

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



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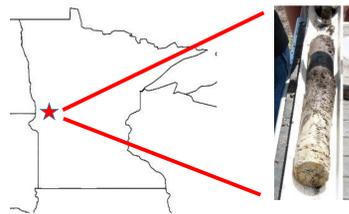
Introduction

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.

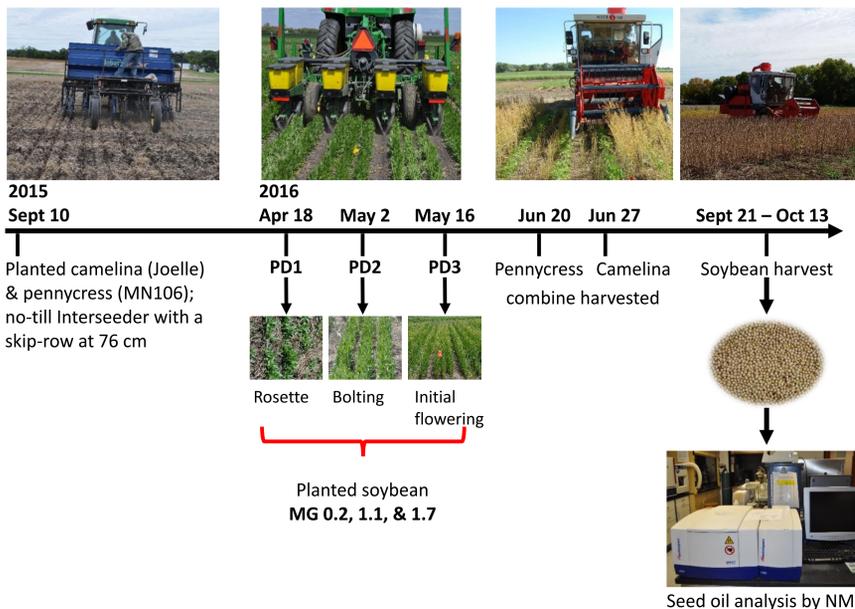
Objective

- 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



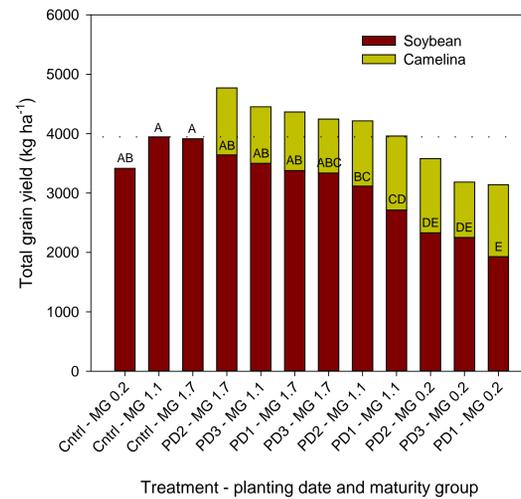
Conducted in west central Minnesota, USA on a Barnes loam soil



Soybean relay planted into winter camelina on May 2, 2016. Note the camelina run over by tractor tires. Within 24 to 48 hours after relay-seeding, camelina plants were fully erect again.

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.

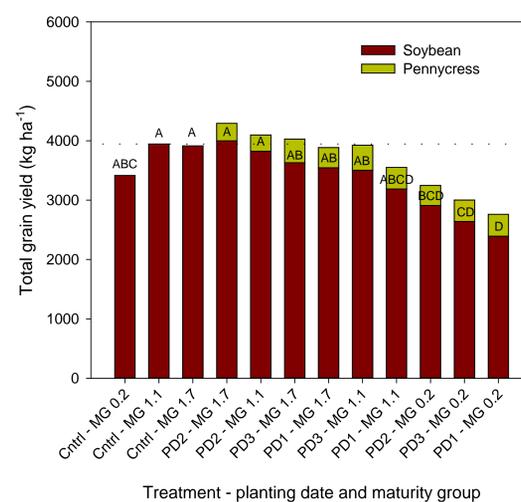


- Camelina yield was not affected by soybean MG or PD and ranged from 907 to 1252 kg ha⁻¹
- MG X PD interaction was significant for relayed soybean yield
- Yields of the relayed MG 1.7 soybean were not significantly different than controls and were as high as 3642 kg ha⁻¹ for PD2
- Yields of the relayed MG 0.2 soybean were lower than controls



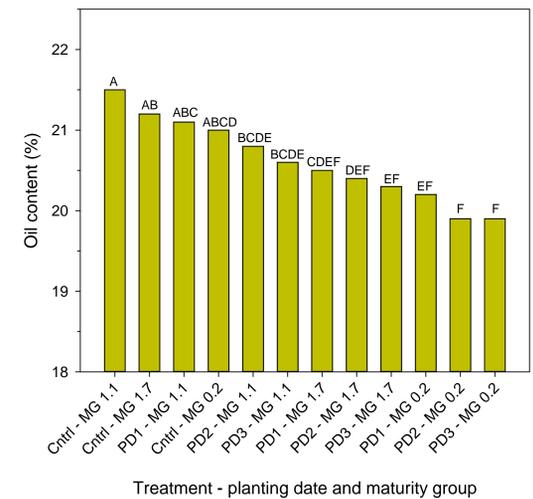
Emerged soybean relayed between camelina rows.

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.



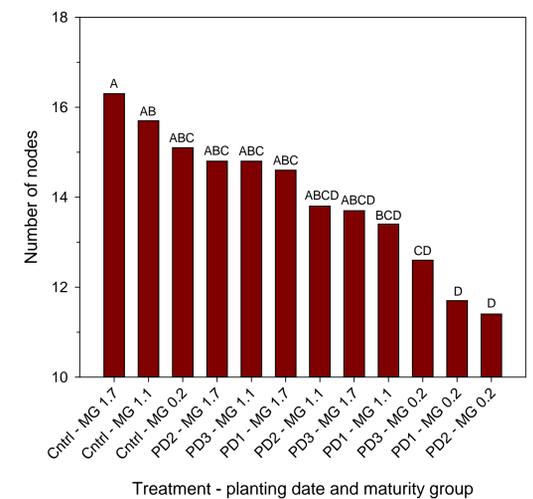
- Pennycress yields were low ranging from 275 to 423 kg ha⁻¹ but were not affected by relayed soybean
- Only the MG effect was significant for relayed soybean
- Relayed soybean yields: MG 1.7 > MG 1.1 > MG 0.2

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.



- Full-season control soybean had slightly higher oil content than relayed soybean by about 0.5 to 1.0%
- Both PD and MG significantly effected oil content of relayed soybean: PD1 > PD2 = PD3; MG 1.1 > MG 1.7 > MG 0.2

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



- Node numbers did not differ between relayed MG 1.1 and 1.7 soybean and their controls
- Relayed MG 0.2 soybean had 2.5 to 3.7 fewer nodes than its monocropped full-season control

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
- Oilseed relay cropping only affected node numbers for the early MG soybean (0.2)
- Planting longer MG soybean than normal from early to mid-May improved relayed soybean yield

References

- Gesch, R.W., D.W. Archer, and B.T. Berti. 2014. Dual cropping winter camelina with soybean in the Northern Corn Belt. *Agron. J.* 106:1735-1745.
- Johnson, G.A., M.S. Wells, K. Anderson, R.W. Gesch, F. Forcella, and D.L. Wyse. 2017. Yield tradeoffs and nitrogen between pennycress, camelina, and soybean in relay- and double-crop systems. *Agron. J.* 109: 2128-2135.