

Nutrient Management Practices for the Optimization of Organic Milling Oat (*Avena sativa*)



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Introduction

- ❖ Milling oats are a valuable organic crop in Western Canada. Saskatchewan (SK) alone accounts for 48% of Canada's total organic oat acreage ¹.
- ❖ Oat responds well to high levels of soil available nutrients ²; production may be limited under organic management as organic farmlands are often deficient in nitrogen (N) and phosphorus (P) ³
- ❖ Including a legume green manure in a crop rotation can improve yields through their ability to supply soil available N ⁴.
- ❖ Organic amendments such as animal manures act as rich sources of plant available P ⁵.
- ❖ Developing a well-planned crop sequence that includes a green manure crop and integrates the use of animal manures may be able to meet the high nutrient demand of oat.

Objective

- ❖ To evaluate the agronomic response of organically managed oat to previous stubble and animal manures.
- ❖ Determine if applying animal manures prior to previous stubble crops has subsequent effects on oat yield and quality.

Materials & Methods

- ❖ Field studies conducted at two sites in 2019/2020 on University of Saskatchewan organically managed land;
 - Kernen Research Farm (clay loam soil, pH 6.8),
 - Goodale Research Farm (sandy loam, pH 5.9)
- ❖ Lattice design replicated 4 times



Treatments:

- Previous stubble:** fababean, fababean green manure plough down (PD), wheat, fallow.
 - Animal manure:** composted cattle manure, fresh laying hen manure, no manure.
 - Animal manure application timing:** prior to previous stubble crop (Yr0), prior to oat crop (Yr1).
- ❖ **Statistical analysis:** linear mixed model using R Statistical Software 2020, significance determined using Satterthwaite's method ($p < 0.05$).

Materials & Methods

Table 1. Outline of field operations and data collection at Kernen and Goodale sites.

	Yr0	Yr1
Manure Application & Timing	• Yr0 manures broadcast and soil incorporated fall 2018.	• Y1 manures broadcast and soil incorporated fall 2019.
Crop	• Previous stubble crops seeded spring 2019.	• Oat seeded spring 2020.
Management	• Fababean PD terminated and incorporated at late flower/flat pod stage. • Fababean and wheat stubble incorporated after harvested.	• Mechanical weed control when necessary.
Data collected	• Dry weight biomass samples and yields.	• Dry weight biomass samples, yields, plump & thin kernel percentages.

Preliminary Results

Figure 1. Oat yields in response to previous stubble types at Kernen and Goodale.

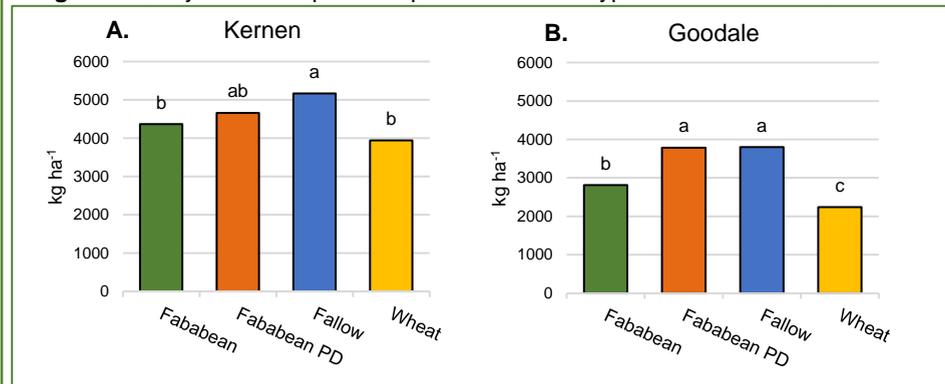
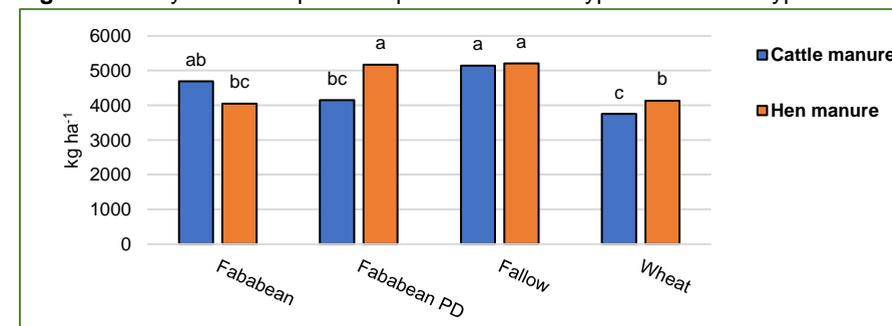


Figure 2. Oat yields in response to previous stubble type and manure type at Kernen



Discussion

- ❖ Previous stubble type had a significant effect on subsequent oat yields at Kernen ($p=0.002$) and Goodale ($p<0.001$) (Figure 1).
- ❖ Oat seeded in wheat stubble yielded the lowest; however, Kernen oat yields produced in fababean stubble were not significantly different than yields produced in wheat stubble.
- ❖ The highest oat yields occurred from fallow and fababean PD stubble.
- ❖ An interaction between previous stubble type and manure type was observed only at Kernen ($p = 0.02$) (Figure 2).
- ❖ Fallow with either manure and fababean PD with hen manure resulted in the greatest yields; however, fababean with cattle manure was not significantly different.
- ❖ Manure application timing had no effect on oat yields.

Conclusions

- ❖ Previous stubble type strongly influences oat yields more so than manure type and its application timing.
- ❖ Growing a fababean crop for green manure plough down can be an effective alternative to fallow for improving subsequent oat yield.

Next Steps

- ❖ Complete a third site-year (2020/2021) at Kernen.
- ❖ Further analyze treatment effects on oat quality via beta-glucan levels.
- ❖ Analyze plant tissue P and N levels from biomass samples.

References

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Acknowledgements

Thank you to the field staff at the Kernen Research Farm. Also, thank you to The Canadian Agriculture Partnership for funding this research.

