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Pruning Effects on the Cold Hardiness of 'Haggerston Gray' Leyland Cypress and 'Natchez' Crape Myrtle

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Abstract. **The effects of late summer, fall, and winter pruning on the cold hardiness of × *Cupressocyparis leylandii* (A.B. Jacks. and Dallim.) Dallim. and A.B. Jacks. 'Hag gerston Gray' (Leyland cypress) and *Lagerstroemia* L. 'Natchez' (crape myrtle) were determined. Pruning in late summer through early winter significantly reduced the cold hardiness of both taxa. The maximum difference in cold hardiness between pruned trees and controls for × *Cupressocyparis leylandii* 'Haggerston Gray' in October, December, January, and February was 3, 3, 2, and 6C, respectively. The maximum difference in cold hardiness between pruned plants and controls for *Lagerstroemia* 'Natchez' in December, January, and February was 3, 4, and 2C, respectively. Early spring pruning of Leyland cypress and late winter or early spring pruning of crape myrtle are suggested from these data.**

Crape myrtle and Leyland cypress are widely grown in the southeastern United States. Leyland cypress is used for screens, hedges, and Christmas trees, while crape myrtle is often used as a specimen shrub or small tree in borders, or mass plantings for flower, bark, and fall color (Halfacre and Shawcroft, 1989). Both taxa are pruned regularly throughout the year to maintain desired characteristics. Several researchers (Gibson. 1988: Wade and Midcap, 1990: Wade and Moddy, 1988) have suggested de: laying pruning of crape myrtle in late summer or early fall.

Late summer, fall, and early winter pruning may predispose woody ornamental plant taxa to cold injury. In Georgia, Gibson (1988) has suggested delaying pruning of trees and shrubs until the threat of severe freeze is over.

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Table 1. The lowest survival temperature of x Cupressocyparis *leylandii* 'Haggerston Gray' plants pruned between Aug. 1989-Mar. 1990

Pruning month	Temperature (°C) Sampling month					
	August	October	December	January	February	March
August	−6[z]	−3 a[y]	−12 a	−16 a	−14 c	−12 cd
October		−6 b	−12 a	−16 a	−10 b	−12 cd
December			−15 b	−16 a	−10 b	−12 d
January				−18 b	−8 a	−10 bc
February					−14 c	−10 b
March						−6 a

[z]Unpruned controls are last datum of each column.
[y]Mean separation within columns by Duncan's multiple range test ($\alpha = 0.05$).

Table 2. The lowest survival temperature of Lagerstroemia 'Natchez' plants pruned from Aug. 1989-Mar. 1990

Pruning month	Temperature (°C) Sampling month					
	August	October	December	January	February	March
August	>0[z]	>0[y]	−12 b	−10 b	−12 b	−6 b
October		>0	−9 a	−8 a	−10 a	−2 a
December			−12 b	−8 a	−10 a	−2 a
January				−12 c	−12 b	−4 b
February					−14 c	−6 b
March						−2 a

[z]Unpruned controls are last datum of each column.
[y]Mean separation within columns by Duncan's multiple range test ($\alpha = 0.05$).

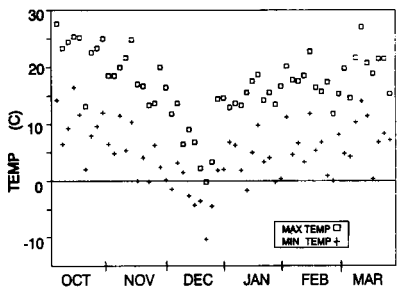

Fig. 1. Maximum and minimum temperature data collected from Oct. 1989-Mar. 1990 in Athens, Ga., by the National Weather Service. Each point represents a 3-day average.

In South Carolina, the majority of ***Camellia*** japonica plants (four out of five) pruned severely in fall and early winter died, while all plants pruned in February or later survived the relatively mild winter temperatures of 1988-89 (Baxter and Segars, 1989). However, most of the recommendations relative to time of pruning for woody trees and shrubs are based on observations. Because no quantitative data are available on the decrease in cold hardiness from pruning woody ornamentals, an investigation was conducted to determine the effect of pruning date on the subsequent cold hardiness of x *Cupressocyparis leylandii* 'Haggerston Gray' and *Lagerstroemia* 'Natchez'.

Both taxa were propagated by cuttings from established plantings in the Athens, Ga., area. Cuttings of 'Haggerston Gray' cypress were taken on 2 Feb. 1989 and prepared as described by Dirr and Frett (1983). Terminal cuttings of 'Natchez' crape myrtle (Egolf, 1981) were taken on 4 May 1989 and dipped for 5 set in 0.1% potassium lh-indole3-butanoic acid (K-IBA). After air drying, cuttings were placed in a 2 perlite : 1 peat (v/v) medium in the greenhouse at 25C (day)/18C (night) under mist.

Cuttings of 'Haggerston Gray' were transplanted on 27 Apr. 1989 and 'Natchez' cuttings were transplanted on 13 June 1989 into a 100% pine bark medium amended with ($kg \cdot m^{-3}$) 1.4 gypsum lime, 5.5 dolomitic limestone. and 0.7 Micromax trace elements (Sierra Chemical, Milpitas, Calif.). Two rooted cuttings of each taxon were placed into a 3.8-liter container and grown under polypropylene (55% shade) at the Univ. of Georgia, Athens. About 100 containers with two cuttings in each were used for each taxon. Each container received a top dressing of 12 g of Osmocote 17-7-12 (17N-3.1P-9.9K) (Sierra Chemical) after transplanting. In addition, supplemental water-soluble 2-20-20 (20N-8.7P-16.6K) fertilizer was added weekly at a rate of 100 ppm N until 1 week before the first pruning treatment.

Plants were randomly assigned pruning dates. Plants were pruned on 10 Aug., 12 Oct., or 7 Dec. 1989, or on 11 Jan., 8 Feb., or 8 Mar. 1990. On each pruning date, a sufficient number of plants was pruned to provide 12 to 15 randomly assigned plants for each subsequent sampling date. Thus, no plant was sampled more than once. On 10 Aug. 1989, 60 and 70 plants were pruned of 'Haggerston Gray' and 'Natchez', respectively. Of these, 12 were randomly assigned to each of the five subsequent sampling dates. Likewise, 48 and 55 plants were pruned on 12 Oct. 1989 for sampling at later dates for 'Haggerston Gray' and 'Natchez', respectively. Similarly, at least 36, 24, and 12 plants of each taxon were set aside for January, February, and March treatment dates. Material used for cold hardiness determinations of controls on each sampling date was obtained from material pruned on that date (≥12 plants). At the time of the initial pruning treatment, 'Haggerston Gray' and 'Natchez' plants were ~30 and 60 cm tall, respectively. Both taxa continued to grow after the August and October prunings. Preliminary experiments to determine the amount of tissue to be removed showed no difference in cold hardiness between 7.5-, 15.0-, or 30-cm-long prunings of 'Natchez' plants; therefore, a 15-cm pruning was selected as a moderate pruning treatment (data not presented). A 7-cm-long shoot was removed from each 'Haggerston Gray'.

The samples from each pruning treatment date were transported to Griffin, Ga., on ice in plastic bags containing a moist paper towel. All samples were prepared within 4 h of arrival at the laboratory. Four stem segments (6 to 7 cm) and leaves, if present, from each treatment date were wrapped in moist cheesecloth and placed in a test tube. Test tubes were submerged in a 60 ethylene glyco1 : 40 water solution (v/v) in a controlled-temperature bath (Model 2425, Forma Scientific, Marietta, Ohio). Stem temperatures were measured by copper-constantan thermocouples placed next to the samples and recorded by a datalogger (Model CR7-X, Campbell Scientific, Logan, Utah). After nucleation, samples were maintained at -2.0C ± 0.5C for 8 to 12 h, and then the temperature was lowered at a rate 14C/h. Samples were removed from the bath at 3C intervals on August, October, and December and 2C intervals in January, February, and March. Unfrozen controls were prepared and kept at 4C ± 1C for the duration of the test.

After completion of freezing, samples were thawed at 4C ± 1C for 12 to 18 h. Samples were placed in petri dishes and incubated at room temperature and 100% relative humidity until visual evaluation of injury as described by Bannister and Fagan (1989), Dirr and Lindstrom (1990), Fuchigami et al. (1971), Hummel et al. (1982), Lindstrom and Dirr (1989), and Stergios and Howell (1973). Segments showing breakdown of cells and brown discoloration in the cambium and phloem were rated as dead. Unfrozen controls and uninjured samples remained turgid and green and displayed no brown discoloration. The number of stems killed at each temperature was determined. The lowest temperature at which the majority of stems survived was recorded as the lowest survival temperature (LST) (Sakai et al., 1986). Data were analyzed by analysis of variance and means separated by Duncan's multiple range test ($\alpha = 0.05$).

Temperatures were recorded at the National Weather Service located ~ 7 km from the Univ. of Georgia. The lowest temperature was - 14C on 24 Dec. 1989 (Fig. 1).

With the exception of the February sampling of the August-pruned plants, all pruned cypress were significantly less cold hardy than the unpruned controls (Table 1). However, in March, the pruned trees were significantly more cold hardy than the unpruned control. The pruned plants of the October-February sampling dates showed significantly less cold

hardiness than the unpruned controls. The maximum differences in cold hardiness between pruned and control samples for October, December, January, and February were 3, 3, 2, and 6C, respectively.

A similar loss of cold hardiness was observed for crape myrtle plants (Table 2). The pruned plants of the December-February sampling dates showed significantly less cold hardiness than the unpruned controls. Once again, in March several of the pruned plants were significantly more cold hardy than the unpruned controls. The maximum differences in cold hardiness between pruned and nonpruned samples for December, January, and February were 3, 4, and 4C, respectively. No differences were detected between unpruned controls and August-pruned plants in December. Crape myrtle acclimates slowly in fall, and the lack of cold hardiness in the October sample reflects this. Even control October plants failed to survive - 3C.

Under the conditions studied, pruning in fall or early winter significantly reduced the cold hardiness of cypress and crape myrtle plants. Similar results were obtained on apples (Malus domestica Mill. 'Jonathan' and 'Stayman') by Burkholder (1936), (Malus L. spp.) Anthony et al. (1936), and grapes *(Vitis labrusca* L. 'Concord') Edgerton and Shaulis (1953), and Wolpert and Howell (1984). However, Magoon and Dix (1941) reported no injury to early or late-pruned grape vines *(Vitis labrusca* 'Concord', *Vitis* spp. 'Ontario' and 'Delaware'). In our study, August to January pruning resulted in a reduction of cold hardiness; however, these differences were not observed in the March sampling date, possibly due to the unusually warm winter in 1990 (Fig. 1). The National Weather Service in Athens reported 14 and 24 days above 15C in January and February, respectively. New shoot growth normally begins in March, yet most plants of both taxa initiated new growth by February.

Shoot injury by early fall freezes is prevalent in the southeastern United States, particularly on nursery stock. Fall or early winter pruning of 'Haggerston Gray' cypress decreased cold hardiness compared with the unpruned controls. Logically, pruning should take place after the threat of spring freezes. Our data indicate that for maximum survival of 'Natchez', crape myrtle, no pruning in either the landscape or commercial nursery should be done until late winter or early spring, preferably just before budbreak. Late summer and fall pruning of 'Natchez' crape myrtle to encourage new flowers also should be avoided. Our study provides quantitative data that support previous observations by Baxter and Segars (1989), Gibson (1988), Wade and Midcap (1990), and Wade and Moody (1988).

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