

Impact of Cover Crops on Weed Dynamics in Organic Dry Beans



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Introduction

- Dry edible beans are planted in early to mid-June in Michigan, allowing time for the spring growth of overwintering cover crops
- Cover crops have the potential to decrease weed pressure in subsequent cash crops by reducing weed germination, growth, and seed inputs

Objective

- Determine the influence of cover crops on weed pressure (density and biomass) in organic dry beans

Materials & Methods

- Cover crops planted prior to dry beans (Figure 1):
 - Medium red clover 'Marathon' (11 kg/ha)
 - Oilseed radish 'Groundhog' (12 kg/ha)
 - Rye 'Wheeler' (100-125 kg/ha)
 - No cover
- Two-level experiment (RCBD at each level):
 - Main sites:
 - MSU research locations (East Lansing and Hickory Corners, MI)
 - Included all cover crops treatments
 - Total 6 site-years
 - Satellite sites:
 - MI organic farms (9 sites)
 - Included one cover crop and a no cover control at each site
 - Total 18 site-years
- Cover crop + pre-season weed biomass was collected at peak production (i.e. late-fall for radish, prior to spring incorporation for rye, clover, and no cover)
- Weed measurements:
 - Within-row weed density and dry aboveground biomass
 - Three quadrats per plot (15 cm by 76 cm)
 - Sampling times (based on bean stages):
 - V2 (appearance of first trifoliolate)
 - R1 (appearance of first open flower)
- Soil nitrogen was sampled at V2 and R1 at all locations

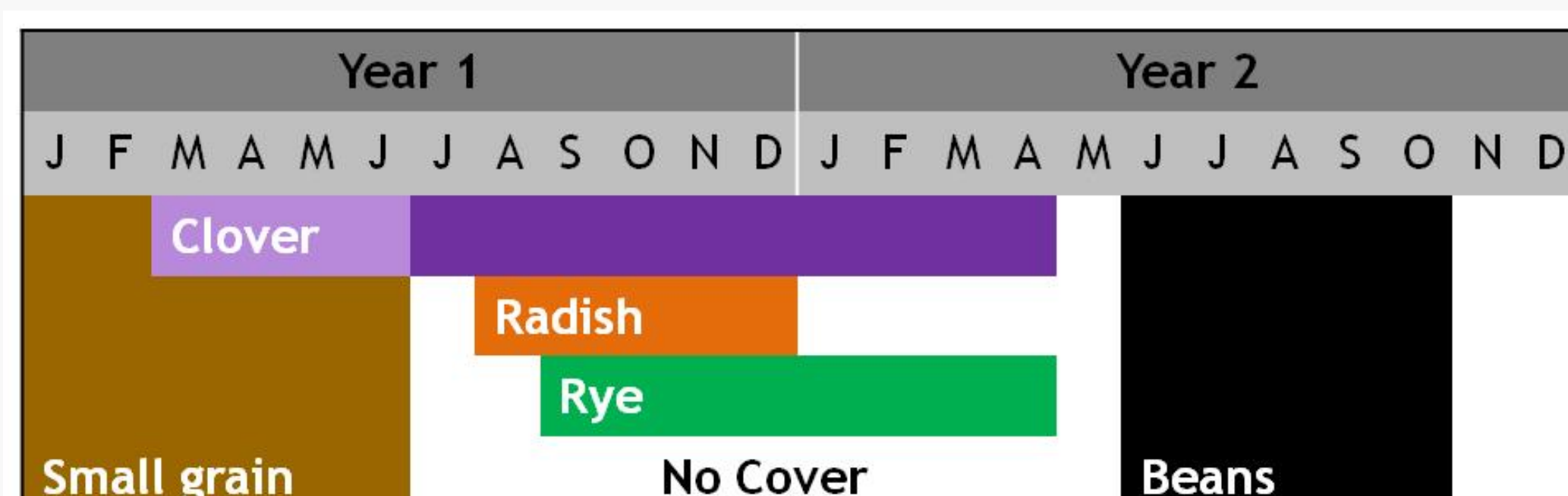


Figure 1. Cropping sequence to study the impact of cover crops on dry beans.

Results (Main sites)

- Oilseed radish did not influence weed biomass or density relative to the no cover treatment at Hickory Corners and East Lansing
- Rye rarely affected weed pressure, but did reduce weed biomass at 2 of 12 sample times compared to the no cover treatment
- At 4 of the 12 sample times, plots following a clover cover crop had greater weed biomass than all other cover treatments (E. Lansing Figure 3 b, Hickory Corners not shown)
- At 6 of the 12 sample times, plots following clover had higher weed densities than the no cover crop treatment, especially when common lambsquarters was prominent in the seedbank (Figure 3d, Figure 2)
- Greater weed pressure following clover may be related to increased nitrogen availability (Figure 3f,h)
- Differences in clover biomass in East Lansing may be attributed to clover planting date (Figure 3g,h). Clover was planted in August 2010, whereas in 2011 it was frost-seeded in April



Figure 2. Common lambsquarters was clearly visible in beans planted following clover at East Lansing in 2012.

Cover crop impact on weeds: 2 Examples

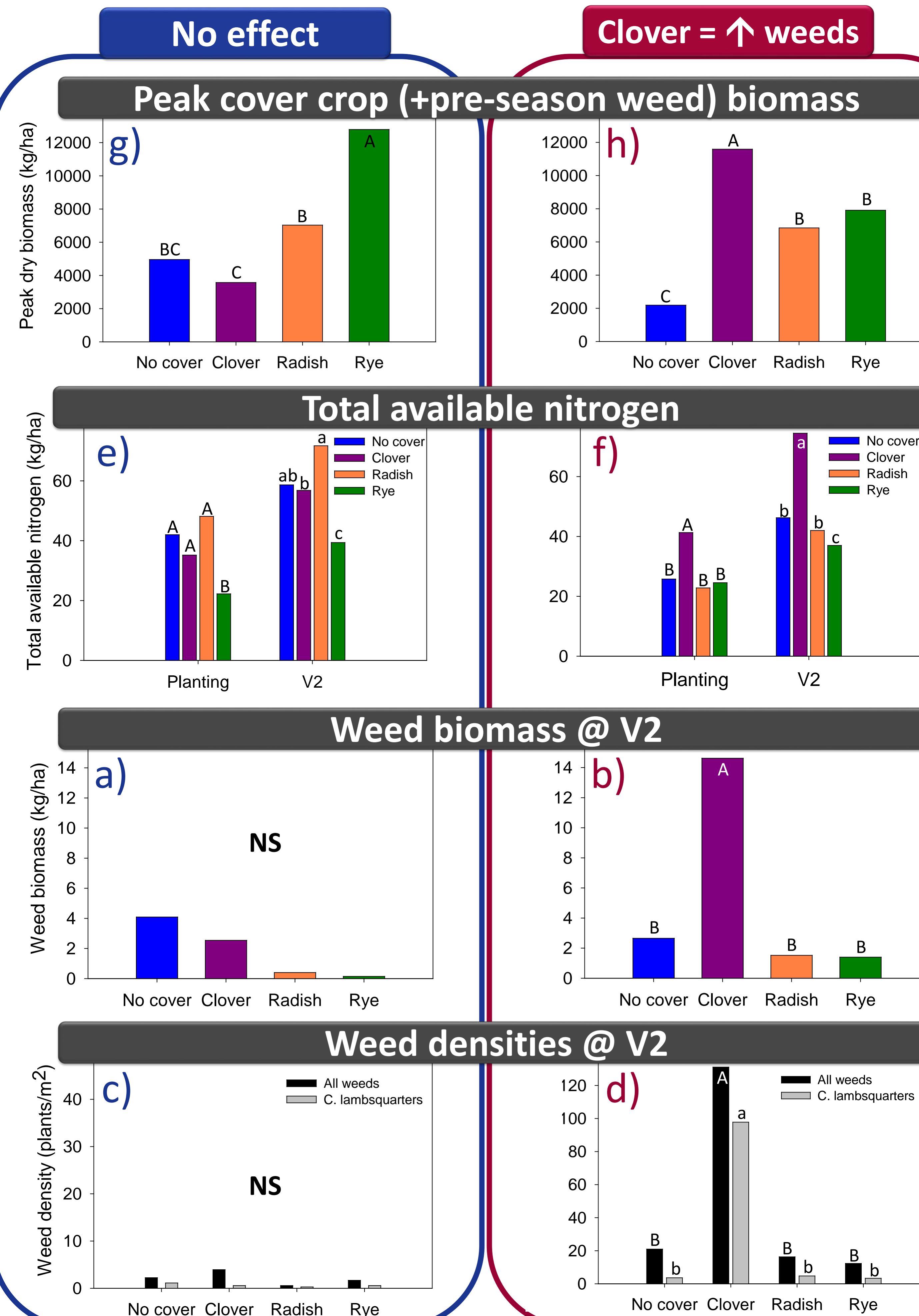


Figure 3. Cover crop had no effect on weeds in E. Lansing 2011 at V2 (left), however higher clover biomass resulted in increased weed pressure E. L. 2012 at V2 (right).

Results (Satellite Sites)

- The peak cover crop biomass at the satellite sites was lower than the main sites for clover and oilseed radish, due to later planting dates (data not shown).
- There were few differences among cover crop treatments at the satellite sites with regards to weed biomass and density (data not shown).



Figure 4. Samples of cover crops from the satellite sites.

Conclusions

- Weed biomass and density increased in dry bean following clover only when cover crop dry biomass was greater than 7,000 kg/ha. Increased nitrogen availability may increase common lambsquarters germination and growth (Williams and Harper 1965; Blackshaw et al. 2003)
- Oilseed radish and rye rarely influenced weed pressure.
- Differences in weed biomass and density at satellite plots following clover were negligible possibly due to the lower clover biomass (ranging from 1,000 to 6,000 kg/ha).