HRI's Mission:

To direct, fund, promote and communicate horticultural research, which increases the quality and value of ornamental plants, improves the productivity and profitability of the nursery and landscape industry, and protects and enhances the environment.

Growth Control of Asiatic Jasmine and Carolina Jessamine with Uniconazole[1]

Gary J. Keever[2] and William J. Foster[3]
Department of Horticulture
Alabama Agricultural Experiment Station
Auburn University, Auburn, AL 36849

Abstract

A single foliar spray of 75 to 300 ppm uniconazole suppressed runner elongation of *Trachelospermum asiaticum* (Siebold & Zucc.) Nakai (Asiatic or Japanese star jasmine) for 9 weeks. Uniconazole did not, however, affect number of runners exceeding 20.3 cm (8 in) in length or shoot dry weight. Two foliar sprays of 300 to 900 ppm uniconazole or two drench applications of 3 to 20 mg ai/pot, applied 6½ weeks apart, suppressed lengths of the longest runners for at least 19 and 6 weeks, respectively, and runner number exceeding 20.3 cm (8 in) and shoot dry weight for 46 weeks. Two foliar sprays of 75 to 300 ppm uniconazole or two drench applications of 1 to 5 mg ai/pot, applied 14 weeks apart, reduced shoot dry weight of *Gelsemium sempervirens* (L.) Ait. (Carolina jessamine) 38 and 59 weeks after initial treatment, but had no effect on shoot length as early as 14 weeks after initial treatment. Shoot length of jessamine was reduced 6 and 19 weeks after initial treatment with two foliar sprays of 300 to 900 ppm uniconazole or two drench applications of 3 to 20 mg ai/pot. Foliar rates of 600 or 900 ppm and drench rates of 10 to 20 mg ai/pot suppressed shoot growth of jessamine excessively and were considered unacceptable.

Index words: growth retardant, growth regulator, uniconazole, XE-1019.

Growth regulators used in this study: Uniconazole (uniconazole), (E)-1-(p-chlorophenyl)-4,4-dimethyl-2-(1,2,4-triazol-1-yl)-1-penten-3-ol.

Species used in this study: Asiatic or star jasmine [*Trachelospermum asiaticum* (Siebold & Zucc.) Nakai]; Carolina jessamine [*Gelsemium sempervirens* (L.) Ait.].

Significance to the Nursery Industry

Extensive shoot elongation of Asiatic jasmine and Carolina jessamine necessitates frequent hand pruning during production. Uniconazole, applied foliarly at 75 to 300 ppm, provided short-term control (9 weeks) of Asiatic jasmine but not Carolina jessamine growth. Two applications of 300 to 900 ppm uniconazole suppressed Asiatic jasmine elongation for at least 19 weeks, while drench application of uniconazole (3 to 20 mg ai/pot) was less effective. Two 300 ppm foliar sprays or 3 to 5 mg ai/pot medium drenches produced the highest quality Carolina jessamine; higher rates severely stunted growth and were considered unacceptable. Uniconazole offers nurserymen a means of reducing the frequency of hand pruning these two species; however, the po-

[1]Received for publication September 26, 1994; in revised form January 17, 1995.

[2]Professor of Horticulture.

[3]Former Superintendent, Ornamental Horticulture Substation, Mobile, AL 36689; current address: The Scotts Company, 1411 Scottslawn Rd., Marysville, OH 43041.

The *Journal of Environmental Horticulture* (USPS Publication No. 698-330) is published quarterly in March, June, September, and December by the Horticultural Research Institute. Subscription rate is $65.00 per year for educators and scientists; $85.00 per year for others; add $25.00 for international orders. Second-class postage paid at Washington, D.C. and at additional mailing office. Send address changes to HRI, 1250 I Street, N.W., Suite 500, Washington, D.C. 20005.

tential for insufficient growth inhibition or severe stunting exists.

Introduction

Asiatic or Japanese star jasmine (*Trachelospermum asiaticum*), a twining evergreen vine, is one of the most widely used ground covers in southern landscapes (USDA Zones 8 and 9). Its vigorous growth rate necessitates frequent pruning during production; however, the plant's horizontal growth habit does not lend itself to mechanical pruning. Like Asiatic jasmine, Carolina jessamine (*Gelsemium sempervirens*, USDA Zones 6–9) is a vigorous, twining evergreen vine requiring repeated prunings during production. Due to its propensity to climb both during production and in the landscape, Carolina jessamine is typically staked or trained on lattice during production. Both of these crops are labor intensive, contributing to increased production costs.

Uniconazole (Sumagic) is a plant growth regulator that reduces growth by inhibiting gibberellin biosynthesis (1). While uniconazole has shown promise for reducing pruning frequency of woody plants in nursery and landscape settings (6, 7, 9, 10), plant response has been variable, dependent on species and application rate (4, 5, 7, 10, 11). Owings et al. (8) reported that a single foliar spray of 60 to 240 ppm uniconazole controlled runner elongation of Asiatic jasmine for at least 4 months. In a short-term study by Warren (11), Carolina jessamine did not respond to a single foliar application of 75 to 275 ppm uniconazole, but medium application of 1 to 5 mg ai/pot reduced shoot dry weight 14 to 22%, 17 weeks after application. Growth response beyond 17 weeks was not evaluated. Additional information is not available on the response of Asiatic jasmine or Carolina jessamine to uniconazole during container production. The objectives of this study were to evaluate the magnitude and duration of growth response exhibited by these species to multiple applications of medium- or foliar-applied uniconazole.

Materials and Methods

Two experiments were conducted with both Asiatic jasmine and Carolina jessamine. Due to differences in methodology and results, species and experiments are presented separately.

Asiatic jasmine. Uniform liners of Asiatic jasmine were transplanted on April 20, 1988, into 2.8 liter (#1) pots of a pine bark:peat (3:1 by vol) growth medium amended per m^3 (yd^3) with 8.3 kg (14 lb) Osmocote 17N-3P-10K (17-7-12) (The Scotts Co., Marysville, OH 43041), 3.6 kg (6 lb) dolomitic limestone, 1.2 kg (2 lb) gypsum, and 0.9 kg (1.5 lb) Micromax (The Scotts Co.). Plants were placed in full sun under overhead irrigation (1 hr interval delivering 1.3 cm (0.5 in)), applied as needed. On May 25, jasmine was pruned to 10 cm (4 in). On June 16, when new growth was consistently uniform in appearance, a single foliar spray of 0, 75, 100, 150, 200 or 300 ppm uniconazole was applied uniformly in a volume of 204 ml/m^2 (2 qt/100 ft^2). Environmental conditions at time of application were 32.2C (90F) and 55% relative humidity. Treatments were completely randomized with five replicates of two plants each.

Nine weeks after treatment (WAT), lengths of the 3 longest runners and number of runners longer than 20.3 cm (8 in) were collected on each plant, and shoot dry weights of five single-plant replicates were determined. Runners shorter than 20.3 cm (8 in), a typical pruning length during production, were considered to be positively affected by uniconazole. Because of the vigorous growth exhibited 14 WAT, treatments were reapplied September 22 (14 WAT), 1988 (31.7C (89F), 67% relative humidity). At the end of the growing season [19 weeks after second treatment (WAST)], similar data were collected again on the jasmine, as well as a foliar color rating (1, 3, 5 = light, medium, dark green).

Due to insufficient control of shoot elongation with most rates in the first experiment, a second experiment was conducted using higher foliar spray rates and drench application. Materials and methods were similar to those in the first experiment, except as noted below. Liners were potted on May 9, 1989, pruned to 10 cm (4 in) on June 21, and treated on July 12; mean heights of jasmine was 12.2 cm (4.8 in) when treated. Treatments included a foliar spray of 0, 300, 600 or 900 ppm uniconazole or a medium drench of 3, 5, 10, 15 or 20 mg ai/pot. Air temperature and relative humidity at treatment were 31.3C (88F) and 70%, respectively. Treatments were reapplied on August 28, 6½ WAT (31.1C (88F), 74% relative humidity). Length of the 3 longest runners per plant and number of runners longer than 20.3 cm (8 in) were recorded on August 24 (6 WAT), November 29 [13 weeks after second treatment (WAST)] and June 5, 1990 (40 WAST). Shoot dry weights also were taken 40 WAST. Due to excessive elongation of numerous runners on plants in most treatments and to determine if there was a growth- inhibiting effect following pruning, plants were pruned to 20.3 cm (8 in) after collecting data on November 29.

Carolina jessamine. In the first experiment, methodology was identical to that used with Asiatic jasmine in experiment 1, except as noted: jessamine was pruned to ≈15 cm (6 in); and, in addition to foliar spray treatments, a growth medium drench of 1, 3 or 5 mg ai/pot was applied in a volume of 50 ml (1.7 oz). On September 20 (14 WAT), shoot lengths were recorded by straightening the longest shoot and measuring from the medium surface to the shoot tip. Shoot dry weights of 5 single-plants and a foliar color rating were taken at the end of the 1988 growing season (19 WAST) and again in June, 1989 (40 WAST). A root rating (1–5 = 0, 25, 50, 75, 100% coverage of the rootball surface) also was made in June.

A second experiment was conducted beginning in 1989 using methodology and treatments identical to those used in the second jasmine experiment, except the experiment was terminated 13 WAST. Shoot lengths of jessamine were measured 6 WAT and 13 WAST.

In experiments that included both spray and drench treatments, contrasts were used to compare means averaged across rates. Single degree of freedom orthogonal contrasts were used to study plant response to uniconazole rate.

Results and Discussion

Asiatic jasmine—Experiment 1. Runner length of Asiatic jasmine 9 WAT decreased quadratically with increasing uniconazole spray rates; runners of plants sprayed with 75 or 300 ppm uniconazole were 15% or 31% shorter than those of control plants (Table 1). Most of the decrease in runner length occurred between 75 and 150 ppm uniconazole, while runners of plants sprayed with the two highest rates (200,

Table 1. Response of Asiatic jasmine to uniconazole, Expt. 1.

Uniconazole treatment		Runner[z]	
Method of application	Concentration	Length[y] (cm)	Number[x]
Spray	(ppm)		
	0	95.9	16
	75	81.8	17
	100	79.8	17
	150	67.9	19
	200	66.6	19
	300	66.6	16
Significance[w]		L***Q***	Q*

[z]Data collected 9 weeks after treatment (WAT).

[y]Average of 3 longest runners per plant.

[x]Number of runners longer than 20.3 cm (8 in).

[w]Not significant (NS) or significant at the 5% (*) or 0.1% (***) level; L = linear, Q = quadratic. Control included in regression analysis.

300 ppm) were similar in length to those of plants sprayed with 150 ppm. Number of runners exceeding 20.3 cm (8 in) in length was significantly affected by uniconazole, increasing with the intermediate rates before declining with the highest rate. However, a difference of no more than three runners per plant has little practical importance. Shoot dry weight was not influenced by uniconazole rate 9 WAT (data not shown). Runner number or length, shoot dry weight or foliar color rating measured at the end of the growing season was not affected by uniconazole (data not shown). These results suggest a short-term suppression of jasmine shoot elongation with foliar sprays of 75 to 300 ppm uniconazole. Plants in this test would still require hand pruning during the season of application.

Experiment 2. Runner length of Asiatic jasmine decreased quadratically with increasing spray rates 6 WAT and 13 WAST (Table 2), but not 40 WAST (data not shown). The decrease in length ranged from 27 to 34% 6 WAT and from 23 to 31% 13 WAST. Runner length also decreased with drench-applied uniconazole 6 WAT, but not 13 or 40 WAST. The decrease in runner length 6 WAT ranged from 14 to 23%, with similar values for plants receiving 5 to 20 mg ai/pot. The similarity in runner lengths among spray treatments 40 WAST and drench treatments 13 and 40 WAST indicates the dissipation of growth suppression of at least some runners followed by accelerated shoot elongation, a response previously observed (2, 3). Runner lengths of sprayed plants averaged 11% and 25% less than those of drenched plants 6 WAT and 13 WAST (Table 2), respectively, but by 40 WAST values were similar (data not shown).

Number of runners exceeding 20.3 cm (8 in) in length decreased quadratically with increasing spray drench rates at all sampling dates. The decrease ranged from 54 to 70% 6 WAT, 35 to 40% 13 WAST, and from 49% to 60% 40 WAST with spray treatments and from 60 to 67% 6 WAT, 40 to 63% 13 WAST, and from 53 to 74% 40 WAST with

Table 2. Response of Asiatic jasmine to uniconazole, Expt. 2.

Uniconazole treatment		Runner length[z] (cm)		Number of runners[y]			Shoot dry weight (g)
Method of application	Concentration	6 WAT[x]	13 WAST[xw]	6 WAT	13 WAST[w]	40 WAST	40 WAST
Spray	(ppm)						
	0	66.9	123.6	16	29	27	152.2
	300	49.2	95.2	8	19	14	110.5
	600	48.8	90.7	6	19	12	102.4
	900	44.2	85.1	5	17	11	104.9
Significance[v]		L**Q*	L**Q*	L**Q*	L**Q**	L**Q**	L***Q***
Drench	(mg ai/pot)						
	0	66.9	123.6	16	29	27	152.2
	3	57.5	113.2	7	17	13	104.6
	5	50.5	96.6	5	13	9	95.5
	10	53.6	109.4	7	13	8	88.9
	15	51.9	112.5	6	16	11	93.3
	20	51.7	138.5	5	11	7	73.9
Significance		L**Q**	NS	L**Q*	L**Q**	L**Q**	L***Q***
Spray		47.4b[u]	90.3b	6	18a	12a	105.9a
Drench		53.0a	119.7a	6NS	14b	10b	91.2b

[z]Average of 3 longest runners per plant.

[y]Number of runners longer than 20.3 cm (8 in).

[x]Treatments initially applied on July 12, 1989, and reapplied on August 28, 1989, 6½ weeks after treatment (WAT); WAST = weeks after second treatment.

[w]Plants pruned to 20.3 cm (8 in) following data collection.

[v]Not significant (NS) or significant at the 5% (*), 1% (**) or 0.1% (***) level; L = linear, Q = quadratic. Control included in regression analysis.

[u]Not significant (NS) or significant at the 1% level; values are means within a method of application, excluding the control, averaged across rate.

drench treatments. The greater % decrease in runner number 40 WAST compared to 13 WAST with both spray and drench treatments indicates that pruning of elongated shoots of uniconazole-treated plants may enhance growth suppression. Reduced number of runners longer than 20.3 cm (8 in) indicates a persistent growth inhibition of at least some runners per plant, while runner lengths indicate a resumption of normal to accelerated elongation of some shoots. This effect was obvious when visually examining the plants. Runner numbers were similar for sprayed and drenched plants 6 WAT, but 23% and 21% less for drenched plants 13 and 40 WAST, respectively. Fewer elongated shoots on drenched plants indicate a more persistent suppression compared to sprayed plants, a response previously reported (2, 4, 11). Shoot dry weight response to uniconazole treatments was similar to that of runner number, decreasing 27 to 31% and 31 to 51% with increasing spray and drench rates, respectively. Dry weights of drenched plants averaged 14% less than those of sprayed plants.

Carolina jessamine—Experiment 1. Visual observation of jessamine 9 WAT indicated no obvious growth differences among plants receiving the different treatments. This observation was supported by shoot length 14 WAT lacking a rate response to either foliar- or drench-applied uniconazole (data not shown). However, drenched plants, averaged over all rates, were significantly shorter than plants sprayed [127.1 cm (50 in) vs. 141.5 cm (55.7 in)] 14 WAT (data not shown). Shoot dry weights of jessamine 19 and 40 WAST decreased either linearly or quadratically with both increasing foliar and drench rates (Table 3). The decrease in shoot dry weights with foliar-applied uniconazole ranged from 5 to 30% and from 0 to 25% 19 and 40 WAST, respectively. The decrease in the difference in weights of treated and control plants over time suggests a dissipation of growth suppression. With drench-applied uniconazole, shoot dry weights were 34 to 38% less than those of control plants 19 WAST and 26 to 44% less 40 WAST. At both dates, weights of sprayed plants were significantly greater than those of plants drenched [79.4 g (2.8 oz) vs. 64.3 g (2.3 oz), 19 WAST; 151.5 g (5.3 oz) vs. 115.1 g (4.1 oz), 40 WAST). The greater response and persistence to drench-applied uniconazole is well documented (2, 4, 11) and agrees with previous research with jessamine (11). Foliar color ratings at both dates were unaffected by treatments (data not shown).

Experiment 2. Shoot length of jessamine decreased quadratically 6 WAT and 13 WAST with increasing rates of both foliar- and medium-applied uniconazole (Table 4). The decrease in shoot length ranged from 59 to 63% 6 WAT and from 60 to 82% 13 WAST with spray treatments, and from 37 to 74% 6 WAT and 42 to 88% 13 WAST with drench treatments. Shoot lengths of plants treated with the two methods of application were similar on both dates (data not shown). Of all the treatments, foliar sprays of 300 ppm or medium drenches of 3 or 5 mg ai/pot produced plants of the highest quality, ones that elongated sufficiently to be staked but that did not require frequent pruning or were not so stunted as to appear undersized (foliar sprays of 600 or 900 ppm or medium drenches of 10 to 20 mg ai/pot, Figs. 1 and 2).

Vigorous shoot elongation of Asiatic jasmine and Carolina jessamine necessitates frequent hand pruning during production. Response to uniconazole varied with species, method of application and rate. A single foliar application of 75 to 300 ppm uniconazole suppressed runner elongation of Asiatic jasmine for at least 9 weeks. Two foliar sprays of 300 to 900 ppm uniconazole applied 6½ weeks apart, sup-

Table 3. Response of Carolina jessamine to uniconazole, Expt. 1.

Uniconazole treatment		Shoot dry weight (g)	
Method of application	Concentration	19 WAST[z]	49 WAST
Spray	(ppm)		
	0	95.9	180.9
	75	95.0	182.2
	100	81.3	157.4
	150	77.5	151.6
	200	73.7	130.2
	300	69.9	136.1
Significance[y]		L***	L***Q**
Drench	(mg ai/pot)		
	0	99.5	180.9
	1	61.9	134.2
	3	64.8	109.4
	5	66.2	101.8
Significance		L***Q***	L***Q*

[z]Treatments initially applied on June 16, 1988, and reapplied on September 22, 1988, 19 weeks after treatment (WAT); WAST = weeks after second treatment.

[y]Significant or not significant (NS) at the 5% (*), 1% (**) or 0.1% (***) level; L = linear, Q = quadratic. Control included in regression analysis.

Table 4. Response of Carolina jessamine to uniconazole, Expt. 2.

Uniconazole treatment		Shoot length[z] (cm)	
Method of application	Concentration	6 WAT[y]	13 WAST[y]
Spray	(ppm)		
	0	63.8	166.9
	300	25.9	67.6
	600	21.5	60.8
	900	21.5	30.8
Significance[x]		L**Q***	L**Q**
Drench	(mg ai/pot)		
	0	63.8	166.9
	3	40.3	96.1
	5	34.8	81.6
	10	16.4	21.0
	15	15.4	17.4
	20	16.8	20.0
Significance		L**Q***	L**Q**

[z]Longest shoot was straightened and measured.

[y]Treatments initially applied on July 12, 1989, and reapplied on August 28, 1989, 6½ weeks after treatment (WAT); WAST = weeks after second treatment.

[x]Significant at the 1% (**) or 0.1% (***) level; L = linear, Q = quadratic. Control included in regression analysis.

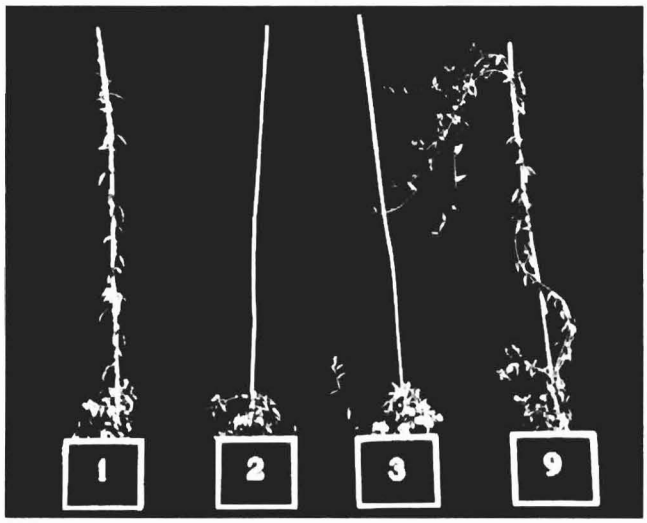

Fig. 1. Carolina jessamine 13 weeks after the second foliar application of (left to right) 300, 600 or 900 ppm uniconazole; control plant on the right.

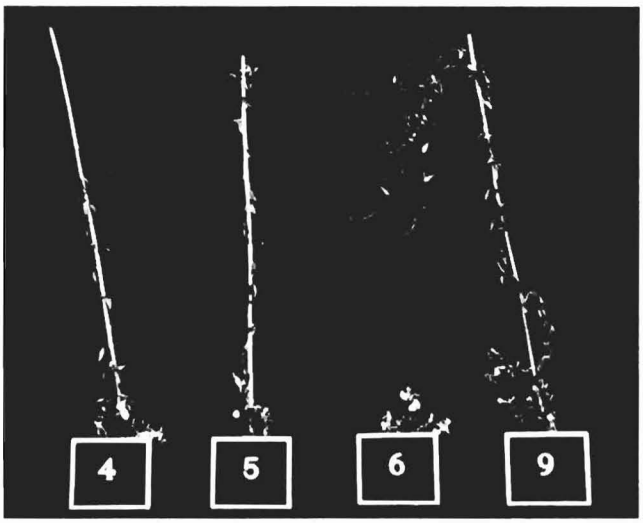

Fig. 2. Carolina jessamine 13 weeks after the second medium drench application of (left to right) 3, 5 or 10 mg ai/pot; control plant on the right.

pressed runner elongation for at least 19 weeks, while two drench applications of 3 to 20 mg ai/pot suppressed elongation for at least 6 weeks. These same rates reduced the number of runners exceeding 20.3 cm (8 in) and shoot dry weight for 46 weeks. A single foliar spray of 75 to 300 ppm uniconazole or drench of 1 to 5 mg ai/pot had no effect on Carolina jessamine shoot length 14 WAT. Shoot length of Carolina jessamine was reduced 6 and 19 weeks after initial treatment with two foliar sprays of 300 to 900 ppm uniconazole or two drench applications of 3 to 20 mg ai/pot. Foliar rates of 600 or 900 ppm and drench rates of 10 to 20 mg ai/pot suppressed shoot growth of Carolina jessamine excessively and were considered unacceptable.

Literature Cited

1. Henry, M.J. 1985. Plant growth regulating activity of sterol and gibberellin biosynthesis inhibitors. Bul. Plant Growth Regulat. Soc. Amer. 13(2):9–11.

2. Keever, G.J. and D.A. Cox. 1989. Growth inhibition in marigold following drench and foliar-applied paclobutrazol. HortScience 24:390.

3. Keever, G.J. and C.H. Gilliam. 1994. Growth and flowering response of butterfly-bush to Cutless. J. Environ. Hort. 12:16–18.

4. Keever, G.J. and M.S. West. 1992. Response of established landscape plants to uniconazole. HortTec. 2:465–468.

5. Newman, S.E., S.B. Tenney, and M.W. Follett. 1989. Influence of uniconazole (Sumagic) on *Hibiscus rosa-sinensis* L. Mississippi Agr. Expt. Sta. Res. Rpt. 14(4):1–3.

6. Norcini, J.G. and G.W. Knox. 1988. The effect of XE-1019, EL-500, SADH, and ancymidol on *Ligustrum* and *Photinia*. HortScience 23:733 (Abst.).

7. Norcini, J.G. and G.W. Knox. 1989. Response of *Ligustrum x ibolium*, *Photinia x fraseri*, and *Pyracantha koidzumii* 'Wonderberry' to XE-1019 and pruning. J. Environ. Hort. 7:126–128.

8. Owings, A.D., M.S. Adams, M.R. Stewart, D.L. Fuller, and W.A. Meadows. 1988. Evaluation of six growth regulators in the production of container-grown Asian jasmine. Proc. Southern Nurserymen's Assoc. Res. Conf. 33:251–255.

9. Sterrett, J.P. 1988. XE-1019: Plant response, translocation, and metabolism. J. Plant Growth Regul. 7:19–26.

10. Vaigro-Wolff, A.L. and M.R. Warmund. 1987. Suppression of growth and plant moisture stress of forsythia with flurprimidol and XE-1019. HortScience 22:884–885.

11. Warren, S.L. 1990. Growth response of 13 container-grown landscape plants to uniconazole. J. Environ. Hort. 8:151–153.