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39. Feeding through the leaves: Scientists study whether foliar fertilization has benefits for tree growers. Landgren, C. and Kowalski, J. Digger 54(8):115-118, 120. 2010.

Feeding through the leaves

Scientists study whether foliar fertilization has benefits for tree growers

These Colorado blue spruce trees (*Picea pungens* 'Hoopsii') receive their first foliar fertilizer treatment during a study recently conducted by researchers at the North Willamette Research and Extension Center.

Partial funding for this project was provided by a grant from the ODA Nursery Research and Regulatory Committee, Helena Chemical and Wilbur-Ellis.

By Chal Landgren and Judy Kowalski

Could the addition of foliar fertilization benefit a Christmas tree plantation or container-grown conifer operation?

That is the short version of a research question and the start of a research project now entering a second year. The answer could be one of the following:

a. Fertilization (both liquid foliar or granular application to the soil/media) is of no benefit — at least for plants grown in soil.

b. Granular fertilization provides sufficient plant nutrients alone.

c. Granular fertilizer application provides the "backbone" for needed plant nutrients, and foliar fertilization may provide a boost with the micro-nutrients.

But before getting too far ahead, let's back up and define the experiments used to answer the question posed in the first sentence of this article. To do so, we will break down the answer in two parts by differentiating container grown tree trials from in-field experiments.

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Conifers grown in bark media in containers

In late February 2009, 50 *Picea pungens* 'Hoopsii' (blue spruce) and 50 *Abies nordmanniana* (Nordmann fir) trees were selected from local Willamette Valley conifer nurseries. The trees were of uniform size and color, and were five years of age in 5-gallon containers.

In March, both species were repotted into 7-gallon containers. A custom blended potting mix consisting of 50 percent coarse Douglas fir bark, 30 percent fine Douglas fir bark, 20 percent screened pumice and 3 lbs. per cubic yard of calcium carbonate was used for both species. Old media was gently removed in a water bath during the repotting procedure.

After potting, plants were moved into a retractable roof structure at the North Willamette Research and Extension Center in Aurora, Ore. and placed on a gravel/shade cloth surface. Individual drip irrigation spikes were placed in each pot.

Trees were arranged into random planting spots and labeled for one of five fertilizer treatments. Treatment groups included either a foliar only fertilizer treatment, a controlled release fertilizer (CRF), or a combination of both.

With one of the foliar only treatments, the media was covered with a thin plastic barrier to exclude any fertilizer contact with the media. This was

Table 1. Treatments for container trial

Treatment #	Type/Products	Analysis	Rate
1	Foliar/Helena-Kayphol	0-5-32	16 oz/acre
	Foliar/Helena-CoBo	12-0-0	32 oz/acre
	Foliar/Helena-PhosCalZn	4-15-0	32 oz/acre
2	Foliar/Wilbur-Ellis Berry Mix	13-8-8	2 gal/acre
3	Foliar Tmt #1 w/exclusion	As above	
4	Untreated Control		
5	CRF-Osmocote	18-5-9 (13 month)	182g/pot
6	CRF-Osmocote+ Tmt #1	Tmt #1 & # 5	As above

Table 2. Foliar nutrient levels after one growing season

Species	Tmts	N %	P %	K %	Ca %	Mg %	S %	B ppm	Fe ppm	MN ppm	CU ppm
Spruce	1	1.1	0.18	0.66	0.20	0.10	0.07	16	44	137	0.6
Spruce	2	1.1	0.19	0.62	0.14	0.09	0.07	14	31	151	<0.5
Spruce	3	1.3	0.21	0.66	0.14	0.10	0.08	15	45	175	0.9
Spruce	4	1.3	0.22	0.71	0.12	0.09	0.08	13	43	136	0.9
Spruce	5	2.2	0.25	0.96	0.28	0.12	0.12	18	39	326	1.1
Spruce	6	2.1	0.26	1.02	0.34	0.13	0.14	16	52	352	1.6
Species	**Tmts**	**N %**	**P %**	**K %**	**Ca %**	**Mg %**	**S %**	**B ppm**	**Fe ppm**	**MN ppm**	**CU ppm**
Nordmann	1	1.2	0.18	0.77	0.23	0.13	0.09	17	77	182	1.6
Nordmann	2	1.1	0.16	0.64	0.16	0.11	0.07	10	100	132	1.4
Nordmann	3	1.1	0.17	0.75	0.15	0.10	0.08	20	89	162	0.8
Nordmann	4	1.0	0.16	0.69	0.15	0.10	0.08	9	107	141	1.2
Nordmann	5	1.7	0.17	0.84	0.21	0.13	0.11	7	100	213	1.0
Nordmann	6	1.9	0.18	0.98	0.25	0.14	0.14	25	102	256	1.5

done to eliminate concerns about additional foliar fertilization getting picked up by the roots from foliage drip. An untreated control plant received no fertilizer throughout the entire growing season.

Each treatment was replicated nine times. The foliar applications were applied for both species at budbreak and again 30 days later. The CRF applications occurred 30 days before bud break. Application rates appear in Table 1 on Page 116 (opposite).

On August 4, 2009, growth measurements were repeated on both species. Height, caliper and weight data were recorded, as previously done in May. Growth measures were not statistically different between treatments

Both species were kept on a regular irrigation schedule throughout the growing season. Leaching fractions, electrical conductivity (EC) and pH tests were also done periodically during the study.

At the conclusion of one growing season, researchers checked the nutrient levels in the needles of both species in late fall. The results appear in Table 2 (Page 116).

In looking at a statistical analyses, the treatments where CRF was added (5 and 6) had N levels that were significantly above the other treatments. Boron levels were higher in treatments 1, 4 and 6 with the Nordmann fir as a result of foliar sprays containing Boron. Boron was absent in the CRF material.

Growers and buyers might be more interested in visible results. With Nordmann fir, higher foliar nitrogen had a direct and visible correlation with darker green trees. Interestingly, the same visible difference was not evident in the blue spruce. Color was remarkably similar across treatments even though the CRF applications had markedly higher nitrogen levels.

Other interesting "visible" indicators are just now being manifesting. For example, the treatments that showed the highest nitrogen levels in spruce were

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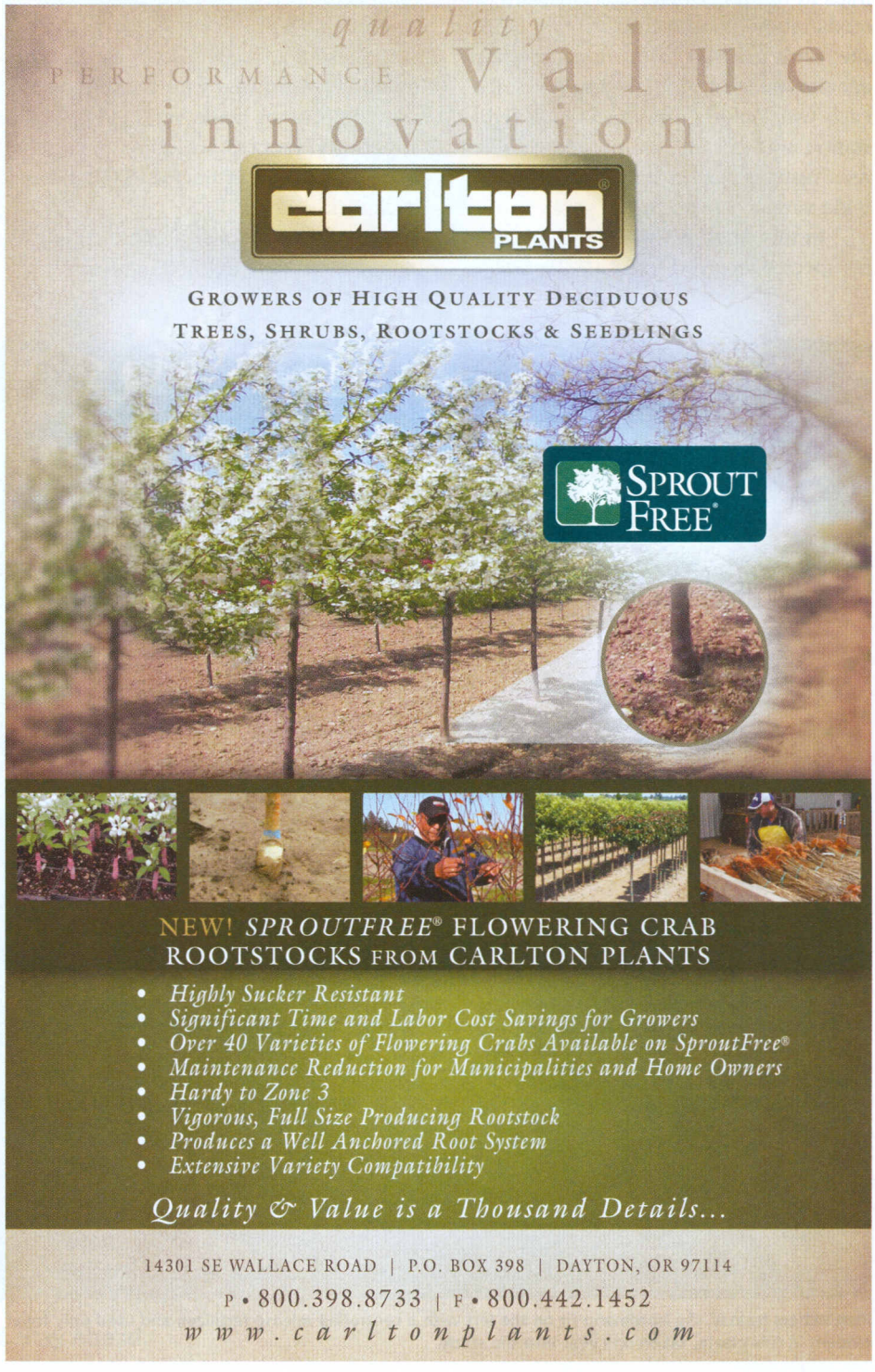

first to break bud. Growth, too, may show differences this season, though it is too early to measure.

Field grown conifers

The "short version" of this experiment is that soil really complicates field trials in fertility. Unlike uniform bark media, there is no "standard" soil type or site. Christmas tree plantations and nursery sites exist on a wide range of soils each with unique histories of past fertilization and existing soil nutrient profiles. As a result, these experiments showed wide variation from site to site.

In this "trial" a variety of conifer species received foliar and/or soil applied fertilization. The foliar products used were the same as those in the container trial, and were applied at similar rates and timing. These were applied to trees in existing Christmas tree plantations and nursery sites. The mix of conifer species included noble fir, grand fir, Atlas cedar, 'Hoopsii' blue spruce and Nordmann fir.

These field trials were typically installed by growers with the fertilizer applications made via their regular application process, including helicopter, tractor mist blower, tractor PTO tanks or backpack sprayer.

Some of the foliar application sites also received soil applied granular fertilization, most commonly Urea-Sul or custom blends. Treatment block sizes ranged from 40 trees at one site to 10 acres at another. A few sites received no granular fertilizer. Irrigation was minimal to non-existent in these sites.

A total of eight sites were used in the field portion of this trial. The only consistent result across these eight locations was that you could not "see" any differences between treatments. No off-color rows indicated the spots where fertility was lacking. The control trees looked similar to the foliar application and those looked similar to the ground

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Researchers treated the Nordmann fir on the left with a controlled release fertilizer, and used only foliar feeding on the tree on the right. The difference is evident in this photo, taken one year into the study.

At a couple of sites one could measure differences in some nutrients in the fall following application, particularly with nitrogen. In these cases, it appeared that the soil applied materials made the difference.

applied fertilizer applications.

At a couple of sites one could measure differences in some nutrients in the fall following application, particularly with nitrogen. In these cases, it appeared that the soil applied materials made the difference. This is not surprising given the fact that the amounts of nitrogen provided by the foliar applications are small compared to that applied via ground application.

These fertilization trials will be continued on three sites in the year ahead, as growers wanted to see if multiple year applications might show differences.

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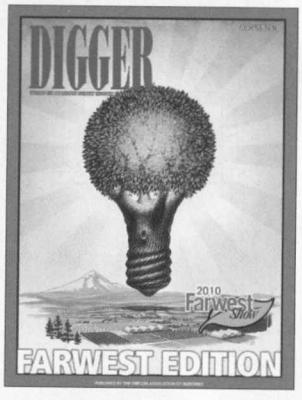

Cover: "Grow Here" is the theme for the all-new 2010 Farwest Show August 26–28 at the Oregon Convention Center in Portland, Ore. It's your opportunity to create new business relationships, grow your business, and see everything that is new in the way of plants and nursery-related products. Turn to Page 51 for the Show Guide, which has complete information on seminars, exhibitors, products and more!

This page: The Farwest Show floor will be packed with several exciting, all-new features, including the Garden Center Pavilion and the New Products Showcase.

Printed in Oregon on domestic recycled paper when available.

FARWEST SHOW GUIDE BEGINS ON PAGE 51

2010 Farwest Show