Cultivar and planting date selection for relay-cropping soybean with winter oilseeds

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Introduction

Winter camelina [Camelina sativa (L.) Crantz.] and pennycress (Thlaspi arvense L.) are two winter-hardy oilseeds that can serve as both cash- and cover-crops. Double- and relay-cropping soybean with these winter oilseeds have been demonstrated as viable cropping systems for the Upper Midwest (Gesch et al., 2014; Johnson et al., 2017). Relay-cropping can result in greater total grain yield and economic returns than a sole full-season soybean crop. However, more work is needed to improve soybean cultivar selection and planting time to optimize relay system production.

Objective

- Evaluate relay soybean planting date (PD) and maturity group (MG) on soybean productivity in winter oilseed-soybean relay systems.
- Evaluate the effect of relay soybean PD on winter camelina and pennycress productivity.

Methods

Conducted in west central Minnesota, USA on a Barnes loam soil. Planted camelina (Joelle) & pennycress (MN106); no-till interseeder with a skip-row at 76 cm. 2015

2016

Soil analysis by NMR

Growing season calendars

2015

Sept 10

2016

Apr 18

May 2

May 16

Jun 20

Jun 27

Sept 21 – Oct 13

Planted camelina (Joelle) & pennycress (MN106); no-till interseeder with a skip-row at 76 cm

PD1

PD2

PD3

Pennycress

Camelina

Combine harvested

Soybean harvest

Planted soybean

MG 0.2, 1.1, & 1.7

Rosette

Bolting

Initial flowering

Emerged soybean relayed between camelina rows.

Results

Figure 1. Grain yields for the camelina-soybean relay system in 2016. For soybean yields, bars followed by the same letter are not different at the P < 0.05 level.

Figure 2. Grain yields for the pennycress-soybean relay system in 2016. For soybean yields, bars followed by the same letter are not different at the P < 0.05 level.

Figure 3. Seed oil content for soybean relayed into camelina. Bars followed by the same letter are not different at the P < 0.05 level.

Figure 4. Node numbers for soybean relayed into camelina. Bars followed by the same letter are not different at the P < 0.05 level.

Figure 5. Oil content for soybean relayed into pennycress. Bars followed by the same letter are not different at the P < 0.05 level.

Figure 6. Total grain yield (kg ha⁻¹) for soybean relayed into camelina and pennycress. Bars followed by the same letter are not different at the P < 0.05 level.

Figure 7. Total grain yield (kg ha⁻¹) for soybean relayed into pennycress. Bars followed by the same letter are not different at the P < 0.05 level.

Summary

- Regardless of PD, relaying soybean did not adversely affect camelina and pennycress yields.
- The longer MG soybean (1.7) tended to be the most productive in the oilseed relay systems and yields were not different than monocropped MG 1.1 soybean, standard for the region.
- Soybean oil content was slightly reduced by relaying.