

Row width and population effects in two dry bean classes

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Introduction

- Michigan is the #1 producer of black beans and the #2 producer of small red beans in the United States.
- Recent breeding of upright dry bean varieties has led to direct harvest, discouraging in-season cultivation while opening the possibility of growing beans in narrow rows.
- Research is needed to determine whether narrow rows can contribute to weed control in the absence of cultivation, increase yield, or provide other agronomic benefits at various planting populations.

Objectives

- Determine the effects of row width and planting population on canopy closure and weed biomass in upright cultivars of black beans and small red beans.
- Determine the effect of row width and planting population on yield of these crops.

Materials and Methods

- Two locations: Michigan State University, East Lansing, MI; Saginaw Valley Research and Extension Center, Richville, MI
- Black bean variety 'Zorro', Small red bean variety 'Merlot'; both bred to be upright varieties
- Randomized complete block design with plots split by herbicide treatment, 4 replications
- Three planting populations:
 - Blacks: 196,400; 261,800; and 327,300 plants/ha
 - Small reds: 148,200; 196,400; and 261,820 plants/ha
- Row widths:
 - East Lansing: 38 and 76 cm
 - Richville: 38, 51, and 76 cm
- Two herbicide treatments: weed-free and POST herbicide
- All treatments repeated in both black and small red beans
- Data collection:
 - Weeds were harvested at peak biomass from POST treatments
 - Photosynthetically active radiation was measured above and below the canopy throughout the growing season for canopy closure.
 - Yields were obtained by direct harvest with a plot combine adjusted to 18% moisture.
- Data was analyzed using PROC MIXED in SAS. Interactions and main effects were tested, means were separated with Fisher's protected LSD.

Figure 1. Key dates for dry bean development

	Planting Date	Peak Canopy	Weed Harvest	Yield Harvest
E. Lansing	June 16	Aug. 10	Sept. 21	Sept. 29
Richville	June 10	Aug. 17	Sept. 4	Sept. 7

Weed Control at East Lansing

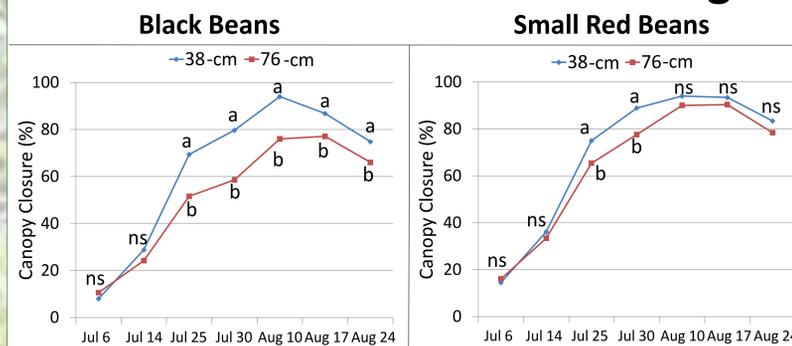


Figure 2. Canopy closure of 'Zorro' black beans was quicker and more complete in 38-cm rows than in 76-cm rows.

Figure 3. Canopy closure of 'Merlot' small red beans was greater early in 38-cm rows than in 76-cm rows.

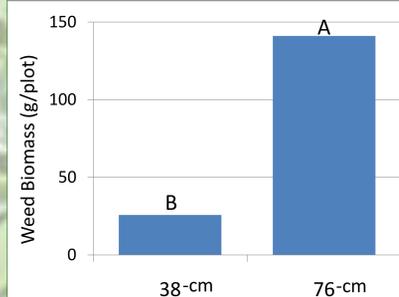


Figure 4. 'Zorro' black beans planted in 38-cm rows suppressed weed growth after POST treatment compared with 76-cm rows.

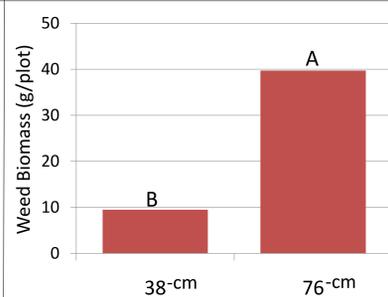


Figure 5. 'Merlot' small red beans planted in 38-cm rows suppressed weed growth after POST treatment compared with 76-cm rows.

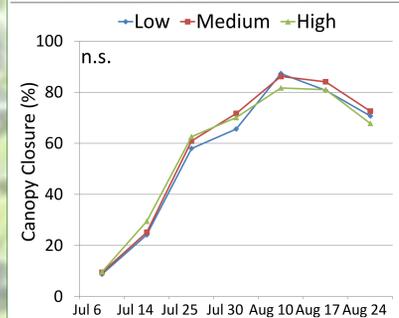


Figure 6: Planting population did not affect canopy closure in 'Zorro' black beans.

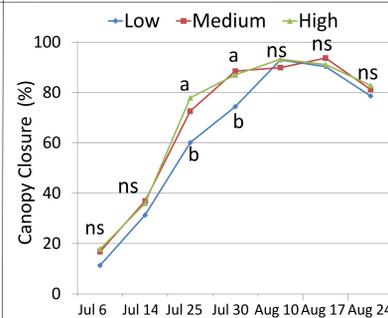


Figure 7: Medium and high planting populations resulted in better mid-season canopy closure in 'Merlot' small red beans.

- 'Merlot' small red beans provided greater canopy closure than 'Zorro' black beans, which resulted in greater weed suppression (data not shown).
- Dry beans planted in narrow rows (38-cm) provided quicker more effective canopy closure than dry beans planted in wide rows (Figures 2 & 3).
- Narrow rows also suppressed weed growth (Figures 4 & 5).
- Plant population only affected mid-season canopy closure for 'Merlot' small red beans (Figures 6 & 7).

Conclusions

When moisture was adequate, narrow row dry beans closed the canopy more quickly and completely than wide row dry beans. This resulted in significant weed suppression and relative reductions in weed biomass. Yield was higher in narrow rows than in wide rows in 'Zorro' black beans, but row width did not affect yield in 'Merlot' small red beans. Changing the planting population also did not have a significant effect on yield of either dry bean class. Under drought conditions, weed suppression may not change based on row width, and canopy closure and yield become erratic, sometimes being greater in wide rows. This research will be repeated in 2011.

Yield at East Lansing

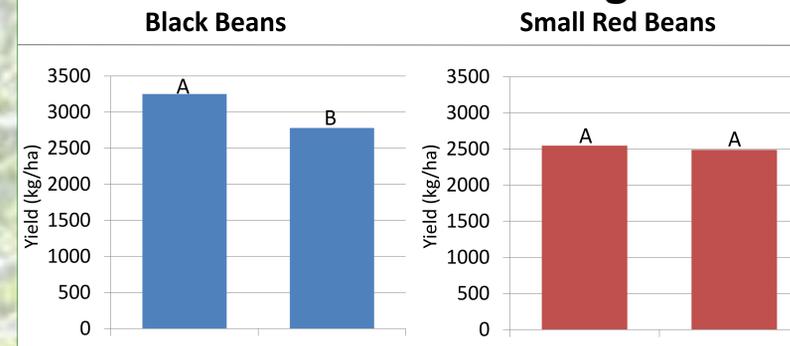


Figure 8. Yield of 'Zorro' black beans planted in 38-cm rows was greater than 76-cm rows.

Figure 9. Row width did not affect 'Merlot' small red bean yield.

- Averaged across treatments, black bean yield was greater than small red beans.
- Row width only affected yield of 'Zorro' black beans (Figures 8 & 9).
- Yield was 470 kg/ha more for black beans planted in 38-cm rows compared with 76-cm rows (Figure 8).
- Planting population did not affect yield for either dry bean class (data not shown).

Figure 10. Beans at harvest



Richville

- At Richville, serious drought conditions occurred throughout the growing season. Only 8-cm of precipitation occurred while the crop was growing (Figure 11).
- Yields, weed populations, and canopy closure were all depressed compared to East Lansing. Results were variable and much different than those at East Lansing.

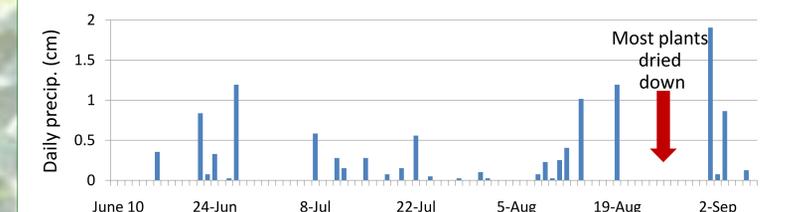


Figure 11. Daily precipitation at Richville during the dry bean growing season.

- There were some differences between canopy closure early in the season for both dry bean classes. However, due to drought conditions there were no differences in canopy closure in mid- to late- season (data not shown).
- There were also no differences in weed biomass between dry bean class, row width or plant population.
- In black beans, 76-cm rows resulted in higher yields than 38-cm rows in the weed-free plots (data not shown).
- In small red beans, the medium population resulted in slightly higher yields compared with the high population.

Acknowledgements

