Cover Crops Before Sweet Corn: Does This Mean Fewer Weeds?

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Introduction

There has been increased pressure on vegetable growers from consumers and policy makers to reduce pesticide inputs and improve sustainable production practices.

The inclusion of cover crops in a management system may lead to the suppression of weeds through competition for resources, physical obstruction of weed emergence, and allelopathy[1].

The objective of this study was to determine if cover crops reduce the presence of weeds in sweet corn production.

Methodology

- Field experiments were established in 2006 and 2007 in pea – cover crop – sweet corn rotation in Bothwell and Ridgetown, Ontario.
- Crops included: 1) peas "Encore" and 2) sweet corn "Temptation".
- Cover crop treatments included: 1) oats, 2) fall rye, 3) oilseed radish + rye (OSR+rye), 4) oilseed radish (OSR) and 5) no cover control.
- Cover crops were planted on Aug. 4, 2006 and July 19, 2007 at Bothwell and Ridgetown, respectively.
- Cover crop biomass was quantified in the fall and spring.
- Weed population measurements were as follows:
  - Fall – total weed biomass (Ridgetown site only).
  - Spring – weed biomass and density by species prior to cover crop kill.
  - Summer – weed biomass and density by species in the sweet corn at 28 and 56 days after herbicide treatment (DAT).
- Sweet corn was treated with:
  - Accent with Agral 90 on June 19, and Basagran Forte on June 26, 2007 at Bothwell.
  - Dual II Magnum on May 29, and Accent with Agral 90 on 13 June 2008 at Ridgetown.
- Marketable and total sweet corn yields were determined in both weedy and non-weedy treatments.

References

1. Creamer, N.G., M.A. Bennett, B.R. Stinner, J. Cardina and E.E.Regnier. 1996. Mechanisms of weed suppression in cover crop-based production systems. HortScience 31(3):410-413.

Cover Crop Biomass Production

- Overall, all four of the cover crops established well and produced significant biomass to provide protection from wind and water erosion (Fig. 1 & 2).
- Over the entire growing season, cover crop biomass production ranged from 830 to 4700 and 1680 to 17255 kg ha^{-1} at Bothwell and Ridgetown, respectively.

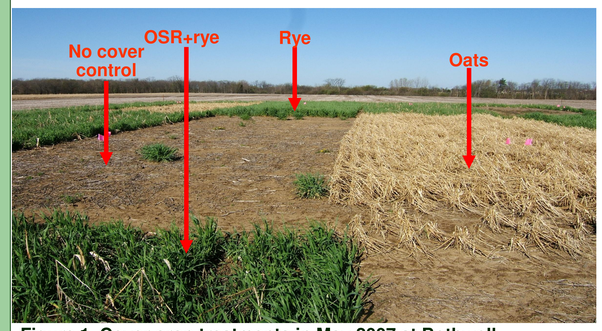

Figure 1. Cover crop treatments in May 2007 at Bothwell .

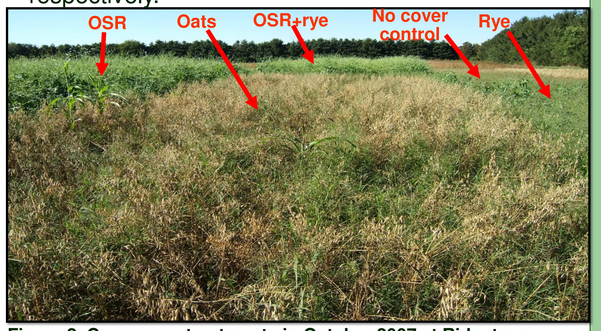

Figure 2. Cover crop treatments in October 2007 at Ridgetown.

Weed Populations

- In the fall, at Ridgetown, weed biomass in the OSR treatments was 29.0 g m^{-2} lower than in the no cover and 59.1 g m^{-2} lower than in the cereal treatments (Fig. 3).
- In late fall, when compared to the first two sample dates, neither oat nor rye reduced weed biomass levels compared to the no cover treatment (Fig. 3).
- In the spring, 99% of weeds at both sites were broadleaves, with dominant species being common chickweed, Canada fleabane and henbit at Bothwell and common ragweed, OSR and woodsorrel at Ridgetown.
- In the spring, at Bothwell, all of the covers lowered weed biomass below the no cover control (Table 1).
- In the spring, at Ridgetown, cover crops had no effect on weed populations (Table 1).
- In sweet corn crop, at Bothwell, 94% of weeds were grasses, with long-spined sandbur being the dominant species.
- In sweet corn crop, at Ridgetown, 81% of weeds were broadleaves, with ragweed being the dominant species.
- In sweet corn crop, after herbicide application, weed populations were generally unaffected by the cover crops (Table 1).
- Although not observed in our study, if allowed to set viable seed, OSR can produce up to 684 plants m^{-2} in the spring, which may affect sweet corn yields.

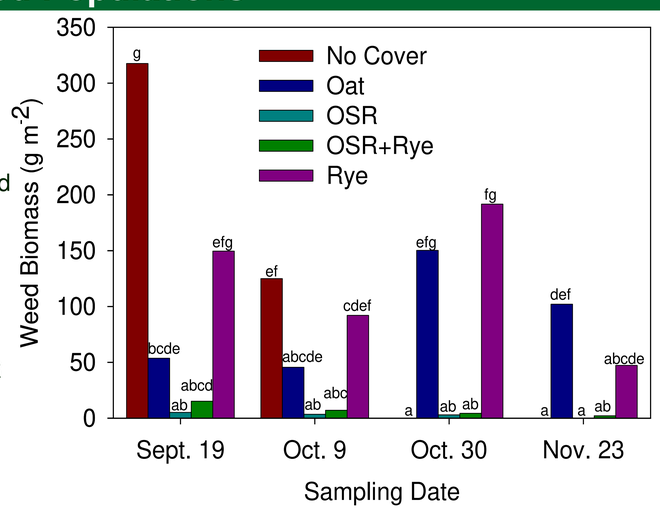

Figure 3. Fall biomass production (g m^{-2}) of weeds at Ridgetown (2007-2008). Bars labeled with the same letter for each site were not significantly different .

Table 1. Weed biomass in the spring and summer following different cover crops, at Bothwell (2006-2007) and Ridgetown (2007-2008). **Within columns, means followed by the same letter were not significantly different except for summer weed biomass at Bothwell where means are compared between both sample dates.**

	Spring		Summer		
	Bothwell	Ridgetown	Bothwell		Ridgetown
Cover crop			28 DAT	56 DAT	
	---g m^{-2}---				
No cover	23.3 b	2.3 a	62.6 ab	59.5 ab	66.1 ab
Oat	0.8 a	7.4 a	63.9 ab	242.5 b	77.4 b
OSR	--	2.0 a	--	--	55.0 ab
OSR+Rye	0.3 a	2.3 a	37.1 a	194.6 b	44.1 a
Rye	0.6a	1.0 a	61.1 ab	222.9 b	77.6 b

Cover Crop & Weed Treatment Effect on Sweet Corn Yields

- Cover crop treatments had no impact on marketable sweet corn yield (Table 2).
- Total yields were also generally unaffected by cover crops, with the exception that oat produced higher total yields than the no cover control at Bothwell (data not shown).
- Weedy plots had lower total sweet corn yields than the non-weedy plots at Ridgetown; this was not seen at Bothwell (Table 2), likely due to differences in harvest dates between weed treatments.

Table 2. Marketable yields for each cover crop and weed treatment. Within sites, means followed by the same letter were not significantly different .

	Marketable Yield (t ha^{-1})			
	Bothwell		Ridgetown	
Cover Crop	Non-weedy	Weedy	Non-weedy	Weedy
No Cover	7.8 a	9.2 a	15.4 a	1.6 b
Oat	11.0 a	13.8 a	22.9 a	1.7 b
OSR	--	--	14.4 a	3.8 b
OSR+Rye	8.8 a	10.0 a	21.0 a	2.8 b
Rye	9.0 a	8.9 a	27.5 a	7.8 b

Discussion

- All cover crops established well and produced significant biomass.
- Cover crops did not positively or negatively affect sweet corn yields, compared to the no cover control.
- The effectiveness of the cover crops to control weeds was variable in the spring before sweet corn planting and minimal in the summer during the growing season.
- After growing cover crops for 1 year, the cover crops tested do not provide significant weed suppression or problems during the sweet corn growing season.
- However, in the fall, cover crops with OSR were effective at reducing weed biomass compared to a no cover control. The long term effects of OSR on spring and summer weed populations is not known, and was not studied in this experiment.

Acknowledgements

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