Research

The effect of organic fertilizers on plant growth

by RICHARD TREGIDGO

Slow- and controlled-release fertilizers are a staple in container production. While many studies have been conducted on these fertilizers' efficiency, few, if any, have been done on the effect of organic slow-release fertilizers on plant growth. In 1999, I conducted a study at my nursery, North Slope Farm, Pleasant Mount, PA, where I compared the effect of organic slow-release fertilizers vs. conventional controlled-release fertilizers on plant health and growth. North Slope is an organic nursery that produces containerized perennials and woody ornamentals.

I was able to conduct my study thanks to the USDA-funded Northeast Sustainable Agriculture Research and Education (SARE) Farmer/Grower Grant Program, which gives grants to growers to conduct studies that could have multiple applications. In 1999, I applied for and received a producer grant from the SARE regional office at the University of Vermont, Burlington. As part of my agreement with SARE, I would disseminate the results to the nursery industry and be available to answer industry professionals' questions. I evaluated two groups of plants for size and color. The study began in May and concluded in October, when collaborators from various state and federal agencies and a technical advisor visited the nursery to evaluate plant growth and health.

THE EXPERIMENT. **Group No. 1.** In May 1999, small, medium and large rooted cuttings were placed in 1-gallon containers with a medium consisting of 3 parts composted yard waste, 2 parts red shale, 1 part mushroom compost and 1 part peat by volume. Fertrell Compost 3-5-4 was mixed into the medium at 10 pounds per yard. *Spiraea japonica* 'Little Princess' ('Little Princess' Japanese spiraea), *Juniperus horizontalis* 'Blue Rug' ('Blue Rug' creeping juniper), *Euonymus alatus* 'Compactus' (dwarf burning bush) were used.

We topdressed 'Little Princess' with an organic blend of two Fertrell products and 'Blue Rug' with the organic Fertrell Holly Care 4-6-4. The traditional fertilizer Osmocote 14-14-14 was used on 'Compactus', as well as on other 'Little Princess' and 'Blue Rug' plants. Controls received no fertilizer. All plants were initially watered with Fertrell 3, a liquid kelp- and fish-based foliage plant food. I use this only with initial watering because kelp has auxins that encourage better rooting and help prevent transplant shock. Two tablespoons of Fertrell 3 are mixed per gallon of water.

Results for Group No. 1. 'Blue Rug' and 'Compactus' had comparable growth or color across all treatments. The size of 'Little Princess' was comparable for all fertilizer regimes, and fertilized plants were bushier and slightly larger than the controls. The color of all 'Little Princess' was the same regardless of treatment.

Group No. 2. In July 1999, uniform rooted cuttings were placed in 2-gallon pots with the same medium as that in the first study, except the red shale volume was decreased by half. This study focused on 2-gallon *Juniperus scopulorum* 'Moonglow' ('Moonglow' Rocky Mountain juniper) and *Chamaecyparis pisifera filifera aurea* 'Gold Thread' ('Gold Thread' false cypress). Twenty-five plants of each cultivar were topdressed with the traditional Osmocote 14-14-14 or the organic Fertrell Holly Care 4-6-4. There were no controls for this group. All plants were watered with a kelp and fish solution.

Results for Group No. 2. 'Moonglow' and 'Gold Thread' had the same growth and color for both fertilizer treatments. In 2000, however, those receiving the organic treatment were slightly bushier than the ones receiving the Osmocote 14-14-14.

Unfortunately, none of the plants in both groups was salable in 1999; this could have been due to a widespread drought in our area that year. I have found organic fertilizers to be, on average, cheaper than traditional fertilizers. In addition, my study showed the plants receiving the organic and traditional fertilizers had comparable growth and color. In some cases, fertilizer wasn't needed at all.

My study indicates organic fertilizers can be a suitable alternative to traditional fertilizers. However, because the experiment was limited to a few taxa, further investigation may be needed.

Richard Tregidgo is owner of North Slope Farm, Pleasant Mount, PA. For more information on the experiment, call or fax (570) 448-2374.

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An Example of On-Farm Research

Over the years, we've tried to promote and encourage backyard and on-farm research related to horticulture. We would love to be able to publish the findings of *HortIdeas* readers, but so far we haven't received many reports from you. Below are excerpts from an on-farm research project sponsored by the U.S. Department of Agriculture's SARE Program (see *HortIdeas*, December 1999, page 139, for grant application contact information), for which we thank Richard and Laura Tregidgo. The results will be of interest to many *HortIdeas* readers, but we also hope that this article will inspire at least a few readers to conduct and write up horticultural research of their own.

First, an introductory note from the Tregidgos:

North Slope Farm in northeast Pennsylvania consists of 55 acres. About 40 acres are in hardwoods, 12 acres in old pasture, and three acres in intensive nursery crop container production. We raise perennials, flowering shrubs, and some evergreens. We purchased the property in 1984 and planted our first nursery crop in 1987.

Over the years, this essentially wooded tract of land has become our home and farm. We have built a house for ourselves, two small storage barns, a garden shed complete with skylights, and a greenhouse. There are no full-time employees; however, we occasionally have some part-time help in the busy spring season. Both of us work part-time off the farm. Laura works in the local hospital and is a volunteer E.M.T. with the local ambulance squad. Richard's efforts include some plant installations and fertilizer sales to farms, garden centers, and landscapers.

When we tell people that we grow our plants organically, the usual response is, "Why bother, you can't eat them!" While this is true, we have developed a growing system over the years that addresses many concerns, both local and regional, for gentler natural designs.

Our garden, the plants we *do* eat, is completely organic. We grow in raised beds, filled with compost, over native soils. Rows between the beds are mulched with wood chips. We have few weed problems, few insect problems, and great veggies. Each fall, Laura adds chopped leaves, greensand, and rock phosphate to each bed. In the spring, some fresh compost and kelp meal along with a natural organic fertilizer are added to each raised bed. Since this approach had worked so well in the garden, we decided to apply the same techniques to our container nursery crops.

After spending a few years going through a learning curve for the differences between annual veggies vs. woody ornamentals, we now soil test incoming batches of compost, approximately 50-100 tons per year, for nutrient levels.

We purchase composted dairy, poultry, and horse manures from local sources. We also obtain mushroom compost, which we let age an additional year. Our wood chips and pine bark mulch come from local sawmills. We collect used nursery containers from our garden center customers for reuse at our farm. One of our fertilizer customers has a recycling operation for landscapers. The landscaper wastes are composted by them and are also sold back to the landscapers. We have begun to use these materials, as well, in our potting mixes.

In sum, we have tried to address our concern for regional nutrient management and fertilizer run-off through the use of composted wastes, recycled containers, and mulch products.

In any given year, we have about 10,000 plants in various stages of production. Our single largest crop is perennials. We are always reading and looking for information on nursery crops, and we happened to come across a short note about a Northeast Region - SARE call for proposals in horticulture. Although we were familiar with SARE, we were not aware that they considered proposals for horticultural crops. We called the regional office at the University of Vermont, applied, and were funded in 1999. Our project was entitled "Slow Release Natural/Organic Fertilizers in Nursery Crop Production."

We wish to thank all of the people who gave of their time and expertise to assist us in this project. In addition, we wish to thank the U.S.D.A. Sustainable Agriculture Research and Education Program for a grant to partially fund this research (FNE99-281). If you would like more information on this experiment or would like to visit our farm, please call us at 570-448-2374.

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Slow Release Natural/Organic Fertilizers in Nursery Crop Production

Recent studies have reviewed the use of slow release and controlled release fertilizers in nursery container production. In addition, topics such as fertilizer run-off, release rates, salt residues, etc., were also discussed.... [But we found] no side-by-side comparisons of natural organic slow release fertilizers and conventional controlled release fertilizers.

In an effort to address this lack of information, a proposal was made to Northeast Region - SARE Program 1999 to conduct an experiment using Osmocote controlled release fertilizer (14-14-14) and natural organic fertilizers manufactured by the Fertrell Co. (Holly Care 4-6-4, Gold SS 2-4-2, Super N 4-2-4). To effect the comparison of these two different fertilizer systems, a number of regularly grown nursery crops were chosen:

Group 1 (360 total; purchased from Appalachian Nurseries, Waynesboro, Pennsylvania, in 2.5-inch pots). **Spiraea japonica** 'Little Princess', **Juniperus horizontalis** 'Blue Rug', and **Euonymus atropurpureus** (dwarf burning bush).

Group 2 (100 total; purchased from Musser Forests Inc., Indiana, Pennsylvania, in 2.5-inch pots). **Juniperus scopulorum** 'Moonglow' and **Chamaecyparis** 'Gold Thread Cypress'.

Group 1 plants were potted in used one-gallon nursery containers. The potting medium consisted of composted landscaper waste (donated by Organic Recycling, Inc., Old Tappan, New York, three parts by volume), red shale (two parts), mushroom compost (one part), and peat (one part). The pH was 6.5. Potting was completed in early May, 1999. Plants were sorted so as to have equal amounts of small, medium, and large ... [sizes] in each group of 30 plants.

All plants were randomly coded. Fertilizers were top-dressed as per manufacturers' directions and covered with a small amount of potting soil. All plants were watered with a kelp/fish solution (two tablespoons per gallon).

[Group 1] plants, in groups of 30, were fertilized as per the following:

Osmocote 14-14-14

Fertrell 3-3-3 (50/50 blend 2-4-2/4-2-4 with Araganite) on **Spiraea**

Fertrell 4-6-4 on **Juniperus**

Control

Fertrell poultry compost 3-5-4 (mixed into potting soil, 10 pounds per cubic yard).

Group 2 plants were potted in used two-gallon nursery containers. The potting medium consisted of the same materials (except red shale volume was decreased). The pH was 6.8. Potting was completed in early July, 1999. All of the ... [plants] received were very uniform in size. Fertilizers were top-dressed as per manufacturers' directions and covered with a small amount of potting soil. All plants were watered with a kelp/fish solution, as above.

[Group 2] plants, in groups of 25, were fertilized as per the following:

Osmocote 14-14-14

Fertrell Holly Care 4-6-4

There were no controls.

Soil and water tests were performed by A&L Eastern Agricultural Laboratories, Inc., Richmond, Virginia. In addition, a Solvita™ Soil Life Test (Woods End Research Laboratory, P.O. Box 297, Mt. Vernon, ME 04352, phone 207-293-2457), which measures approximate levels of carbon dioxide respiration, was performed in October, 1999. The Solvita™ test showed "ideal" to "high" soil biological activity. Based on soil test analyses, the potting soil was blended to achieve a balanced level of nutrients. Water test results indicated that all components tested for were at "low" or "safe" levels; pH was 7.9....

With the assistance of our collaborators and technical advisor, a meeting took place at North Slope Farm on October 5, 1999, at the end of the growing season, to evaluate the fertilizer/plant combinations.

Each group of plants was evaluated for growth (size), color, and saleability:

Group 1. **Juniperus horizontalis** 'Blue Rug', all about the same, no difference in growth or color; **Spiraea japonica** 'Blue Princess', fertilized plants were bushier and slightly larger than control plants, color about the same; **Euonymus atropurpureus** (dwarf burning bush), all about the same growth and color.

Group 2. **Juniperus scopulorum** 'Moonglow', all about the same growth and color; **Chamaecyparis** 'Gold Thread Cypress', all about the same growth and color; one evaluator considered the Holly Care group "bushier" [than the Osmocote group].

Saleability for the entire group was not considered. None had reached the requisite size.

Our farm site in Zone 5 (2000 feet elevation, possibly Zone 4) usually means we have about 100-105 frost-free growing days. Drought in 1999 was widespread and was a factor in the growth rates for this experiment. Irrigation was used on a regular basis.

Conclusions

The inclusion of large amounts of various composts in the potting medium had a very strong influence on the growth and color of all of the plants. In light of the current literature concerning the use of compost in container production, this is not surprising. There was a slight advantage gained by the addition of fertilizer, either Osmocote or Fertrell Holly Care or Fertrell 3-3-3 [blend].

"Ideal" soil biological activity (as per the Solvita™ test) contributed to the overall availability of plant nutrients throughout the growing season.

Our past experience in container production of nursery crops has included composts from various sources. We were pleased to see how well these compost-based systems performed this past year.

Rooted cuttings [as purchased for this experiment] have usually taken us two years to get to marketable size. During the first year—the "transplant" year—the plant seems to be going through a process of acclimation. As roots begin to fill the potting medium, growth in the second season is usually quite drastic. During the 2000 growing season, we will continue to monitor and evaluate these [experimental] plants. We expect that the slight advantage (bushier, etc.) of the fertilized groups will continue to improve relative to the control plants....

Collaborators: Kimberley J. Miller, Pennsylvania Dept. of Agriculture; David Mattocks, Fertrell Co.; Ron Phelps, Pocono Northeast RC & D; Robert Muller, Jr., Wayne Conservation District; Diane Johnson, Master Horticulturist.