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 (Geschl et al., 2010; 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 relay systems.
- Evaluate the effect of relay soybean PD on winter camelina and pennycress productivity.

Methods
Conducted in west central Minnesota, USA on a Hanes loam soil.

2015
2016

<table>
<thead>
<tr>
<th>Date</th>
<th>Action</th>
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<tbody>
<tr>
<td>May 10</td>
<td>Planted camelina (seeds) &amp; pennycress (MGS25): no till, interseeded with a skiprow at 76 cm</td>
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<tr>
<td>May 16</td>
<td>PD1</td>
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<td>May 18</td>
<td>PD2</td>
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<td>May 20</td>
<td>PD3</td>
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<td>Pennycress - Camelina combine harvested</td>
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<td>Soybean harvest</td>
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<td></td>
<td>Harvested soybean MG 0.2, 1.1, &amp; 1.7</td>
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<td>Seed oil analysis by NMR</td>
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Figure 1. 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 2. Grain yields for the pennycress soybean relay system in 2016. For yields of the relayed MG 0.3 soybean were lower than controls. Camellina yield was not affected by pennycress MG or PD and ranged from 907 to 1252 kg ha⁻¹. MG X PD interaction was significant for relayed soybean yield. Yields of the relayed MG 1.7 soybean were not significantly different than controls and were as high as 8842 kg ha⁻¹ for PD2. Yields of the relayed MG 0.3 soybean were lower than controls.

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

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

Figure 5. Soybean relay planted into winter camelina on May 3, 2015. Note the camelina run over by tractor tires. Wait 24 to 48 hours after relay-seeding, camelina plants were fully erect again.

Summary
- Regardless of PD, relayed 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 monocoprop MGS 1.1 soybean, standard for the region.
- Soybean oil content was slightly reduced by relaying.
- Oilseed relay cropping only affected node numbers for the early MG soybean (D 12).
- Planting longer MG soybean than normal from early to mid-May improved relayed soybean yield.

References