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Significance to the Nursery Industry

Black root disease caused by *Thielaviopsis basicola* has been reported to be destructive to Japanese holly in nursery production. The study reported here demonstrates that there is also a correlation between decline of landscape-grown Japanese holly and the presence of *T. basicola* in the roots. In some cases, the disease may only result in decreased rate of growth without symptoms of dieback or chlorosis, thus poor health may not be recognized. Holly transplanted into the landscape with this disease may in time, decline. Furthermore, the site will become infested with a fungal pathogen that has the ability to survive in soil for many years. It is in the best interest of propagators, nurserymen and landscape contractors to learn to recognize the root symptoms of this disease and to avoid out-planting diseased plant material.

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Reducing Moisture Stress in *Cornus florida*[1]

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Abstract

Two experiments were conducted to evaluate potential means for reducing moisture stress in *Cornus florida*. In experiment 1, the antitranspirant (Folicote), and defoliation treatments were applied before inducing stress and after withholding water for 1 week. Folicote was not effective at either application time in reducing moisture stress; plants treated with Folicote had similar shoot water potentials as untreated. Defoliation at both times reduced moisture stress compared to control plants. In experiment 2, two defoliants, (2 chloroethyl) phosphonic acid (ethephon) and 2,3 dihydro-5,6-dimethyl-1,4-dithiin 1,1,4,4, tetroxide (Harvade), were compared at 3 rates each. Percent defoliation of dogwood was similar among treatments after 26 days, with defoliation ranging from 78 to 94 percent.

Index words: Defoliation, antitranspirants, moisture stress

Introduction

Flowering dogwood is a moisture sensitive plant grown widely in the southeastern United States. Periods of drought stress occur almost annually in this area. Prolonged drought stress is detrimental to growth and survival of dogwood.

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Reduction of the transpiring surface is one of the drought resistant mechanisms in many plants. Antitranspirants have been used for reducing transpiration rate and thus moisture loss from plants. According to Gale and Hagan (4), there are 3 basic types of antitranspirants—film forming, stomata closing and reflecting. Folicote, a film forming antitranspirant, when applied at a 5% (volume) rate, reduced total transpiration in *Hydrangea macrophylla* by 10–15%, (8). In a study by Davies and Kozlowski (3), Folicote reduced transpiration in *Fraxinus americana* for 8 days, but exhib-

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ited phytotoxicity after 16 days. Other work with Folicote (2) reported that Folicote reduced stomatal conductance in *Rhododendron simsii* by 30% the first 2 days after application, but showed no effect thereafter.

Some plants naturally shed leaves, thereby reducing the transpiring surface (6). Askew et al. (1) noted that hand defoliation reduced wilt and stress after transplanting leafed-out dogwood. Research has also proven that nursery stock can be chemically defoliated (5). In the landscape a dogwood is often noticed with dead leaves attached to the tree long after death of the plant, indicating that dogwood does not naturally shed its leaves when undergoing stress. The purpose of these tests was to evaluate potential means of alleviating moisture stress in dogwood.

Materials and Methods

Experiment 1. Experiment 1 was initiated to study the effect of antitranspirant application time on dogwood moisture stress.

One-year-old bare root *Cornus florida* liners were potted in January, 1984, in #3 containers. A pine bark and sand potting medium (4:1/v:v) was amended on a m^3 (yd^3) basis with 3.5 kg (6 lbs) dolomite, 1.2 kg (2 lbs) gypsum, and 1.2 kg (2 lbs) superphosphate, 0.6 kg (1.0 lb) Aquagro, 0.9 kg (1.5 lb) Micromax, and 8.3 kg (14 lbs) of 18N-2.5P-10K (18-6-12) Osmocote. The potted liners were maintained under normal nursery conditions until placed in a polyethylene greenhouse on September 5, 1984 at which time treatments were carried out. The 6 treatments initiated were (1) plants treated with Folicote[3] antitranspirant (5% by volume), (2) about 90% of the foliage removed by hand; (3) plants treated with 5% Folicote 1 week after watering plants; (4) plants hand defoliated 1 week after watering; (5) plants not watered; and (6) plants watered as needed (control). Treatments 1–5 were not watered after day 1 until day 14.

Shoot water potential was measured at 3:00 p.m. on days 3, 5, 7, and 14 with a Scholander Pressure Bomb.[4] The experiment was concluded on September 19, 1984. Plants were arranged in a randomized block design consisting of 6 single plant replicates.

Experiment 2. On October 4, 1984, 48 one-year-old *Cornus florida* liners potted and established in #3 containers since January, 1984, were placed in an outdoor nursery to evaluate chemical defoliants. Plants were maintained under normal nursery conditions.

Treatments consisted of 100, 200, and 400 ppm of the defoliants Harvade[5] (2,3-dihydro-5,6-dimethyl-1,4-dithiin-1,1,4,4-tetroxide) and Ethrel[6] [(2-chloroethyl)phosphonic acid] (A.H. Marks and Company Limited). Dupont WK, a surfactant, was applied with each rate and in a separate treatment at a 2% rate.

Percent defoliation was rated on days 12, 18, 26, and 32. The experimental design was a randomized block with 6 single plant replicates.

[3]Crystal Soap and Chemical Company, Lansdale, Pa.

[4]PMS Instrument Company, Corvalis, Ore.

[5]Uniroyal Chemical Division of Uniroyal Inc.

[6]A.H. Marks and Company Limited.

Results and Discussion

Experiment 1. The antitranspirant, Folicote, did not reduce the effects of moisture stress based on shoot water potential measurements (Fig. 1). In fact, plants that received Folicote before the onset of moisture stress were more stressed on day 7 than the drought control plants with a shoot water potential of −50.8 bars compared to −30.3 bars with the nonwatered plants.

Folicote applied during stress resulted in shoot water potential readings (−61.3 bars) similar to those of the nonwatered plants (−64.8 bars) on day 14. These data differ from that of Ceuleman et al. who noted that Folicote reduced stress but only for 2 days (2).

Neither Folicote treatment maintained shoot water potential levels comparable to those of the defoliated treatments. Plants defoliated before moisture stress had a shoot water potential of −9.5 bars, which is slightly higher than the −13.3 bars of the watered control plants on day 7. By day 14 the shoot water potential of plants defoliated before moisture stress had dropped to −29.2 bars compared to the shoot water potential of −64.8 bars for nonwatered plants. This would indicate that defoliation prior to a known stress period such as transplanting would be beneficial in reducing moisture stress which agrees with work by Askew et al. (1).

Defoliation during moisture stress was effective in reducing moisture stress. Prior to defoliation, all plants had similar shoot water potentials.

After defoliation, shoot water potential decreased from only −28.8 bars to −36.2 bars from day 7 to day 14. This indicates considerably less stress than the drought control plants which increased in stress from −30.3 bars to −64.8 bars during that same period. Consequently, defoliation during an extended drought period might help the plant survive severe drought stress.

These data indicate that Folicote is not effective in relieving moisture stress in dogwood when applied before or

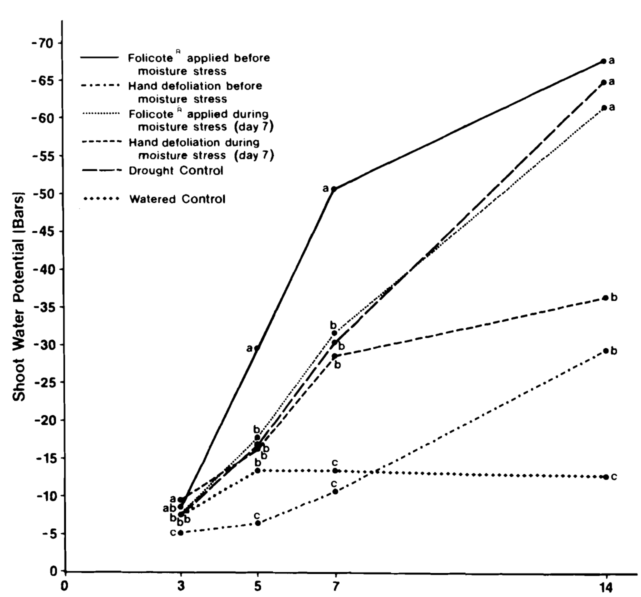

Fig. 1. **Shoot water potential of dogwoods treated with Folicote or hand defoliated before or during moisture stress in Experiment 1, measured days 3, 5, 7, and 14 days beginning September 5, 1984. Means separation by days using Duncan's multiple range test, 5% level.**

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during periods of moisture stress. However, defoliation did reduce moisture stress in dogwoods during drought periods and might be an available means of reducing stress if an easy and safe way to defoliate could be found.

Experiment 2. Initially, dogwoods receiving Ethrel treatments had a higher percentage of defoliation than those receiving Harvade treatments (Table 1). However, by day 18 all defoliant treatments had effectively defoliated plants with defoliation ranging from 71.5% to 92.3%.

Ethrel gave the most rapid defoliation without injury. The 100 ppm Ethrel rate may be preferred during drought since rapid defoliation would be desirable to reduce water loss via transpiration. Only the 400 ppm rate of Harvade resulted in any plant phytotoxicity (data not shown). Previous work with pin oak (7) showed that 85% defoliated 17-year-old trees 10 weeks after defoliation had a foliar density that was 90% of trees not defoliated. This previous work would suggest that use of defoliation as a means of alleviating drought stress should be limited to a time period during the first half of the growing season thus allowing time for natural refoliation to occur.

Table 1. Percent defoliation of dogwood treated with Harvade, Ethrel and surfactant.

	Defoliation (%) days after application			
Treatment (ppm)	**12**	**18**	**26**	**32**
Harvade 100	9.2b[z]	88.5ab	89.7a	90.5a
Harvade 200	11.7b	71.5b	77.5a	82.5a
Harvade 400	7.5b	80.8ab	87.8a	90.5a
Ethrel 100	46.7a	92.3a	93.8a	94.6a
Ethrel 200	33.3a	84.0ab	90.3a	92.8a
Ethrel 400	45.0a	85.8ab	90.8a	94.2a
DWK (2%)	5.8b	26.7c	32.2b	35.2b
Control	0.0b	0.0d	0.0c	0.0c

[z]Means in columns with same letter do not differ significantly using Duncan's multiple range test, 5% level.

Significance to the Nursery Industry

The antitranspirant, Folicote, was ineffective in reducing the effects of moisture stress on dogwood. In situations where regular watering of drought stressed dogwood is not available, defoliation may provide an alternative to losing the tree due to prolonged drought stress. Although the experiments were carried out with containerized dogwood, these data suggest that survival of summer-dug dogwood could possibly be enhanced by defoliation prior to digging or soon after digging.

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