Cover Crop Options and Mixes for the Upper Midwest: Is a Winter Rye Monoculture the Only Option?

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Introduction

Winter rye (*Secale cereale* L.) is the predominant cover crop being planted by corn and soybean farmers in the upper Midwest. Winter rye is an excellent nitrogen scavenger, grows at a lower base temperature than most other potential cover crops, is very winter hardy, accumulates high levels of residue, and decreases soil erosion. In recent years, cover crop companies and different interest groups have been promoting the benefits of cover crop mixes and new cover crop species. Our study was designed to test new cover crop options and cover crop mixes for their performance in corn-soybean systems in the upper Midwest. Our objectives were to evaluate potential cover crops and cover crop mixes and their effects on 1) cover crop biomass; 2) weed community; 3) soil, water, and nutrient contents; and 4) corn health and yield.

Materials and Methods

A field study was conducted at five Iowa sites over two growing seasons. The sites were located at Ames and Lewis, Iowa in 2013-2014 and Boone, Lewis, and Sutherland, Iowa in 2014-2015. The cover crops were no-till drilled in October immediately after soybean harvest. Cover crops were terminated with glyphosate in late April to early May before planting corn. Full season corn hybrids were planted in late April to early May.

The cover crop treatments included monoculture plantings of winter rye, winter triticale, camelina, two canola varieties, turnip, hairy vetch, spring barley, and spring oat. Rye or triticale was combined with camelina or vetch to make two-way mixes. Rye or triticale also was mixed with camelina and vetch as three-way mixes.

Data collected included fall cover crop biomass taken just before a killing frost; weed community in cover crops immediately before cover crop termination; weed community in V3 corn; spring cover crop biomass immediately before termination; soil test nitrate, P, and K immediately before cover crop termination; volumetric soil water content at corn planting, V6, and R1; corn chlorophyll with SPAD readings at V6 and R1; and corn yield.

Results and Discussion

Fall cover crop biomass was limited by the lack of growing degree days. All cover crop treatments established, but produced very small amounts of biomass. Rye-camelina mix produced the greatest biomass, 61 lb/acre. In the spring, cover crop biomass was greatest for rye and rye mixes. The results of spring cover crop aboveground biomass accumulation are shown in Figure 1. Barley, oat, Sitro canola, and Claremore canola did not survive either winter, while turnip and vetch had limited winter survival.

Rye and rye mixtures had the greatest aboveground biomass, carbon, and nitrogen accumulation and the lowest soil nitrate levels among all treatments. Winter rye mixtures showed no advantages over rye monoculture for biomass, carbon, or nitrogen accumulation.

Cover crop treatment did not influence soil phosphorus, soil potassium, weed density, or

weed community, and had minimal effect on soil water. Corn chlorophyll levels as measured by SPAD readings were lowest in rye associated treatments. Corn yield was not affected by cover crop treatment.

The results from this study show that winter rye cover crop mixtures may not be any better than planting rye as a monoculture. Rye associated cover crops produced the most biomass, carbon, and nitrogen accumulation. Triticale and camelina have limited potential as an October-seeded cover crop. Cover crop seeding should be completed before mid-October to allow more cover crop growth. Aerial and high clearance intercrop seeders may be options.

Acknowledgements

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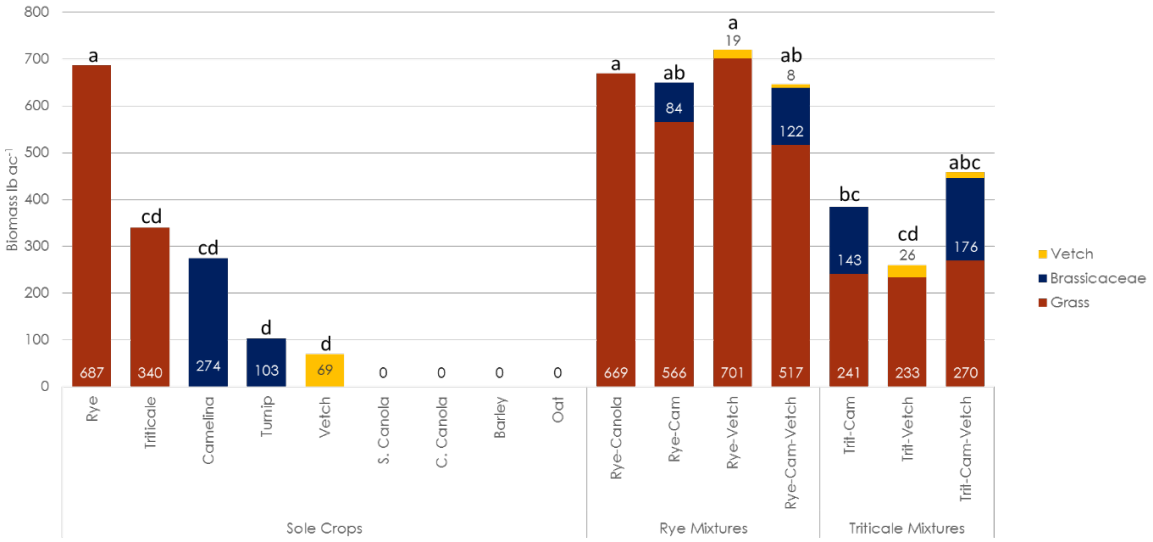

Figure 1. Spring cover crop aboveground biomass at cover crop termination. Average across five sites, late April/early May. Means with the same letter do not differ (P ≤ 0.05).

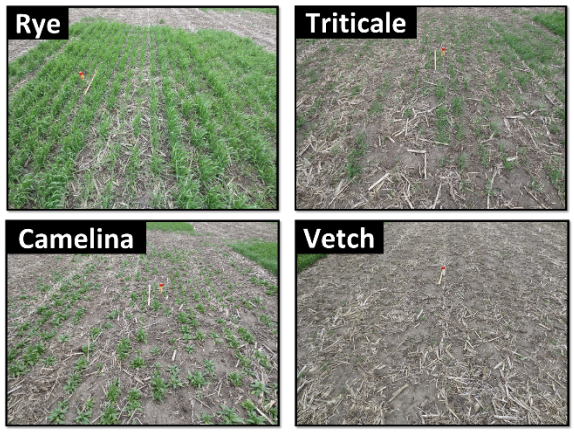

Figure 2. Spring cover crop aboveground biomass of four different sole crop treatments immediately before cover crop termination. Pictures taken at Sutherland location April 28, 2015. Growth is roughly representative of the average of all five sites.