



Influence of Harvest Date on Pennycress Seed Yield and Quality

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Introduction

Opportunity: Establish winter cover crops in Minnesota that maximize the short growing season and contribute to farm profitability.

- Temporal intensification can be used to integrate winter-hardy crops after summer annual crops have been harvested and utilize end-of-season growing degree units.⁵
- Winter annual crops are able to capture much of the growing season not utilized by a traditional corn (*Zea mays* L.) – soybean (*Glycine max* L.) rotation.⁶
- Early season pennycress (*Thlaspi arvense* L.) harvest allows a summer annual double crop to be planted, and increases the overall amount of seed harvested in a single growing season.⁷
- Pennycress oil can be used as a source of biodiesel. This can increase annual farm income due to overall greater seed production.⁸

Challenge: Pennycress is prone to seed shatter at or past physiological maturity. Harvest losses can exceed 60% if proper timing and practices are not established.⁹

Objectives

1. Evaluate the effect of multiple June harvest dates on pennycress grain moisture and yield.
2. Determine oil content at each June harvest date.

Materials and Methods

Design:

- Two locations: Morris and Rosemount, MN
- Randomized complete block design
- Four replications

Management:

- Planted 16-Sep, 2016 (Morris, MN) and 27-Sep, 2016 (Rosemount, MN)
- 8 harvest dates in Jun 2017
- Treatments were hand harvested

Analysis:

- The REG procedure in SAS and the AIC were used to aid in model selection comparing linear, quadratic, and linear plateau models^{10, 11}

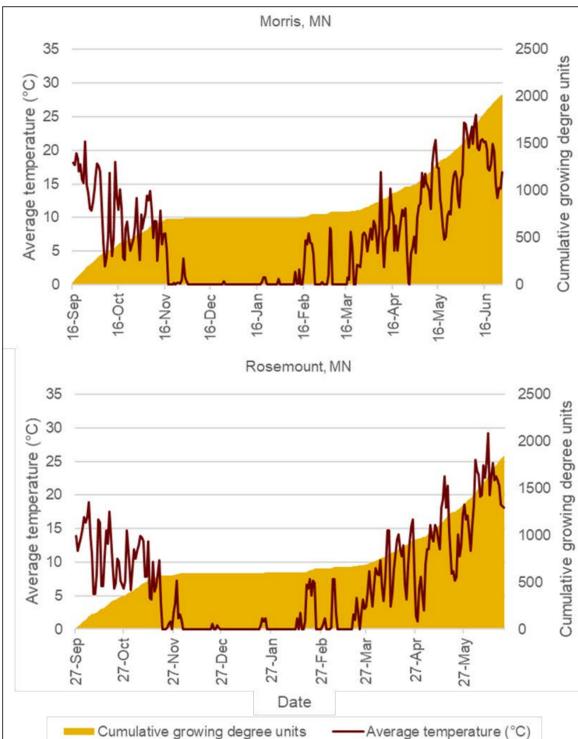


Figure 1. Temperature and cumulative growing degree units at two research locations, (2016-2017).^{12,13}

Results

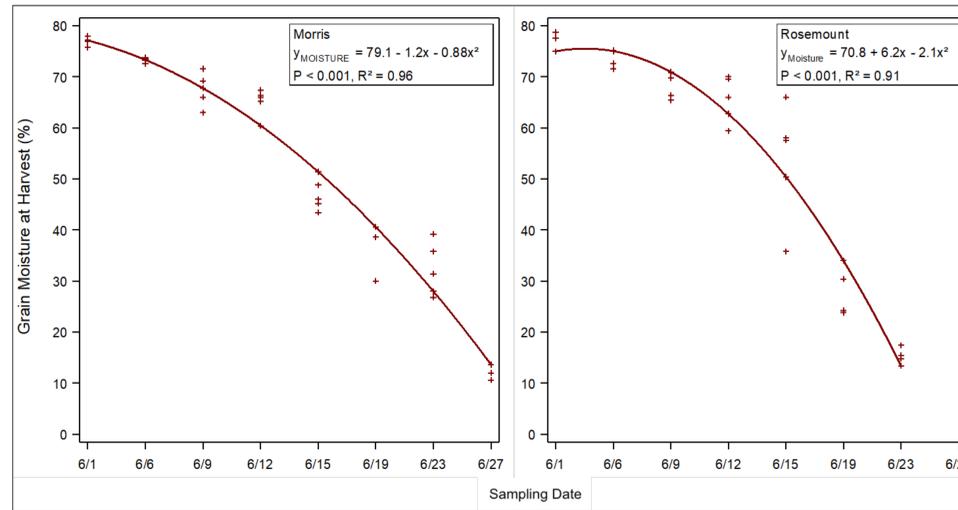


Figure 2. Predicted pennycress grain moisture at harvest in response to sampling date in Morris and Rosemount, MN (2017).

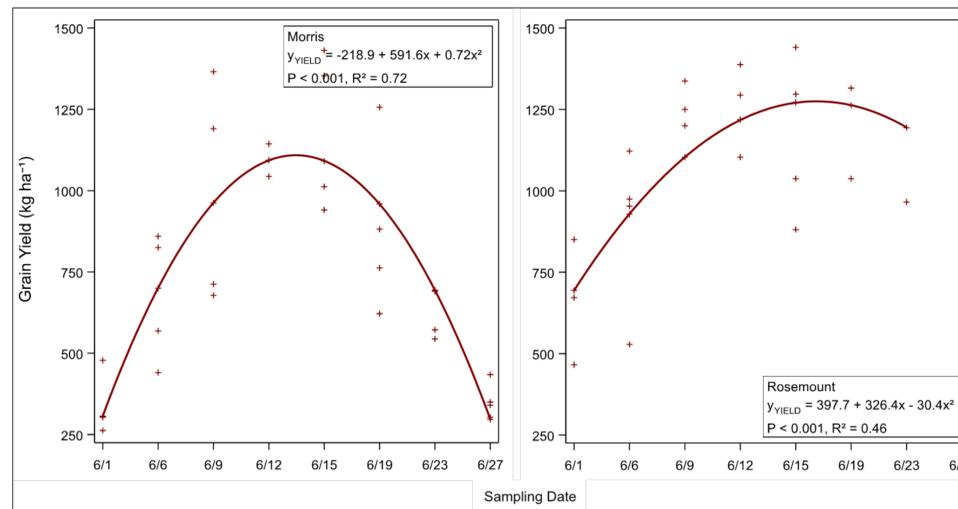


Figure 3. Predicted pennycress grain yield at harvest in response to sampling date in Morris and Rosemount, MN (2017).

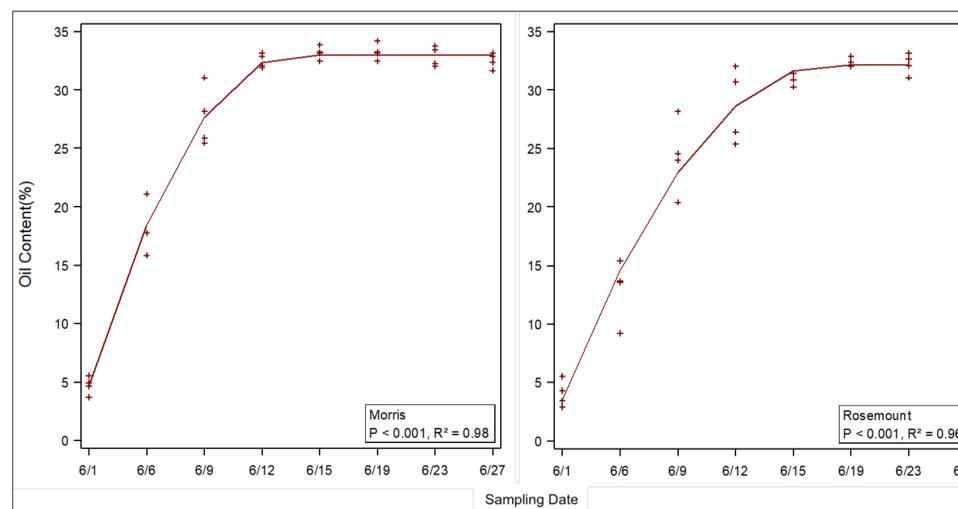


Figure 4. Predicted pennycress oil content at harvest in response to sampling date in Morris and Rosemount, MN (2017).

Discussion

Pennycress Harvest Parameters:

- Pennycress grain yield and oil content is optimized between 50-60% moisture.
- Harvest dates driven by timing of physiological maturity may lead to an increase in post-harvest costs.
- To ensure maximum grain yield and oil content, genetic improvements or harvest aids will be necessary in the future.
- Environmental conditions and equipment can impact grain loss at low grain moisture.
- Moisture content low enough to facilitate harvest without having to dry seed post-harvest is associated with seed loss.



Figure 5. Mature pennycress, Rosemount, MN (2017).

- As silicles mature, fragility increases.

Pennycress Oil Production:

- Oil content plateaued as grain yield reached maximum value.
- Later harvest dates did not result in changes to oil content.



Figure 6. Mature pennycress field, Rosemount, MN (2017).

Conclusions

Pennycress harvest date should be chosen carefully based on silicle maturity in order to minimize grain loss.

Mid-June harvest dates are the most productive in terms of grain yield and oil content.

- Grain yield was maximized between 12-Jun and 15-Jun at both locations.
- Oil content plateaus at the same time that harvest losses increase.

Given that oil content remains consistent, maximizing grain harvest is the most important factor in choosing pennycress harvest date.

References

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⁷Version 9.4; SAS Institute Inc., Cary, NC
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¹²USDA-ARS Swan Lake Research Center Weather Station
¹³Rosemount Research and Outreach Center Weather Station

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