Effects of Fall Fertilization on Freeze Hardiness of Deciduous vs. Evergreen Ornamentals

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Nature of Work: A lack of research exists investigating freeze hardiness of both evergreen and deciduous plants in the same experiment. Closely related species are included in the same experiment in order to determine if fertilizer application rate and timing affect the freeze hardiness of evergreen and deciduous plants differently.

Study #1, CANR Study
Main Plot: Taxa
Viburnum pragense (evergreen viburnum)
Viburnum plicatium (deciduous viburnum)
Sub-plot: Fertilization
High Rate 6 month SRF (10 Lb/yard 17-5-10) April 23
High Rate 6 month SRF April 23 and ½ High Rate (6.5 grams per pot) Sept. 1.
High Rate 6 month SRF April 23 and High Rate (13 grams per pot) Sept. 1.

Study #2, Athens Study
Main-Plot: Taxa
Rhododendron x Satsuki
Rhododendron canescens
Sub-plot: Fertilization:
August - September, 75 mg l^{-1} N
August - November, 75 mg l^{-1} N
August - November, 125 mg l^{-1} N

Data collection:
1. Measure freeze hardiness of stem tissue once per month, from November through April. Measure hardiness on 4 stem segments for each treatment x replication combination at 9 temperatures between -3°C and -27°C .
2. Determine Stem Moisture Content (MC) monthly, from December through March MC = (fresh weight - oven dry weight)/(fresh weight) x 100.
3. Measure Growth Index (GI) in August and October, November and again in May, measurements of maximum height (H), maximum width (W1) and width perpendicular to W1 (W2) are used in the calculation, GI = (H+(W1 + W2)/2)/2.
4. Determine date of leaf drop and number of buds set in fall, and date of bud break and maximum flower production in spring.
5. Analyze N concentration in tissue in December (dormancy), and again in February (prior to bud break in spring).
6. Measure stem and leaf dry mass in May (after first flush of spring growth).

Results: Because this experiment involves freeze hardiness, the effects of fall fertilization on the freeze hardiness of evergreen versus deciduous ornamental have not yet been determined. However, in a previous CANR study, Henning et al. (2002) found that high rates of fertilization in late summer and fall increased growth, but reduced the freeze hardiness of evergreen azaleas.

Discussion: Differences in leaf retention among evergreen and deciduous plants may affect their response to fall fertilization. Fall leaf loss may reduce the ability of deciduous plants to acquire nutrients. However, arguments for maintaining fall nutrition in deciduous species remain strong. Studies have shown that N uptake continues into early fall when root growth is dominant. And uptake of N in the autumn has been shown to contribute more to storage and subsequent remobilization of N the following spring than N acquired during summer.

Because their leaves persist throughout winter, evergreen plants may be better suited for cool season nutrient uptake than deciduous plants. By retaining leaves, evergreen plants continue to transpire and may maintain their ability to produce photosynthate throughout much of fall and winter. Also, evergreen plants may retain the ability to absorb N. When temperatures are low, but not freezing nutrient uptake of evergreen plants is dependant on interactions between temperature and nutrient availability. Despite reduced N uptake rates at low temperatures above freezing, research indicates that fall fertilization can be used to increase the nutrient content of evergreen species.

Significance to the Industry: Information about ways fall fertilization affects evergreen versus deciduous species differently may help nursery growers improve fertility programs, increase plant growth, and avoid freeze damage.