

**Oregon Department of Agriculture Nursery Research Project**

**A CONTINUATION OF *NOSTOC* BLUE-GREEN ALGAE CONTROL SOLUTIONS  
IN NURSERIES**

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*Nostoc* sp. is a cyanobacterium (also called a blue-green alga) that inhabits terrestrial sites. This organism has become more prevalent in nurseries nationwide during recent years, inhabiting gravel and groundcloth as well as other surfaces.

*Nostoc* sp. has the ability to form a coating over its surface, protecting the organism from stresses such as drought and extreme temperatures. During times without water *Nostoc* dries and becomes flakey, but will regrow when water is reapplied.

The presence of this organism in nurseries impacts production in two ways. Worker safety is the primary issue, as *Nostoc* is slippery while wet and often grows on hard surfaces and walkways where workers can easily lose footing and sustain injury. Another issue with this organism is its ability to grow on the bottom of containers creating an unsightly product for customers and a possible shipping problem.

A previously conducted trial in summer of 2013 yielded some successes in the control of *Nostoc* sp. Of the five treatments applied, two were observed to be relatively successful: copper sulfate sprays and solarization. While these provide some options for growers, they may not fit into every operation.

**Project Objectives for 2013 and 2014:**

1. Investigate physical and chemical control methods for *Nostoc* sp.
2. Evaluate rates and duration of effectiveness for control methods

## Methods

Field trials were conducted in two commercial nurseries, one in Yamhill Co. and one in Washington Co. Field plots (each 1 m<sup>2</sup>) were established on July 7, and chemical treatments were applied with a backpack sprayer on July 8, 2014. At each location, there were six chemical treatments plus one untreated control (Table 1), with four replicate plots per treatment arranged as a randomized complete block. While solarization was effective in field trials in 2013, feedback from growers indicated that it would not be economically feasible method for controlling *Nostoc*, so this treatment was not tested in 2014. Each plot was photographed at the beginning and end of the experiment four weeks later (August 5) using a camera attached to a light box mounted on wheels (borrowed from the OSU Turf Management Program). The light box provided consistent lighting necessary for image analysis. Plots were also visually rated on August 5 for *Nostoc* coverage (rating scale: 1=0-20% area, 2=20-40% area, 3=40-60% area, 4=60-80% area and 5=80-100% area) and vigor (rating scale: 1=dead to 5=healthy).

**Table 1.** Results for 2014 *Nostoc* field trial at the Yamhill Co. location based on visual ratings of coverage and vigor four weeks after treatment, and the change in percent coverage of healthy *Nostoc* based on image analysis just prior to treatment compared to four weeks after treatment. Statistical tests were conducted only for change in percent coverage. Values followed by the same letter are not significantly different ( $p < 0.05$ ).

Treatment No.	Product name	a.i.	rate	Ave. coverage rating	Ave. vigor rating	Change in % coverage by healthy <i>Nostoc</i>
1	Untreated control			5	5	-1% a
2	Chlorox	sodium hydroxide	1 in 10 (1 part bleach + 9 parts water)	5	5	+3% a
3	Consan Triple Action 20	n-alkyl-dimethyl benzyl ammonium chlorides	1 tablespoon per gallon; spray; allow to stand 1 hr; repeat	5	5	-8% a
4	Copper sulfate pentahydrate	copper sulfate pentahydrate	2.6 oz./2 gal water/1000 sq. ft.	3	2.25	-59% b
5	Rely	glucosinate ammonium 18.19%	2.4 fl. oz. per gal water	5	5	-9% a
6	Scythe	pelargonic acid	10% solution: 13 fl. oz product per 1 gal water/2 gal per 1000 sq. ft.	1	1	-82% c
7	TerraCyte PRO	sodium carbonate peroxydrate	10 lbs./1000 sq. ft.	2.75	3.25	-52% b

## Results

The trial at the Yamhill Co. site was a good test of product efficacy. The experimental area continued to receive overhead irrigation throughout the trial and *Nostoc* grew vigorously in the untreated plots. Visual ratings of coverage and vigor (Table 1) indicate that one product, Scythe, was very effective at killing *Nostoc*. Nearly all of the *Nostoc* in every plot treated with Scythe appeared to have been eliminated (Figure 1). Assessed four weeks after treatment, copper sulfate gave some control, as did TerraCyte Pro. Plots were visually inspected again on Aug. 28 (7 weeks after treatment), and those treated with Scythe were still devoid of *Nostoc* seven weeks after the single application on July 8, whereas all other plots were completely covered with vigorously growing *Nostoc* (Figure 2).

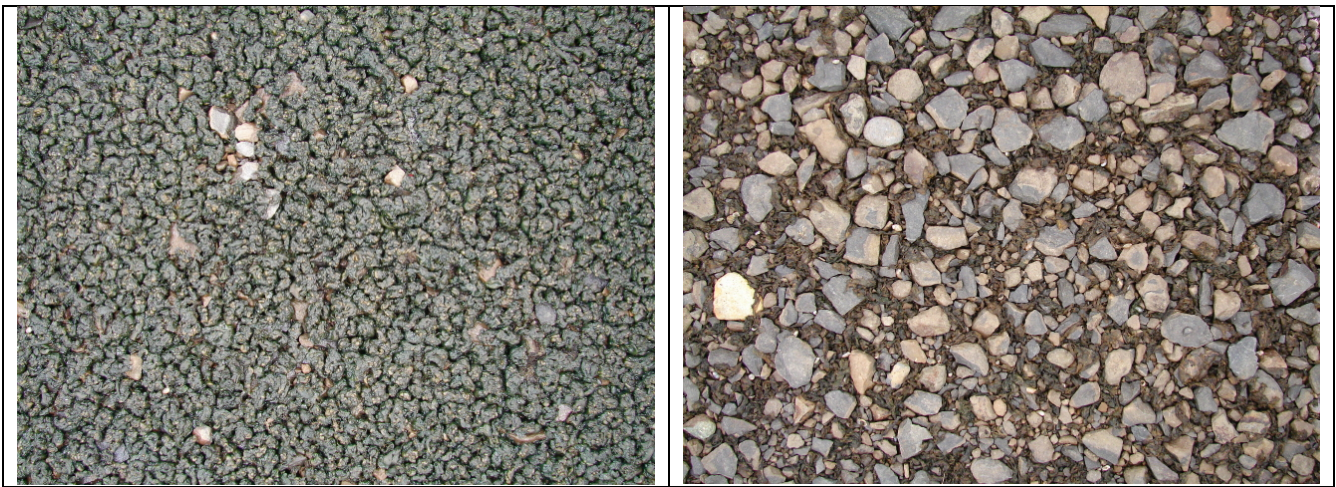


Fig. 1. *Nostoc* trial at Yamhill Co. site four weeks after treatments were applied. Left: Untreated control plot. Right: Plot treated with Scythe.



Fig. 2. *Nostoc* trial at Yamhill Co. site seven weeks after treatments were applied. Plot treated with Scythe is still devoid of *Nostoc*, while the surrounding area is completely recolonized by *Nostoc*.

The trial at the Washington Co. site was somewhat confounded by a lack of irrigation for the first week after treatments were applied, which resulted in early desiccation of the *Nostoc*. In addition, the presence of tire tracks in some of the plots interfered with both the visual ratings and image analysis.

Scythe (pelargonic acid) is currently labeled for use in container nurseries, so this appears to be a good option for controlling *Nostoc*. The 10% rate is the highest labeled rate. It is not known if lower rates would also be effective, but even at this rate it may be cost effective because a single application did provide control for at least seven weeks under conditions conducive for *Nostoc* growth. Care should be taken to avoid spray drift onto desired plants, as pelargonic acid is an herbicide. Products that were moderately effective were copper sulfate (copper sulfate pentahydrate crystals, Chem One) (2.6 oz./2 gallons water per 1000 sq. ft.) and sodium carbonate peroxyhydrate (TerraCyte PRO, Biosafe Systems) (10 lbs. granular per 1000 sq. ft.), however copper sulfate is not labeled for application to soil or gravel, and may pose a hazard to fish and aquatic invertebrates exposed to contaminated runoff.

**NOTE: This report includes information concerning experimental use of unregistered pesticides or unregistered uses of pesticides. Experimental results should not be interpreted as recommendations for use. Use of unregistered materials or use of any registered pesticide inconsistent with its label is against both Federal and State law.**

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