Organic Farmers' Weed Control Strategies in Dry Beans

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Introduction

- Michigan is the number one producer of organic dry beans in the United States (> 4,700 A)
- Pest and nutrient management, as well as dry bean class and cultivar choices, are key to successful organic dry bean production
- Weed management information and recommendations are needed to increase organic acreage and improve the profitability of organic dry bean production

Objective

To compare weed control and dry bean yield at nine organic farms in Michigan

Materials & Methods

- Locations: 9 certified organic farms in Michigan (Fig. 2)
- 'Zorro' black beans and 'Vista' navy beans seeded at 120,000 seeds/A in early to late June
  - Seed was treated with an OMRI approved commercial *Rhizobium* inoculant to facilitate nodulation and nitrogen fixation
- Farmers managed weeds according to current practices on their farms (Fig. 1, Table 1)
- Measurements by MSU research group:
  - Weed biomass
    - Timing: V2 & R5
    - Area sampled: 3 quadrats (6" x 30")
  - Dry bean populations
    - Timing: V2 & harvest
    - Length of row sampled: 20 ft
  - Dry bean yield
    - Length of row sampled: 60 ft
    - Adjusted to 18% moisture
- Replications: 4 at each organic farm
- Data were analyzed using ANOVA with means separated using PROC MIXED ($p \leq 0.05$) in SAS v9.2

Figure 1. Rotary hoeing organic dry beans in Caro, MI with a double rotary hoe

Results

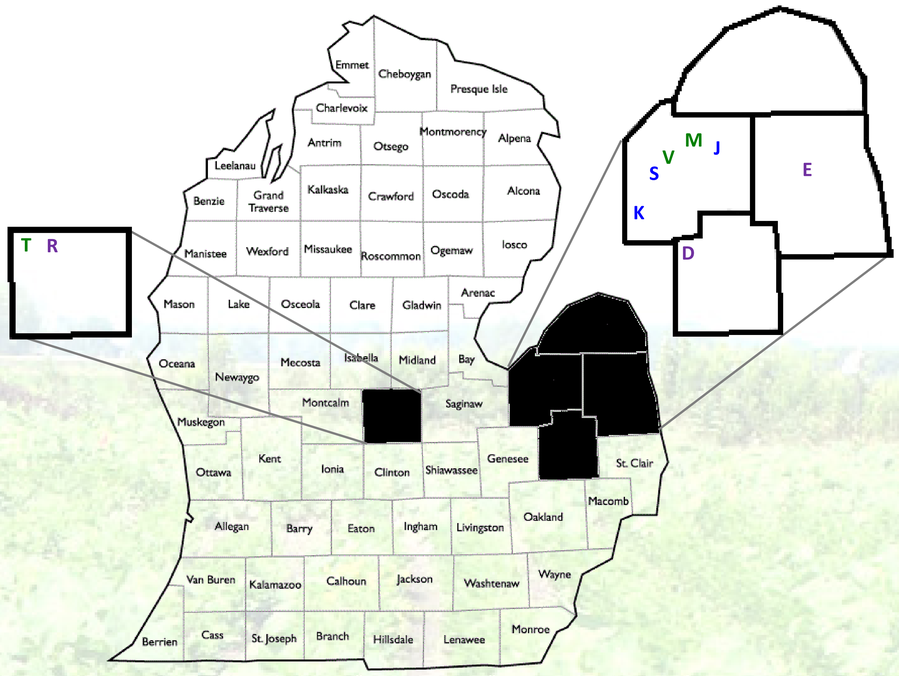

Figure 2. Location of 9 organic farm sites in Michigan
Purple= low yields, **Blue**= intermediate yields, **Green**= high yields

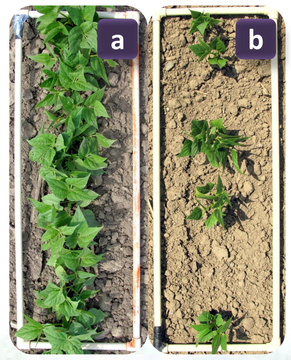

Figure 3. Examples of high (a) and low (b) populations at the V2 dry bean stage and low (c) and high (d) weed biomass at R5

Table 1. Planting date, weed management practices, weed dry biomass, dry bean populations and yield for 9 Michigan farms. **Purple**= low yields, **Blue**= intermediate yields, **Green**= high yields

Location	Planting date	Weed management				Weed dry biomass (V2)	Population (V2)		Yield	
		RH or TW[a]	Cultivated	Hand hoed	Mowed[b]		Navy bean	Black bean	Navy bean	Black bean
		# passes				lbs/A	plants/A		cwt/A	
D	7-Jun	2	4	0	2	20.9 a	81,000 cd	137,700 a	15.3 de	19.0 ef
E	18-Jun	3	4	0	0	20.2 a	24,000 e	45,300 c	11.1 e	17.4 f
R	30-Jun	3	3	1	0	1.4 c	81,500 cd	96,900 b	17.8 cd	18.5 ef
S	4-Jun	1	2	1	0	0.0 c	105,000 ab	106,900 b	23.0 abc	22.6 de
J	29-Jun	1	1	0	0	0.8 c	82,800 c	103,400 b	20.8 bc	21.7 def
K	1-Jul	1	1	2	0	2.1 c	99,100 b	124,200 a	24.8 ab	25.7 cd
V	13-Jun	2	2	1	0	13.4 ab	80,800 cd	103,900 b	26.1 ab	32.3 ab
T	14-Jun	1	2	0	0	7.1 bc	117,200 a	124,800 a	28.0 a	34.3 ab
M	29-Jun	1	1	0	0	0.2 c	67,100 d	101,600 b	27.2 a	28.5 bc

[a] RH= rotary hoed, TW= tine weeded [b] Mowed above the dry bean canopy

- Weed biomass ranged from 0 to 2.1 lbs/A at 5 of 9 locations when weeds were measured at the V2 growth stage of dry beans (Fig. 3 & Table1)
- Black bean populations at the V2 growth stage were 18% lower than the seeding rate of 120,000 seeds/A, when averaged across all farm locations; navy bean populations were, on average, 20% lower than black bean populations (Table 1)
- Black bean yields were 24.4 lbs/A, averaged across nine locations; navy bean yields averaged 21.6 lbs/A (Table 1)

Conclusions

- Weeds were effectively managed in organic black and navy bean production at five of the nine locations by rotary hoeing or tine weeding once, followed by either one or two cultivations
- The three low-yielding farms rotary hoed (or tine-weeded) and cultivated more frequently than the other six organic farm locations because of poor weed control, as measured by weed biomass, at the V2 growth stage of dry beans
- Differences in weed seed banks among the farms will be compared in the greenhouse
- **This is one piece of a multifaceted research project aimed at advancing organic dry bean production systems through better class and variety selections, improving pest management techniques and timing, and integrating cover crops**

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