Technology Brief

SEAWEED PROCESSING BY-PRODUCTS: APPLICATION TO YOUNG TREES

Background

Some seaweed products and constituents are known to stimulate plant growth through several potential mechanisms (e.g. micronutrients, auxins, etc.). Previous plant growth studies in Norway[1] have indicated some growth promoting properties using these materials. Growth trials using a seaweed processing by-product were conducted in Washington apple orchards, in 1997 and 1998. The study was managed by SugarEarth Arts, and funded by the CWC (as a NIST MEP affiliate).

ProNova Biopolymers, Inc., based in Norway, manufactures AlgeFiber™, which is a by-product of seaweed processing. The raw seaweed is extracted with sodium hydroxide and sodium bicarbonate to remove the alginic acid (about 20-30% of the total solids), producing sodium alginate and leaving the fiber by-product enriched with sodium. The AlgeFiber™ by-product contains mostly stem material, as well as perlite and moderate amounts of nutrients.

The purpose of this study was to determine whether the application of AlgeFiber™ could promote the growth of young apple trees when used as a soil amendment. The primary indicators measured in this study were: trunk diameter, leaf greenness (SPAD), total leaf nitrogen (N), and leader growth.

The project was initiated in 1997. However, since apple trees often respond to soil amendments in the year following their application, a second season of tree monitoring was conducted during 1998 to see whether any growth effects were evident. No applications of AlgeFiber™ were made in 1998.

Key Words	
Materials:	Seaweed processing by-products (AlgeFiber)™
Technologies:	Seaweed production.
Applications:	Soil amendment.
Market Goals:	Use of seaweed processing by-products as a soil amendment.
Abstract:	Measure plant growth and yield benefits after the application of seaweed by-products.

Methods

For the field test, apple trees that were newly planted in April 1997 at the Wenatchee Valley College Auvil Orchard, located in East Wenatchee, Washington, were selected.

The AlgeFiber™ was applied to the soil surface around the base of each tree at the following application rates:

- Treatment A = control; no treatment.
- Treatment B = 1 lb AlgeFiber™ /tree.
- Treatment C = 2 lb AlgeFiber™ /tree.
- Treatment D = 4 lb AlgeFiber™ /tree.

The orchard block was irrigated the day after the AlgeFiber™ was applied. A paint mark was made on

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each lower tree trunk that was used to measure beginning and ending trunk diameter with calipers.

The experimental design was a Randomized Complete Block, with five replications. Each plot consisted of three adjacent trees. Trunk diameter measurements were converted into cross-sectional area. The percent growth increment was calculated as:

$$\% \text{ growth} = \frac{\text{final area - beginning area}}{\text{beginning area}} \times 100$$

The trees were observed several times throughout the 1997 and 1998 growing seasons and were measured for trunk diameter, leaf greenness (SPAD), total leaf nitrogen (N), and leader growth.

Leaf greenness (SPAD) measurements were taken by sampling ten leaves per tree at the mid-terminal position. End of season trunk measurements and central leader measurements were taken for each tree. Leaf greenness was measured with a Minolta SPAD meter. Data were analyzed using ANOVA and LSD ($p < 0.05$).

Results

In both 1997 and 1998, no significant effects of AlgeFiber™ on tree growth were detected among treatments. The treatment ranking for trunk growth differed between seasons; in 1997, B>D>>C>A; in 1998, D>A>>B>C. Neither pattern suggests a positive or negative rate response. Trunk growth for all treatments was considerably greater in 1998 than in 1997, and well above the 100% level considered reasonable for replanted trees.

The cumulative trunk growth over the two years was similar for treatments A, B, and C, and considerably greater (but not statistically significant) for treatment D. Leader growth was virtually identical for all treatments in 1998, and slightly greater than for 1997. (Leader growth of 60-90 cm is considered desirable.)

Leaf greenness was significantly lower for treatments B and C than for A and D, however, all were above 40, which is considered a level that reflects ample leaf nitrogen.

Conclusion

AlgeFiber™ had no significant impact on the measured parameters during the first year. There was a statistical difference in leaf greenness during the second season, but not for other parameters. A trend of a rate effect from the AlgeFiber™ application was not evident in either season. No detrimental effects were observed, indicating that the AlgeFiber™ product can be safely applied to apple orchards at the rates tested.

Overall, the trees are performing well after two years, despite being planted on a site with known replant disease and without soil fumigation. However, AlgeFiber™ did not appear to improve tree growth at any of the rates tested in this study.

This finding is similar to other studies[2] which evaluated various organic soil amendments and found no consistent tree growth or yield benefit from their use.

References:

[1]Jeng & Vigerust. Investigation on the effects of the kelp-meal (Protatek BF40) on some physical properties of the soil. *Rapport 1, Institute for Jordkultur*, Agricultural University of Norway, 1985.

[2]D. Granastein, T. Smith, and P. Dauer. On-farm evaluation of soil amendments for orchard production. *Abstract, Washington State Horticulture Association Proceedings*, Wenatchee, Washington, 1998.

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For More Information

For more information, call CWC at (206) 443-7746, email info@cwc.org, or visit the CWC Internet Website at www.cwc.org.

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