RESEARCH RESULTS FOR ORNAMENTAL HORTICULTURISTS

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Auburn University
Agricultural Experiment Station
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Editor

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Growth of 'Hershey's Red' Azalea in Three Pot/Mulch Combinations

Gary J. Keever and Gary S. Cobb

Nature of Work: High soil temperatures have been shown to reduce root and shoot growth of plants. Research indicates that optimum root growth for many plants occurs between 20-30°C (68-86°F) (1). Growth is reduced at soil temperatures above 30°C (86°F) and will cease in many species above 40°C (104°F) (2). Soil temperatures above 49°C (120°F) have been observed in both green and black pots exposed to direct solar radiation (3). This work was initiated to evaluate temperature fluctuations and growth of *Rhododendron* 'Hershey's Red' in 3 pot/mulch combinations during the summer months.

In April, 1982, uniform 'Hershey's Red' liners were potted in 2.8 liter (trade gal.) black or white polyethylene pots in amended pine bark. Three treatments were selected to determine pot/mulch effects on growth medium temperatures and plant growth: 1) black pots on a white clam shell mulch; 2) white pots on a black polyethylene mulch; and 3) black pots recessed into a white plywood frame so that the pot sides were not exposed to direct solar radiation.

Air and container temperatures were monitored continuously during the summer months. In September, root coverage (%) of the surface of the bark medium, relative root development, growth indices, and top dry weight were determined.

Results and Discussion: Growth medium in the black pots on white mulch consistently reached the highest maximum temperatures. Medium in white pots on a black mulch averaged 5°C (9°F) cooler. This is consistent with the findings of Whitcomb (4). Temperatures in the plywood frame, which simulated jammed plants where pots are shaded, were lower than the other two pot/mulch combinations and lower than ambient air temperature. Maximum temperatures at the different locations within a single black pot on white mulch decreased in the following order: south wall, west, south, east, center, and north side. Maximum ambient air temperature was lower than any of the maximum pot temperatures.

Percent root coverage of the growth medium surface was greatest for plants grown in the plywood frame, followed by plants in white pots on black mulch, and least with the black pot/white mulch combination (Table 1). Root coverage was greater on the north side of white pots on black mulch than on the south side. Although not significantly different, values indicated less coverage of the south side of black pots on white mulch compared to the north side. Relative root development and growth indices were greater in the plywood frame and in white pots on black mulch compared to black pots on white mulch. Growth as measured by top dry weight was greater in the white pots on black mulch than in black pots on white mulch.

Lower temperatures and greater root and top growth in white pots on black mulch suggest the need to reconsider black pot/white shell mulch combinations commonly used in south Alabama. White pots on a black mulch appear to provide a viable alternative for growers. Lower temperatures and better root development of plants in the plywood frames suggest that it is beneficial to jam plants or to space plants so that foliage minimizes direct solar radiation stricking the sides of pots during the summer months.

Table 1. Root coverage (%) of the north and south bark surfaces, relative root development, growth index, and top dry weight of 'Hershey's Red' azalea in three pot/mulch combinations.

	Root coverage (%)		Relative root	Growth	Top dry
	North	South	development[z]	index (cm)[y]	weight (g)
Black pot/white mulch	7.2 d[x]	0.7 d	2.6 b	23.6 b	27.5 b
White pot/black mulch	31.1 b	20.4 c	3.3 a	26.0 a	36.7 a
Black pot/plywood frame	47.4 a	42.6 a	3.6 a	25.8 a	34.1 ab

[z] 1= least developed and 5 = most developed root systems.

[y] Growth index = (height + width)/2.

[x] Mean separation within columns by Duncan's multiple range test, 5% level; root coverage values separated among all means.

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Phytotoxicity of Chrysanthemum to Sprays and Drenches of Dursban™ - A Potential Control for Leafminer, Liriomyza trifolii (Burgess)

Kenneth C. Sanderson and Willis C. Martin, Jr.

Nature of Work: The serpentine leafminer, *Liriomyza trifolii* (Burgess) is a serious pest that has prompted three industry conferences to identify, discuss and, hopefully, solve outbreaks of this difficult to control pest (3). An important aspect of leafminer control is the availability of effective insecticides which can reduce these outbreaks. Repeated applications of broad spectrum insecticides and associated mortality of natural enemies and insecticidal resistance have resulted in less than satisfactorily control with currently recommended insecticides. The effective life of any insecticide has been estimated to be three years (1). In the authors' experience, insecticidal control has only been achieved in commercial practice by treating for both adults and larvae. Growers have tested Dursban™ on adults and reported that resistance develops rapidly. Shuster and Everett (4) found foliar sprays of Dursban™ ineffective in reducing leafmining damage. Parrella et al. (2) have documented the effectiveness of Dursban™ (chlorpyrifos trademarked as Dursban™ by Dow Chemical Co., Midland, MI) controlling third stage larvae of *L. trifolii* but indicated that phytotoxicity trials on chrysanthemum were not available. The present study was conducted to evaluate the phytotoxicity of Dursban™ sprays and drenches on chrysanthemum.

Two experiments involving the chrysanthemum cultivars 'Bright Golden Yellow Princess Anne', 'Loyalty', 'Spirit', 'Sunlight' and 'Yellow Mandalay' were conducted during 1982. Rooted cuttings were planted December 16, pinched December 29 and treated with Dursban™ on January 18 in Experiment 1. In Experiment 2, cuttings were tansplanted on January 29, pinched February 12 and treated on February 25. 'Sunlight' plants were grown as "spray" types with the center flower bud being removed at disbudding. Other cultivars had the lateral buds removed. Appropriate photocontrol for commercial flowering of chrysanthemum was employed in each experiment with the plants receiving supplementary incandescent light from 10 p.m. to 2 a.m. each night starting at transplanting and ending at pinching. 'Bright Golden Yellow Princess Anne' plants received one week less lighting than the other cultivars (lighting terminated 1 week before the pinch). Two media were used: Pro-mix (Premier Brands, New York, NY) and a 1:1:1 (v/v/v) soil, sphagnum peat moss and perlite medium. Media were amended with 6 oz. limestone and 1 oz. superphosphate per cu. ft. Fertilization consisted of weekly applications of liquid fertilizer 20-20-20 (20N-8.7P-16.6K) at the rate of 2 lb. per 100 gal. Treatments consisted of Dursban™ 7E applied at 3 rates as a drench (4 oz. per pot) and one rate as a spray. Application rates were derived from the manufacturer's recommendation for use of Dursban™ on turf and a bracketing effect was used for drenching rates. DuPont Spreader Sticker was added to the spray at the rate of 1.3 oz. per 100 gal. Five pots served as an experimental unit and treatments were applied in a randomized block design with 2 replications. Data on date of flowering, plant height, plant spread and flower number were recorded when two-thirds of the flowers were open. Data from both from both experiments were combined for statistical analysis.

Results and Discussion: None of the treatments produced any visible symptoms of injury on the cultivars tested. There were no differences in flowering time due to Dursban™ treatment, however all cultivars flowered in the following order: check (no treatment), 5 oz./100 gal. drench, 20 oz./100 gal. drench and 10 oz./100 gal. spray. Dursban™ treatments did not affect the plant height of any of the cultivars tested, however the 5 oz./100 gal. drench produced the tallest plants and the 20 oz./100 gal. drench produced the shortest plants with most cultivars. Differences in plant spread were not significant, however the 5 oz./100 gal. usually produced plants with the greatest spread. Drenches and a spray of Dursban™ significantly reduced the number of flowers on 'Bright Golden Yellow Princess Anne' plants but did not affect flower number on other cultivars (Table 1). Check 'Bright Golden Yellow Princess Anne' plants produced more flowers than plants receiving the 5 oz./100 gal. drench, 20 oz./100 gal. drench and 10 oz./100 gal. spray.

This work shows that Dursban™ can be used safely as a drench on certain chrysanthemum cultivars for the control of soil insects. In other unpublished work by the authors, Dursban™ has been used as a medium drench on orchids without visible phytotoxicity and has produced transient chlorosis and a reduction in flower number when applied as a spray (5 oz./ 100 gal.) to 'Sunny Mandalay' chrysanthemums. A granular formulation of chlorpyrifos (Dursban™), Lorsban 15G, has received labeling for broad-spectrum soil insect control on agronomic crops and should be tested on chrysanthemums because of its versatility of application (5).

Table 1. Effect of Dursban™ on the number of flowers per plant produced by 4 chrysanthemum cultivars

Treatment	Rate oz./100 gal.	Cultivars				
		BGY Princess Anne	Loyalty	Spirit	Sunlight	Yellow Mandalay
Check	---	3.5a[z]	4.2a	5.3a	7.5a	4.2a
Dursban™ drench	5	3.2b	4.4a	5.1a	7.0a	4.1a
Dursban™ drench	10	3.4ab	4.6a	5.3a	7.4a	4.0a
Dursban™ drench	20	3.3b	4.5a	5.5a	7.4a	4.1a
Dursban™ spray	10	3.3b	4.3a	5.1a	7.2a	4.0a

[z]Means in columns followed by the same letter(s) are not significantly different according to Duncan's multiple test at 5% level.

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Cutting Propagation of *Chionanthus retusus* (Lindl. & Paxt.), Chinese Fringetree

Fred B. Perry, Jr.

Nature of Work: The pure white flowering form of Chinese Fringetree has been grown on a very limited scale for many years due to propagation difficulties. Viable seed production is sparse and germination is poor because of various internal dormancies (requiring a month of stratification at 70°F followed by two months at 40°F). Even with proper stratification procedures, germination may not occur until the second spring. Cutting propagation of Chinese Fringetree has been also recognized as being very difficult if not almost impossible.

On May 17, May 31, and June 14, 1982, 8-inch (20 cm) cuttings were taken from suckering juvenile shoots on interior branches of 25-to-30-year old stock tree plants. The shoot tips were not completely mature with fully expanded leaves until the mid-June cutting date. Five to six leaves remained on each cutting. Root-inducing treatments were check (none) and talc preparations of IBA at 0.3% and 2.0%. The base of each cutting was wounded by removing a thin strip of bark from two sides 3/4-inch (2 cm) long and < 1/8-inch wide (2 mm). Cuttings were inserted under mist in a medium of 1 sand:1 peat:1 perlite and watered in with a Captan drench (1 lb. per 100 gal.). The mist cycle was 2½ seconds each 2½ minutes during daylight hours only. There were 30 cuttings per treatment in 4 replications. The replications were represented by 1 = tips, terminal 8 inches, 2 = second cuttings, 3 = third cuttings, and 4 = base cuttings from suckering shoots. Plot design was a complete randomized block for each cutting date.

Results and Discussion: Rooting percentages increased with increased concentrations of IBA up to 2%, with maturity date, and with the more basal position on the shoot (Table 1). Poor or no rooting occurred on cuttings with no rooting inducing treatment and on tip cuttings throughout the study. Rooting response to 0.3% IBA increased with cuttings taken down the stem and with increased maturity date; however, the best average response of 26.75% is considered poor. Overall rooting response to 0.8% IBA and 2.0% IBA also improved with more basal position taken and with maturity and reached 52.50% and 56.75% respectively. The best rooting percentages were achieved on basal cuttings treated with 0.8% IBA in May and June (87% & 90%) and with 2.0% IBA (97%).

These plants can be propagated by mature spring cuttings, and top quality specimens can be grown. The results of this study show that the maturity of the cutting is of prime importance, not so much from the standpoint of a calendar date but from the standpoint of physiological maturity. The optimum maturity of the cuttings is at the point when the youngest terminal leaf has completely expanded and reached full size and thickness. In central Alabama this can be May 15 to June 15 depending on the earliness or lateness of the season for a given year.

The best cuttings are taken from juvenile shoots arising low on the stock plant. Shoots should be strong, thick, vigorous, current seasons growth and 1/4-3/8 inch (5.1 cm) in diameter. Small diameter shoots taken high in the plant have not rooted as rapidly or as well as the larger stronger shoots. Such cuttings, if rooted, do not seem to grow off well. Cuttings are made by sectioning these shoots into 6-to-8-inch (15-19 cm) cuttings with three or more nodes remaining, discarding the weak small diameter branch tip.

Cuttings should be taken in early morning when turgid and fully protected against drying through every stage of preparation until in the mist bench.

Table 1. Effect of propagation date, IBA, and type of cutting on rooting of Chinese Fringetree *Chionanthus retusus* (Lindl. & Paxt.).*

	Percent rooted				
	Rep. I Tip cutting	Rep. II 2nd. cutting	Rep. III 3rd. cutting	Rep. IV Base cutting	Average
<u>5/17 stuck 6/30 harvest</u>					
Check	0	0	0	0	0
0.3% IBA	0	0	0	0	0
0.8% IBA	0	3	7	13	5.75
2.0% IBA	0	30	57	93	45.00
<u>5/31 stuck 7/14 harvest</u>					
Check	0	0	0	0	0
0.3% IBA	0	7	7	20	8.50
0.8% IBA	0	43	53	87	45.75
2.0% IBA	0	50	70	97	54.25
<u>6/14 stuck 7/28 harvest</u>					
Check	0	0	3	0	0.75
0.3% IBA	0	10	40	57	26.75
0.8% IBA	0	57	63	90	52.50
2.0% IBA	0	53	77	97	56.75

* Thirty 8-inch cuttings were taken for each cutting type from suckering juvenile 32-to 38-inch shoots starting at the shoot terminal or tip.

Effect of Growth Retardants on English Ivy, *Hedera helix* L.

Kenneth C. Sanderson, Willis C. Martin Jr., and Lih-Juy Shu

Nature of Work: Growth control of members of the Arailaceae is desirable because of their widespread use in interior landscapes. In previous work on *Brassaia actinophylla* Endl. (2) and *Hedera helix* L. (1), a single spray application of B-Nine™ (daminozide or butanedioic acid mono (2,2-dimethylhydrazide by Uniroyal Chemical, Bethany, CT) or A-Rest™ (ancymidol) or α-cyclopropyl-α-(p-methoxyphenyl)-5-pyrimidine-methanol by Lilly Research Laboratories, Greenfield, IN) has caused some reduction in plant growth. Single spray applications of Stemtrol™ (piproctanylium bromide or 1-allyl-1-(3,7-dimethyloctyl)-piperidinium bromide by Hoffman La Roche Inc., Nutley, N.J.) have been effective. The objective of this research was to study the effect of 2 applications of these retardants on the shoot length and plant dry weight of *Hedera helix* L.

On June 23, two cuttings of English ivy were directly propagated in 15-cm (5-in.) pots under mist (5 sec. out of every 100 sec. 8:00 a.m. to 5:00 p.m. daily). The pots contained 1:1:1 (v/v/v) soil, sphagnum peat moss, and perlite medium amended with 60 g (2.3 oz.) dolomitic limestone per cu. ft. Plants were grown in a lightly shaded greenhouse equipped with fan and pad cooling (thermostat set at 21°C. (70°F.). Upon rooting, the plants were fertilized weekly with water soluble fertilizer 20-20-20 (20.0 N-8.7 P-16.6 K) at the rate of 908 g (2 lb.) per 378.5 liters (100 gal.). On August 2 and September 2, the growth retardant treatments shown in Table 1 were applied to the plants. Sprays were applied with a low-pressure, high-volume sprayer until runoff. For the drenches, 100 ml (3.3 oz.) were applied to each pot. Treatments were applied in a complete randomized block design with 4 replications and 4 subsamples (pots) per treatment. The height of each plant in each pot was determined on August 2 (prior to treatment) and on October 31 (after the second treatment) and the increase in new growth was calculated for analysis. For dry weight determinations, plants were severed at the soil line and dried in an oven at 80°C. (176°F.) prior to weighing.

Results and Discussion. The greatest reduction in new growth occurred on plants receiving 5,000 ppm N-Nine™ or 150 ppm A-Rest™ sprays (Table 1). Stemtrol™ was ineffective as a spray or drench in reducing growth of English ivy. Growth of plants receiving A-Rest™ drench was less than that of plants receiving no treatment or Stemtrol™ sprays or drenches. The effect of the retardants on plant dry weight was similar to their effect on height. Plants receiving 150 ppm A-Rest™ sprays weighed the least and differed in dry weight from check and Stemtrol™ treated plants.

Plants receiving A-Rest™ drenches did not differ in dry weight from plants receiving A-Rest™ sprays or B-Nine™ sprays.

Our work shows that B-Nine™ sprays and A-Rest™ sprays can be used to retard the growth of English ivy. Such growth retardation might be useful in the production of hanging baskets and compact potted plants and in the maintenance of plants in interior environments.

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Table 1. Effect of growth retardants on new growth and dry weight of English Ivy, *Hedera helix* L.

Treatment	Rate (ppm)	New growth (cm)^{z}	Plant dry weight (g)^{z}
None	- - -	24.2a^{y}	8.6ab
B-Nine spray	5,000	6.9c	6.5cd
Stemtrol spray	150	22.5a	9.3a
A-Rest spray	150	8.4c	5.6d
Stemtrol drench	250	24.3a	7.5bc
A-Rest drench	2	14.7b	7.0cd

^{z}Metric conversion: 2.5 cm = 1 inch, 28.4 = 10 ounce.

^{y}Means in columns followed by the same letter(s) are not significantly different according to Duncan's multiple range test at the 5% level.