The Impact of Fall-Planted Cover Crop Monocultures and Simple Mixtures on Weed Presence Prior to Corn
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Introduction
Farmers increasingly use cover crops synergistically in mixtures to simultaneously take advantage of the benefits of different types of cover crops.

- Legumes - fix nitrogen
- Grasses - scavenge nitrogen, suppress weeds
- Brassicas - scavenge nitrogen, suppress weeds, suppress erosion

The purpose of this study was to quantify the benefits of simple (two-species) cover crop mixtures as compared with pure stands of each cover crop. Weed suppression was one benefit of interest.

Figure 1. Clockwise from top right: hairy vetch, winter pea, annual ryegrass, oats, cereal rye, crimson clover, and radish.

Objectives
1. Determine biomass production for each cover crop when grown in a pure stand versus in a mixture.
2. Assess the impact of pure stands versus mixtures on weed biomass production.

Materials and Methods
Site: East Lansing, MI; 2011
Experimental design: RCBD with 3-4 replications and 3 years
Data analyzed: ANOVA in Statistix v. 9.0; mean separation at P<0.05 using Tukey’s HSD
Planting: cover crops were drilled between mid-August and early September each year after wheat harvest; planting rates are listed in Table 1

Results and Discussion

Cover Crop Biomass
- Cover crop biomass and winter survival varied by year (data not shown).
- Oats and radish (winter killed covers) produced the greatest fall biomass.
- Radish dominated the fall biomass production of the mixture treatments.
- Crimson clover did not reliably establish each year.
- Among the legumes, hairy vetch produced the most biomass and was more successful at overwintering than winter pea.
- Cereal rye produced the most biomass in the spring.
- Cover crop mixtures produced less spring biomass than pure stands.
- The mild winter of ’11-’12 resulted in similar legume and grass fall and spring biomass.

Fall Weed Biomass
- Low weed pressure in fall ‘11 resulted in few treatment differences (data not shown).
- Fall weed biomass was an order of magnitude greater in ‘12 than in ‘13 (Fig. 2).
- Radish and grass treatments had lower fall weed biomass than treatments including a legume.

Spring Weed Biomass
- Annual ryegrass and cereal rye reliably suppressed spring weeds (Fig. 4).
- Hairy vetch, which was the legume treatment with the most spring cover crop biomass, had the least amounts of weed biomass.
- Spring weed suppression was lowest in cover crop treatments which failed to establish (crimson clover) or overwinter (radish, oats, and winter pea).

Conclusions
- Differences were likely due to a combination of varying weather over the three years and varying weed and wheat pressure between fields.
- Radish, both in monoculture and as part of a mixture, was a reliable choice for fall biomass production and weed suppression.
- Cereal rye and hairy vetch were the most reliable grass and legume, respectively, with regard to spring biomass production and weed suppression.

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