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Effect of Corn Row Spacing on Herbicide Effectiveness for Weed Control in 2022

S. H. Lancaster
Kansas State University, slancaster@ksu.edu

E. Adee
Kansas State University, eadee@ksu.edu

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S.H. Lancaster and E. Adee

Summary

Cultural weed control practices such as narrow row spacing can be a key component of successful weed management. Experiments were conducted in the Kansas River Valley to evaluate interactions of herbicide programs and corn row spacings on weed control and grain yield. There were no differences in weed control at a site with low weed density. However, at a site with high Palmer amaranth density, Resicore applied to 15- and 30-inch rows and Bicep + Acuron applied to 15-inch rows resulted in the greatest weed control. Corn yield was similar across all treatments at both locations.

Introduction

Increased prevalence of herbicide resistant weed populations has led to a need for more complex mixtures of herbicides and multiple herbicide application timings throughout the year. Herbicide resistance has also led to a need for nonchemical means of weed management. Understanding how cultural or mechanical weed management practices and herbicides interact is important to maximize weed control.

Light interception can be an effective practice in reducing competition, especially through reduced weed seed germination. Narrower row spacing has been shown as an effective means to help control weeds in crops such as wheat and soybeans. However, little work has been done with corn row spacing to enhance weed control. Unlike wheat or soybeans, which have the option of being planted in rows as narrow as seven inches with a drill, corn is somewhat limited in row spacing by the harvest equipment currently available. Currently, harvest equipment for 15-inch rows is the narrowest available for corn. Additionally, seeding rates for wheat and soybeans are much more variable than for corn, as the plants can adjust to the seeding rate. The increased seeding rates for wheat or soybeans in narrower rows can promote earlier canopy development. Corn typically has a fairly narrow seeding rate range for specific environments due to the architecture of the plant and also the seed cost; therefore, significant increases in seeding rates for corn are not a viable option.

Procedures

Studies were conducted to determine if weed control with different herbicide programs in corn was improved when corn was planted in narrower rows. Two studies were established under dryland or irrigated crop production in Shawnee County, KS, in 2022. The experimental design was a randomized complete block with four replications. There was a two by six factorial arrangement of treatments with two row spacings (15 or 30 inch) and five herbicide programs (Table 1) plus a weedy control. Plots were 10 × 30 feet

(7 × 15 inch rows, 4 × 30 inch rows). The dryland field at Wolf Farm, near Topeka, KS, was Eudora-Kimo complex soil, which had the soybean stubble vertical tilled prior to planting Pioneer 0955 corn at 28,000 seeds per acre. The irrigated field at the Kansas River Valley Experiment Field-Rossville was Eudora silt loam. Soybean stubble was subsoiled in the fall and vertical tilled prior to planting Pioneer 1289 corn at 31,700 seeds per acre. Both studies were planted with a Kinze 3000 planter and the preemergence herbicides were applied on April 26. Both fields received just over 20 inches of rain from April through August, and the irrigated field received an additional 8 inches of water from the middle of June through the middle of August.

Herbicides were applied using a CO_2-pressurized backpack sprayer and a 5-foot hand boom equipped with XR8002 nozzles calibrated to deliver 15 gallons per acre. A postemergence application of Sinate was made at Rossville to manage escaped Palmer amaranth. Weed control was visually estimated throughout the summer until September 12. At Wolf Farm, henbit was the dominant weed species early in the growing season; however a mixture of species that included marestail, dandelion, prickly sida, hophornbeam copperleaf, and green foxtail was present at harvest. Palmer amaranth was the dominant species present at Rossville throughout the growing season. Yield data were collected from four of the middle rows in the 15-inch row spacing and the two middle rows of the 30-inch row spacing with a JD 3300 plot combine equipped with a HarvestMaster Classic Grain Gauge on September 21 and 27 (dryland and irrigated, respectively). Yields were calculated to bushels per acre at 15.5% grain moisture.

Five weeks after planting and herbicide application, Palmer amaranth control at Rossville ranged from 2 to 75 percent (Figure 1, top). The greatest weed control was observed in 15-in. rows treated with Resicore plus Aatrex, and the lowest weed control was observed in 30-in. rows treated with Harness Xtra. In treatments that contained 6 fl oz of Callisto, Palmer amaranth control was greater in 30-in. rows compared to 15-in. rows. However, weed control was greater in 15-in. rows when Acuron or Resicore were applied. There were no differences in henbit control at Wolf Farm 5 weeks after planting, with all treatments resulting in 99% control (Figure 2, bottom).

At harvest, weed control at Rossville ranged from 33 to 76% (Figure 2), while there were fewer differences among treatments compared to early-season ratings. Only the Acuron plus Bicep applied to 15-in. rows resulted in weed control that was greater than the non-treated check. At Wolf Farm, weed control ranged from 56 to 95%; however, there were no statistical differences due to variability among weed populations in the field.

Corn yield was similar across all treatments at both locations (Figure 3). Yields ranged from 172 to 216 bu/a at Rossville and 167 to 193 bu/a at Wolf Farm. Greater maximum yield at Rossville was likely due to the use of irrigation at that site.

Weed control data reflect differences in weed populations among the two locations. The dense Palmer amaranth population at Rossville required additional management and weed control was fair to poor for most treatments. However, weed density was much less at Wolf Farm and weed control ranged from fair to excellent. Corn yields were not affected by any treatment and were similar to the nontreated check in both 15- and

30-inch rows. The main effect of row spacing did not affect either weed control or corn yield at either location.

Acknowledgments

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Table 1. Herbicides and rates applied to corn planted in 15- and 30-inch rows at Rossville and Wolf Farm near Topeka, KS, on April 26, 2022

Treatment	Abbreviation	Herbicide	Rate/acre
1	Bic + Cal	Bicep II Magnum +	2.1 qt
		Callisto	6 fl oz
2	Deg + Cal	Degree Xtra +	3 qt
		Aatrex +	0.5 qt
		Callisto	6 fl oz
3	Har	Harness Xtra +	1.9 qt
		Aatrex	0.7 qt
4	Acu + Bic	Acuron	1.5 pt
		Bicep II Magnum +	1 pt
5	Res	Resicore +	1.5 pt
		Aatrex	1 qt

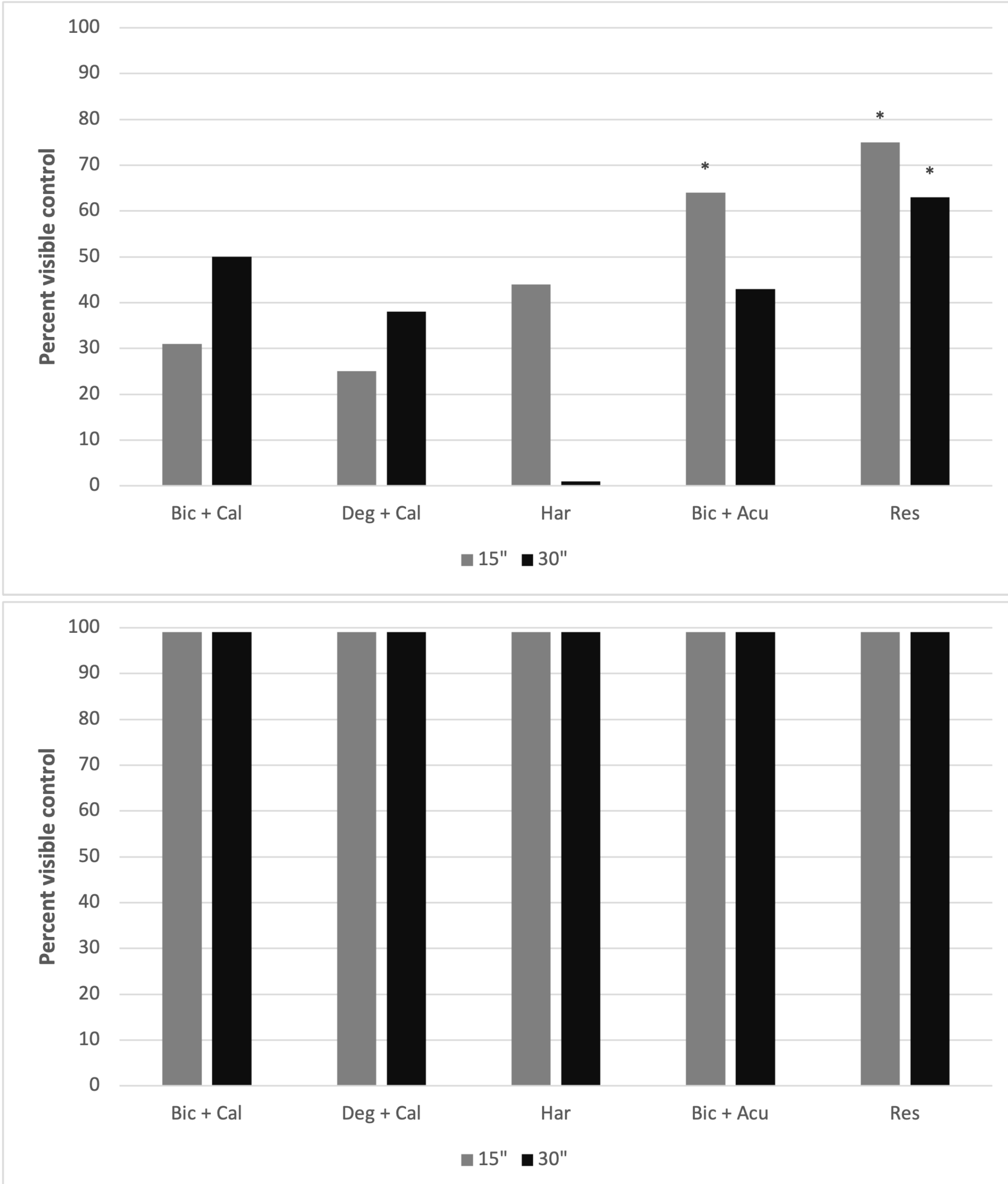

Figure 1. Weed control at Rossville (top) and Wolf Farm (bottom) corn fields five weeks after herbicide application (WAT). The primary weed species present was Palmer amaranth at Rossville and henbit at Wolf Farm. Asterisk indicates control different from nontreated check according to Tukey's HSD (α = 0.05). See Table 1 for the list of treatment abbreviations.

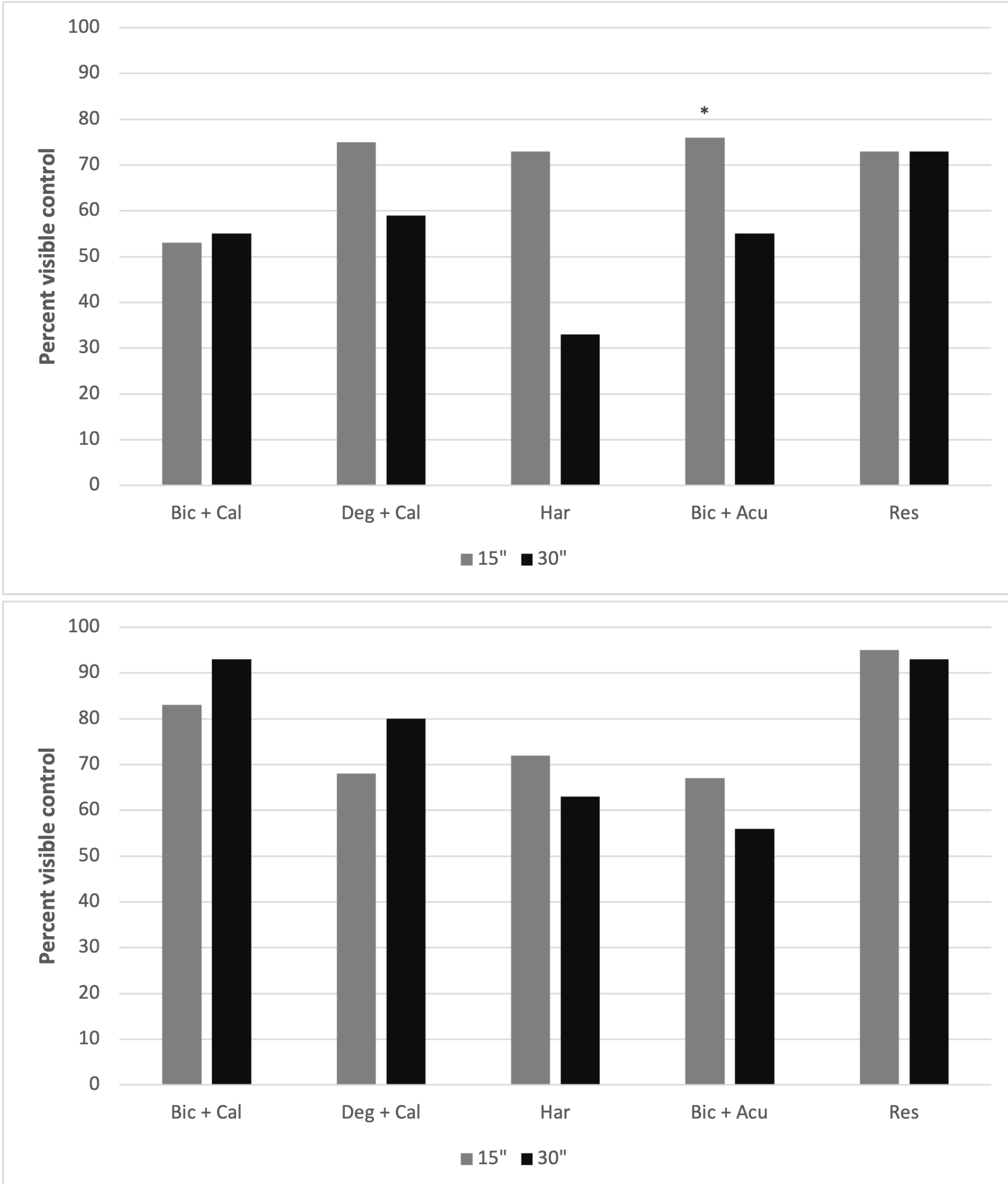

Figure 2. Weed control at Rossville (top) and Wolf Farm (bottom) corn fields seventeen weeks after herbicide application (WAT). The primary weed species present was Palmer amaranth at Rossville and a mixture of species was present at Wolf Farm. Asterisk indicates control different from nontreated check according to Tukey's HSD (α = 0.05). See Table 1 for the list of treatment abbreviations.

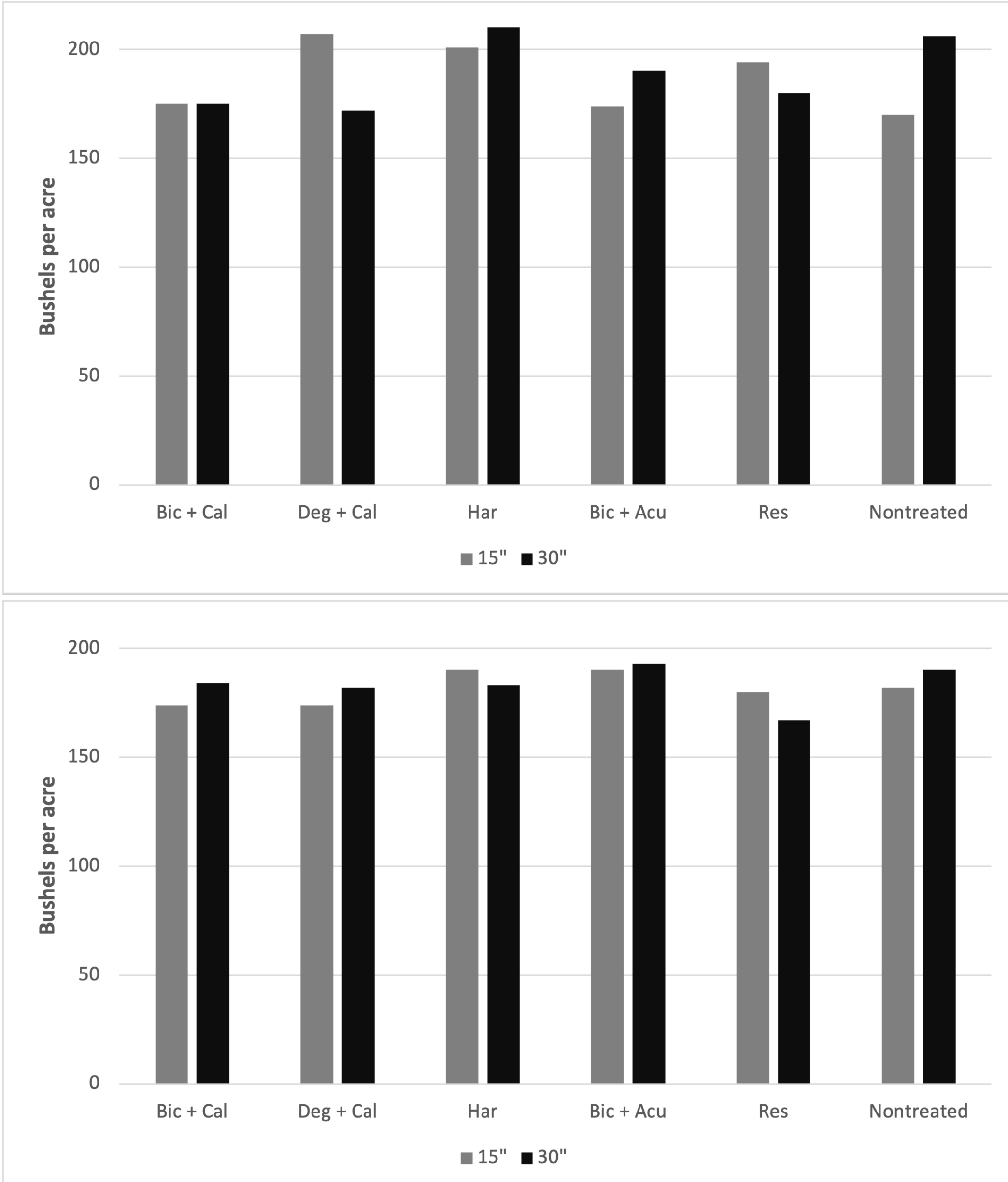

Figure 3. Corn grain yield (adjusted to 15.5% moisture) at Rossville (top) and Wolf Farm (bottom). No statistical differences were observed among treatments at either location. See Table 1 for the list of treatment abbreviations.