Does biochar improve tree growth in a newly established apple orchard?

**In A Nutshell**

Val and Brent were curious to know if biochar will help regenerate soil in their young apple orchard and “help to set in motion biological activity and nutrient retention”. Researchers have documented benefits from biochar in arid and tropical soils, which vary by soil fertility status and biochar quality. Much less is known about biochar’s effect in temperate regions, but there is anecdotal support for biochar use from some farmers in Ontario.

**Tree health**

Val used a tree assessment tool developed by Lorne Jamieson. This tool assesses the following 3 factors:

- Relative Vitality: 0-4 for trees with a graft that didn’t take; 5-9 for trees with a successful graft.
- Relative Insect Pressure: A for no pressure; B some pressure; and C for a lot
- Leaf Colour: G for green; Y for yellow

Pre-previous research on field crops suggests that biochar may increase soil health as a result of changes to the microbial community (Reference 1).

To measure changes in microbial community activity, Val used the Solvita® Field CO2 Test, which estimates microbial respiration from soil.

For each row, she found trees in the treatment and control sections with similar size, leaf colour and root stock. She sampled approximately 90 grams of soil from 6” depth, incubated with a CO2 gel probe in airtight jars at room temperature for 24 hours, and read the probe using the Solvita® handheld field meter.

**RESULTS**

**Soil respiration**

- CO2 flux was relatively high in all samples.
- There was no difference in CO2 flux between soil amended with and without biochar (P=0.28).

**Key Findings**

- In the first year of application, Val and Brent detected no effect of the biochar amendment on soil microbial activity, as a proxy for soil health.
- They also detected no changes in tree health in the first year of application.
- Val and Brent will continue to monitor soil and tree health in future years.

**METHODS**

**Design**

The study site included 5 rows, each with ~30 newly planted cider apple trees. Within each row, Val and Brent alternated two semi-dwarf root stocks, Geneva 202 and Geneva 935. They grafted different scion varieties to each row according to quantity available (Figure 1). In this way, the design is a paired design with 5 replicates.

After planting, Val and Brent randomly assigned either:

- Nutrient amendment + biochar (treatment) or
- Nutrient amendment only (control)

**Nutrient amendment**: Evergreen Liquid Plant Food 5-20-5 + boron, manganese, zinc, copper, and magnesium, based on soil tests.

**Biochar**: from Whole Village in Alton; charged, or uncharged as indicated.

**Biostimulant**: Evergreen Liquid Plant Food 5-20-5

**Tree health**

Val analyzed tree health, by ignoring graft success, as a cumulative score of all three assessment factors:

\[ R = (A+6, B+3, C+0) + (G+6, Y+0) \]

Using this calculation, there was no difference in tree health this year (P=0.22).

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- All trees in the orchard were root-fed at 8-10 inches below surface level.
- They root-fed control trees at 0.17 L/sec and treatment trees at 0.24 L/sec, for an overall rate of 25 lb/acre.