ECOLOGICAL FARMERS ASSOCIATION OF ONTARIO

SOIL HEALTH 2020

RESEARCH REPORT

Effects of liquid and biological amendments on emergence and yield of no-till planted spring cereals

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Farmer-Researcher

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IN A NUTSHELL

To try to hasten emergence and improve yield of no-till planted spring cereals, Ken compared liquid amendment, biological amendment, a combination of amendments and a no-amendment control.

- There was no observable difference in emergence due to amendments.
- There was no significant difference in yield among the different treatments.

MOTIVATION

Small grains are an important part of a diverse, ecological landscape. This is in part because of their complementarity with cover crops: small grains can be no-till planted in the spring into winter-killed cover crops; and, because small grains are harvested early enough in the summer, farmers can grow forage crops in the same season.

Photo 1. Spotty emergence to the left in plots caused by poorly drained soil. Photo taken May 3, 2020.

In 2019, Ken documented great success no-till planting oats and barley into winter-killed daikon radish with his first farmer-led research trial on spring-planted small grains (reference 1).

While the trial showed the advantages of no-till planting into a winter-killed crop, timing of emergence remained a key determinant of yield.

To push the potential for no-till spring cereals further, Ken was curious whether different amendments hastened emergence and increased yields in no-till planted oats.

DESIGN

Ken planted a randomized, replicated trial with five replications of four treatments to try to hasten emergence of no-till spring oats. Ken's treatments included: **liquid amendments** applied in seed trench (molasses @ 2 litres/ac + fish emulsion @ 4 litres/ac mixed with water); **biological amendment** sprayed on seed before putting seed in drill (Phyter Seed root enhancing seed coating @ 1.6 gram/bu of seed oats mixed with water); **combined liquid and biological amendments** (same rates as above); **no amendment control**. The trial design is outlined in **Figure 1.**

In all plots, Ken planted oats into winter-killed daikon on April 4, 2020. Emergence was slow in all plots, and especially in areas of the field with poor drainage **(Photo 1)**. There was no additional management between planting and harvest, which Ken did by direct combining on July 31, 2020.

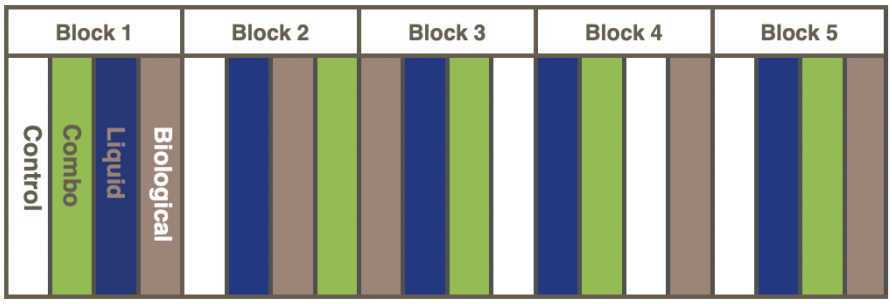

Figure 1. Experimental design for Ken's trial. Ken used 20 100'x15' in a randomized complete block design with the 4 treatments replicated across 5 blocks.

FINDINGS

The spring of 2020 was particularly cold and wet - an ideal season to test amendments that may help with emergence since cold and wet conditions are when seeds need the most help "waking up".

Despite the ideal conditions, Ken observed no differences in emergence, growth or colour throughout the year. To evaluate the effect of the amendments on yield, we used a statistical model called analysis of variance (ANOVA) with a 95% confidence level to calculate the least significant difference (LSD) that we needed to see among treatments in order to call them "statistically different". Using this approach, Ken also found no difference in oat yield among the treatments, as shown in **Figure 2**. The LSD he needed to see was 7 bu/ac, but all treatments were within 3.6 bu/ac of each other. See More on Statistics at the end of the report.

The one effect on yield that Ken detected was from soil conditions across the fields. With 95% confidence, we observed that block 1 yielded significantly less than the other blocks with an average of 60 bu/ac oats; the middle blocks yielded similarly with 72, 72 and 77 bu/ac; and the last block yielded the most with 91 bu/ac.

Ken posits this is because the soil improves from Block 1 to 5 both in terms of drainage and soil quality. Block 1 has suffered from erosion because of a slight slope, while the east end of the field has drainage tile and has not suffered as much from erosion. It is for this reason that the study was designed such that each amendment was replicated in the different areas of the field.

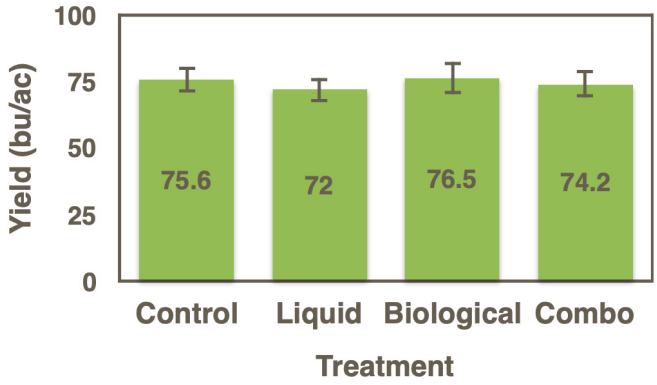

Figure 2. Average yield from the different treatments with lines representing standard errors. Overlap of lines illustrates the similarity in yield among treatments. The least significant difference was 7 bu/ac.

TAKE HOME MESSAGE

Despite the ideal conditions to test amendments to hasten emergence, neither the addition of liquid or biological amendments led to increased yield. Soil drainage and soil quantity and quality were overriding factors affecting oat yield.

NEXT STEPS

The results of this trial affirm what Ken has observed from a number of other times he has tried similar amendments in the past: they are a lot of extra effort for no detectable benefit. He will continue to use compost and other mineral amendments applied before planting.

In terms of this overall system, Ken is curious to try winter-killed millet as a preceding cover crop because of its superior erosion protection and weed control.

Photo 2. Direct combining an oat plot on July 31, 2020.

MORE ON STATISTICS

Using a 95% confidence level means:

- When we measure a yield difference between any two treatments that is greater than the calculated least significant difference (LSD), we expect this difference would occur 95 times out of 100 and, therefore, consider it a reliable difference.
- When we measure a yield difference between any two treatments that is less than the calculated LSD, we consider these treatments unreliably different and not statistically different.

REFERENCES

1. Laing, K. 2019. Is no-till planting spring cereal grain into winter-killed cover crops worth it? https://efao.ca/wp-content/uploads/EFAO-Laing-2019.pdf.

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