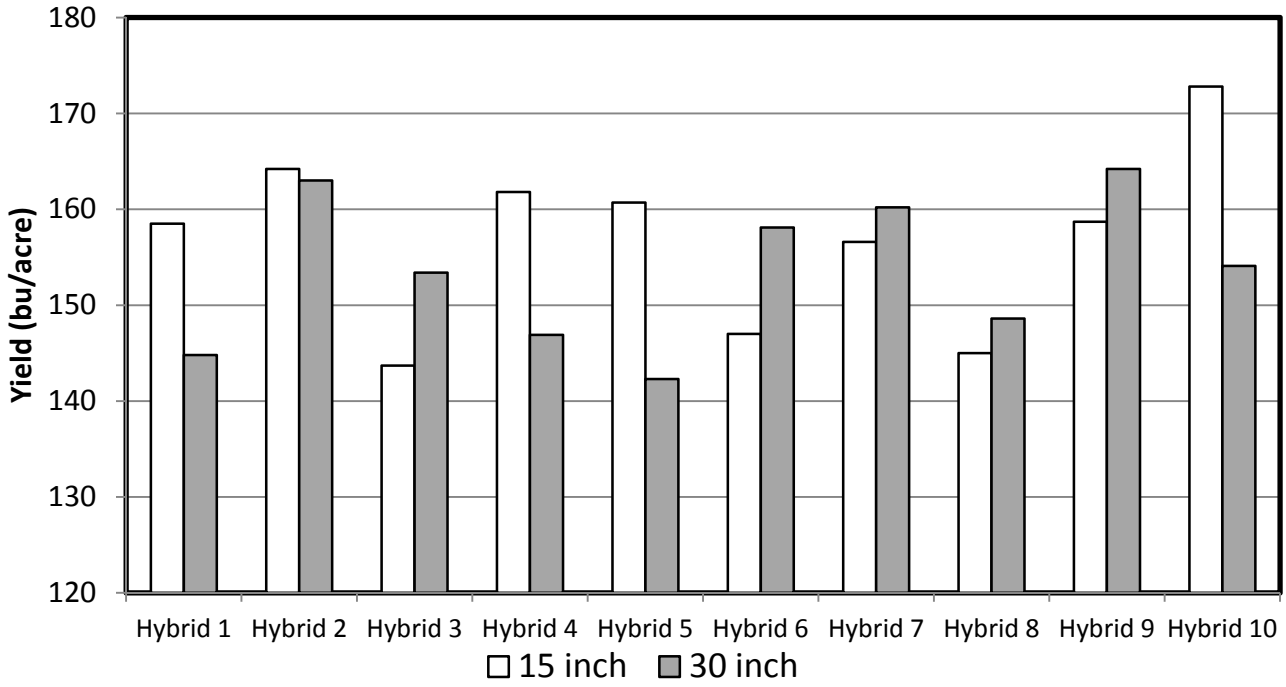

Figure 3. Corn hybrid and seeding rate (30,000 and 36,000 seeds/acre) interaction in 2012 at Novelty, MO. Data were averaged over seeding rates. LSD ($P = 0.1$) = 3.9.