The Affect of Nitrogen Application Techniques on the Growth of Drip Irrigated Flowering Dogwood, Oriental Dogwood, Red Maple and Mountain Laurel

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Nature of Work: Increased salable growth as well as a tree with more harvestable roots can be field grown when drip rather than overhead irrigation is used (1, 2). Since drip irrigation uses less water, further uses for this water conserving irrigation technique are being sought. Fertilizing through drip irrigation lines, fertigation, is a logical use of this system but research results suggesting appropriate rates of field fertigation for woody landscape plant production are lacking. The objective of this test was to compare plant growth under existing practice, granular fertilizer application, with growth under three nitrogen fertigation regimes.

Field plots were established in clay loam soils at the Mountain Horticultural Crops Research and Extension Center, Fletcher, NC. Soil was tested during the fall of 1987. Appropriate soil nutrient levels for each species were established as suggested by the Agronomic Division, N. C. Department of Agriculture, Soil Testing Laboratory for all nutrients except nitrogen in February 1988. Soils were then tilled to a depth of 8 inches to thoroughly mix these nutrients with the soil.

One year old seedling liners of Acer rubrum, *Cornus florida* and *Cornus kousa* were planted four feet apart while two year old container grown seedling *Kalmia latifolia* liners were planted two feet apart in rows twelve feet apart. Three plants of each species were planted per replicate with a total of 4 replicates. Replicates were randomized within treatments. A weed free row was maintained one foot on either side of the crop by mechanical means and with a directed spray of Gramoxone. The same pesticide application, Sevin for Japanese beetle control as needed was made to all treatments.

At the end of the second and third growing season the caliper of each of the tree species was measured at 6 inches above the soil surface. A Growth Index (GI) was determined for *Kalmia latifolia* by measuring the maximum height and width of plants when they were first planted in the field, adding these figures and dividing by two. A Growth Index was determined for each plant at the end of the second and third growing season by making the same measurements then subtracting the initial Growth Index.

Treatments were based on the application rates for actual nitrogen suggested by the North Carolina Cooperative Extension Service. These are 0.25 oz. the first year, 0.5 oz. the second year and 1.0 oz. the third year plants are in the field. Urea (45-0-0) was used as the source of nitrogen throughout the test. Granular urea was applied to bare soil in a circle around the plant, one foot away from the plant base, before bud break in the spring for the Control treatment. The total amount of

nitrogen applied to the fertigation treatments was either 0.5, 1.0 or 2.0 times (X) the control rate. Fertigation treatments were applied six times at weekly intervals beginning at bud swelling in the spring. The amount to be applied was determined by adding the total number of plants per treatment. This was multiplied by the number of ounces of nitrogen to be applied. This figure was divided by 6, the total number of nitrogen applications, to determine how much fertilizer to inject per treatment each week. The corresponding quantity of urea was dissolved in a five gallon plastic bucket then injected via a Venturi injector into Roberts Row Drip 1 gph emitters with an emitter every two feet within the row.

The fertigation procedure was to turn on irrigation and time the duration required for water to flow to the end of the drip irrigation line. This is the length of time required to fill the irrigation lines, i.e., to charge the system. The fertilizer solution was then injected into the line until the bucket of stock solution was empty. Water was added to the bucket to dilute any remaining nutrients then this solution was injected. Finally, the irrigation was run for at least the length of time required to charge the system to be sure the lines were flushed. This process was repeated for each fertilizer treatment, always proceeding from the lowest to the highest application rate.

Results and Discussion: At the end of the second growing season, significant differences existed only in *Cornus florida* (Table 2) where plants grown under all fertigation treatments were larger than those grown with the application of granular fertilizer, our control. By the end of the third growing season, all plants grown under fertigation treatments were larger than the control for all species (Tables 1-4).

Significance to the Industry: Since one-half the standard amount of nitrogen fertilizer produced growth statistically as great as twice the standard rate of nitrogen fertilizer, it is suggested that any nurseryman choosing to fertigate use less nitrogen fertilizer than he would normally apply. How much less remains to be determined. However, since using half as much fertilizer produced significantly more plant growth, no more than one half suggested nitrogen rates for granular fertilizers seems appropriate.

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Table 1. Caliper (in.) of *Acer rubrum* following nitrogen fertilizer treatments.

Treatment	2 years	3 years
Control	0.49 b*	.87 b
0.5 X	0.68 ab	1.16 a
1.0 X	0.76 a	1.37 a
2.0 X	0.68 ab	1.13 a

*Rp05 Duncan's New Multiple Range Test

Table 2. Caliper (in.) of *Cornus florida* following nitrogen fertilizer treatments.

Treatment	2 years	3 years
Control	0.72 b*	.92 b
0.5 X	0.89 a	1.20 a
1.0 X	0.91 a	1.25 a
2.0 X	0.90 a	1.17 a

*Rp05 Duncan's New Multiple Range Test

Table 3. Caliper (in.) of *Cornus kousa* following nitrogen fertilizer treatments.

Treatment	2 years	3 years
Control	0.77 a*	1.05 b
0.5 X	0.86 a	1.28 a
1.0 X	0.84 a	1.20 a
2.0 X	0.88 a	1.23 a

*Rp05 Duncan's New Multiple Range Test

Table 4. Growth Index (in.) of *Kalmia latifolia* following nitrogen fertilizer treatments.

Treatment	2 years	3 years
Control	6.3 b*	11.1 b
0.5 X	9.4 a	17.5 a
1.0 X	8.2 ab	16.8 a
2.0 X	8.9 a	17.3 a

*Rp05 Duncan's New Multiple Range Test

Literature Cited

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Effect of Aisle Cover Crops on Surface Runoff Quantity and Quality

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Nature of Work: Increasing consideration of the offsite effects of soil erosion might require nurserymen to increase the utilization of soil conservation practices. A study was conducted to determine the effect of various aisle cover crops on tree growth and soil erosion. In the spring of 1991 an experimental field plot was established at the Tennessee Tech University Farm on a Typic Paleudult with a silt loam surface texture and a 5% slope. A randomized complete block design was utilized including four aisle covers: clean tilled, two tall fescue plots, and 'Appalow' lespedeza. Appalow is a low growing lespedeza that produces decumbent stems that generally do not exceed 1 ft. in height. The plots were 10 ft. wide, 500 ft. long, ran east to west with crabapple tree liners planted in the center of the plots on the west half and silver maple tree liners on the east half. A 8 in. wide weed free strip centered on the tree rows was maintained using applications of glyphosphate and hoeing. The trees were grown using standard nursery tree production practices. In the summer and early fall of 1990, runoff monitoring plots were established