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Adding to growth

Researchers test the efficacy of soil additives in promoting plant growth and reducing mortality

Tyler Hoskins measures one-year-old plants as part of a study of the efficacy of several plant additives. The study was conducted by Oregon State University, with support from the Oregon Department of Agriculture and the Oregon Association of Nurseries.

By Chal Landgren and Judy Kowalski

There are numerous products on the market that claim to improve the survivability of newly planted crops. These products are applied at planting, either by adding the product directly into the planting hole or by dipping the roots into a solution containing the additive.

Generally, product claims focus on increased water availability, thus alleviating plant stress during dry periods, leading to better quality, larger plants. Other potential benefits include improved nutrient uptake and root development, which also lend a hand in growing a better quality plant.

By late winter 2011 a research project, funded by the Oregon Department of Agriculture in coordination with the Oregon Association of Nurseries, was underway to determine if any of these products could indeed improve seedling survival and/or growth.

The trial looked at field plantings of two commonly grown nursery plants that seem to suffer higher mortality than other species — *Hydrangea macrophylla* 'Endless Summer' and *Berberis thunbergii* 'Rose Glow'.

The study also included noble fir (*Abies procera*), a common Christmas tree species. These tend to show higher than average crop mortality among the commonly planted species in Oregon.

42 ▶

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Researchers measured the survival and growth of seedlings treated with various additives, such as Zeba™ Root Dip (pictured).

Most plantings for Christmas trees do not receive supplemental watering after planting, so any boost in additional available water through the summer and fall months should help improve survival rates and minimize replanting expenses. Likewise, any boost in initial plant growth could offer improvements in size and time to market for both nursery crops and Christmas trees.

The following products were tested on each plant species.

- **Zeba™ Root Dip** — Manufactured by Absorbent Technologies, Inc. A biodegradable, non-toxic, starch-based, super absorbent polymer, designed to rapidly absorb and maintain moisture in the root zone, releasing moisture to plants as needed.
- **Rootex™** — Product of Redox AG. A phosphorus fertilizer (7-47-6) containing fulvic and humic acids, as well as a proprietary blend of amino acids.
- **Geohumus™** — A gel forming polyacrylamide manufactured in Germany. Designed to maintain its structural stability in the ground while maintaining a high level of moisture absorption.
- **BioTerra PLUS™** — A product of PlantHealth LLC. A dry additive containing multiple species of mycorrhizal fungi and organic components. Ectomychorrizae were selected for the noble fir and Barberry and Arbuscular mycorrhizae for hydrangeas.
- **Geohumus+BioTerra** — A mixture of both these products was included as a fifth treatment.

All products were mixed and applied following manufacturers' rates and recommendations. Zeba and Rootex products were applied as root dips. Products were mixed well with water, and seedling roots were dipped into the solutions prior to hand planting. Geohumus and BioTerra PLUS products were added to the planting hole, as seedlings were being planted.

Field study plots of noble fir seedlings were planted at three growers' sites from Lane County to Columbia County, Ore. Planting began in mid-February and ended with the last location in mid-May. A very wet spring spread out the site preparation and planting. Identical 2-year-old, 10-inch plug seedlings were planted at all three sites. At each planting site, 300 trees were randomly divided between the product treatments and a control/untreated group of plants. The Christmas tree sites had no irrigation.

On the barberries and hydrangeas, a total of 540, 4-inch plugs of hydrangea and 540 bare-root barberry plants were planted in mid-May at a single field location on Sauvie Island, Ore. Unlike the conifers, these two crops received regular seasonal irrigation, and treatments were randomized using blocks of 18 trees spread across three rows.

In late September and early October, after all 2011 seasonal growth was complete, final growth measurements were taken on all species in the study. Fir final measurements included height, leader length and caliper size as well as color and lammas growth evaluations. The hydrangea and barberry plants were evaluated using a growth index measurement. This measurement was calculated by taking plant height, plant width 1 (widest measure) and plant width 2 (90 degrees from the widest measure), using the following formula: (ht+ width 1+ width 2)/3. A count of new shoots emerging from the base of each hydrangea and barberry was also taken.

44 ▶

Researchers tested a variety of additivies on noble fir (shown) as well as barberries and hydrangeas.

In addition to these above-ground measurements, three entire plants from each treatment, at each site, were harvested. Extra care was used while digging to ensure all associated roots were collected for each plant. Plants were delivered to PlantHealth LLC in Albany, Ore., for evaluation of roots, including root mass, any mycorrhizae colonization and above-ground biomass.

Results

Now that you know what we did, what did we find? The short answer, with regards to mortality, was very little. It turned out that 2011 was the perfect year for these plants, even though it was a poor year for outside barbecues. We had ample rainfall and few hot spells.

For the noble fir, there were over 900 seedlings in the study and only 35 that died by the end of the first growing season. These were evenly divided between the three farms and without any meaningful separation between treatments. That level of mortality is just under 4 percent. In average years, 6-10 percent mortality is considered a "success." So, it was a great year for trees, but a poor year to test "stressed" seedlings, additives and drought response.

The barberries and hydrangea were irrigated frequently. Even as we were adding the treatments, the irrigation was starting. Some mortality was evident, but in very low numbers and not related to our treatments. The little mortality that was observed appeared to be related to field position and weed stress.

So what did we find about growth or other items we measured? Here we will forego the details of tables and simply offer some summary points.

On the noble fir, we found little difference between treatments for total tree heights and color. We did find a modest increase in tree caliper and leader length for the Rootex treatment that was statistically significant, but not easily observed without tree measurements. These trees were about 1.5 inches taller on average.

More stunning than our treatments, seemed to be related to the "milk-carton effect." One grower had problems with rabbits eating trees, so he was experimenting with various tubes and exclosure options to keep his trees from being eaten. All treatment trees on this site were surrounded by milk-cartons. Trees at this site had double the leader lengths of those at the other two sites and double the level of lammas growth (late season flushing). We can't say for sure that the carton was the reason; but it deserves more attention.

For the barberries and hydrangeas, our treatments provided little in the way of growth improvement or boost in the number of new shoots.

A sub-sample of plants from all species and treatments were evaluated for root mycorrhizae colonization and root/shoot biomass. There was little colonization on any of the plants in any treatment. The biomass sample sizes were small and showed no trend in the barberries and hydrangeas. There were some hints of treatment effects on the noble fir, but a larger sample size would be needed and sampling kills the tree. Growers opted to just wait a while and watch growth to see if any important trends emerge later on.

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