SECTION 7
GROWTH REGULATORS

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Modification of Photinia x Fraseri Growth with Atrinal® and Hand Pruning

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Nature of Work: *Photinia x fraseri,* a woody shrub common to landscapes of the Southeastern United States, possesses strong apical dominance, which leads to a prolific, vertical growth habit. To encourage lateral branching of *Photinia* most nursery growers mechanically prune or hand prune several times during the growing season. An alternative method to initiate lateral branching is using plant growth regulators. Atrinal®, commercially released in 1974 for use on many nursery crops, has been shown to effectively control vegetative growth and initiate lateral branching of *Photinia* (1,2,3); however, the branching and growth response elicited by time of hand pruning has not been extensively studied (2). Therefore, a study was initiated to determine lateral branching and vegetative growth of *Photinia* in response to Atrinal® application rates and time of hand pruning.

Unpruned *Photinia* liners were planted (1/pot) in 1 gallon black polyethylene nursery containers March 16, 1990 in milled pine bark medium amended with 1.5 lbs/yd^3 Micromax, 4 lbs/yd^3 granular dolomite, and 16.6 lbs/yd^3 Osmocote 18-6-12. All plants were maintained on an unshaded concrete slab. Irrigation included rainfall and daily hand watering as required.

A 3 (pruning date) x 4 (Atrinal® application rate) factorial experiment, where each treatment was replicated 6 times, was initiated May 28, 1990. Atrinal® was applied at 0, 2500, 5000, and 7500 ppm. Foliar spray treatments were applied between 1100 CDT and 1300 CDT with a CO_2 pressure sprayer (30 psi) at 2 qts/100 ft^2. One-third of the total plants were hand pruned May 10, 1990 (18 days prior to Atrinal® application), one-third of the plants were hand pruned May 29, 1990 (one day after Atrinal® application), and the remaining plants were maintained unpruned during the study period. Hand pruning removed the upward one-third of terminal shoot growth.

Vegetative growth measurements were taken December 4, 1990, approximately six months after treatment initiation. Shoot height was determined by measuring from the growth medium level to the apex of the tallest shoot. The number of lateral branches greater than 0.25" in length was also recorded. Leaf area was determined on 4 replications using a LI-3000 leaf area meter and shoot dry weight was determined on 4 replications by drying stems and leaves in a convection oven for 72 hours at 150°F.

Data were analyzed using general linear models to determine linear, quadratic, and cubic regression responses and means were separated using least significant differences (LSD) at α=0.05.

Results and Discussion: Lateral branching of *Photinia* increased as Atrinal® application rates increased from 0 to 7500 ppm, regardless of pruning time (Table 1). A combination of pruning May 10, 1990 with 5000 to 7500 ppm Atrinal® produced *Photinia* with more lateral branches than some of the other treatments (Table 1). Increases in Atrinal® application rates resulted in pruned *Photinia* having decreased shoot height (Table 1).

Generally, unpruned plants were taller with fewer lateral branches. Plants pruned May 10, 1990 had decreased leaf area as Atrinal® application rates increased, while plants pruned May 29, 1990 had decreased shoot dry weight as Atrinal® application rates increased (Table 1). This reduction in shoot dry weight was probably due to pruning later in the growing season, which resulted in removal of more early season growth.

Significance to Industry: This research indicates that the timing of hand pruning plays an important role in *Photinia x fraseri* growth responses. In addition, Atrinal® can be successfully used in combination with hand pruning early in the growing season to elicit improved lateral branching when compared to Atrinal® or hand pruning alone.

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Table 1. Vegetative growth factors of *Photinia x fraseri six* months following spray application of Atrinal® as influenced by time of hand pruning.

Atrinal® Application Rate (ppm)	Lateral Branches (no.)	Shoot Height (ft)	Leaf Area (in^2)	Shoot Dry Weight (oz)
		No Hand Pruning		
0	4.50[z]	2.88	273.3	2.58
2500	4.33	2.91	293.8	3.07
5000	5.67	2.46	311.5	2.87
7500	6.83	2.57	283.0	2.68
Response[y]	Q**	ns	ns	ns
		Hand Pruned 10 May 1990 (18 Days Prior to Atrinal® Application)		
0	6.00	2.58	362.5	3.16
2500	7.17	2.39	349.6	3.10
5000	8.17	2.17	326.6	2.95
7500	10.33	1.92	295.7	2.79
Response[y]	L*	C**	Q*	ns
		Hand Pruned 29 May 1990 (1 Day After Atrinal® Application)		
0	5.00	2.31	325.6	2.97
2500	6.67	2.00	315.6	2.62
5000	7.83	1.73	268.6	2.23
7500	6.83	2.25	255.7	2.18
Response[y]	Q*	Q*	ns	L*
LSD (α=0.05)	2.54	0.54	77.0	0.66

[z] Means averaged over six replications for lateral branches and shoot height and over four replications for leaf area and shoot dry weight.

[y] Linear (L), quadratic (Q), or cubic (C) regression response significant at 5%(*) or 1%(**) level, or not significant (ns).

Flowering of 'Shishi-Gashira' Camellia Promoted by Sumagic

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Nature of Work: Camellia sasanqua cultivars are highly desirable woody landscape plants that are widely planted in the Southeastern United States and prized for their showy fall to winter blooms. In nurseries, young, actively growing plants have 3 or 4 growing periods during a single season. When plants are small, growers want vigorous growth and a profuse bud set since larger plants demand a higher price and plants with buds or flowers sell more readily than those without them. However, vigorously growing young plants tend not to set buds and if buds are set, vegetative growth is slowed in proportion to the number of buds set (2).

Growth retardants are routinely applied to numerous pot crops to produce compact plants; a secondary benefit with some crops is early or enhanced flowering. Growth retardants may also be useful in the promotion of flowering of woody nursery crops for landscape use, as indicated in research with Rhododendron (1) and Jasminum (3), or in the production of camellias for temporary use as indoor flowering pot plants (4). This study was conducted to investigate changes in vegetative growth and flowering of 'Shishi-Gashira' camellia following spray application of Sumagic, an experimental plant growth retardant. The goal was to produce flowering plants of a younger age that would be more marketable, or flowering pot plants that could subsequently be planted into the landscape.

Liners of 'Shishi-Gashira' camellia were potted March 21, 1989, into #1 containers of a pine bark and sand (7:1, by vol) growth medium amended per yd^3 with 5 lb dolomitic limestone, 14 lb Osmocote 17-7-12, and 1.5 lb Micromax. Plants were grown outdoors under 47% shade and overhead irrigation.

The following treatments were applied May 26 in a volume of 2 qt/100 ft^2: a single Sumagic spray of 0, 5, 10, 15, 20, 40 or 60 ppm. Plants were arranged in a completely randomized design with 5 replicates of 2 plants per treatment. Growth index [(height + width at the widest point + width 90° to the widest point)/3] was measured about every 4 weeks during the 1989 growing season and again on May 30, 1990, following the spring flush of growth. Time until flowering was determined from the time plants were treated until the first flower was fully opened. At this time, flower number, which included open flowers and flower buds, and flower diameter were ascertained.

Results and Discussion: Leaves of plants treated with Sumagic were darker green and smaller and internodes were shorter than those of control plants. Beginning 4 weeks after treatment (June 23) and continuing through May 30 of the following year, plant growth, as indicated by growth indices, was less as rate of Sumagic increased (Table 1). This growth suppression reached a maximum of 28.3% on November 30 with the application of 60 ppm Sumagic. By May 30, 1990, the reduction in growth indices relative to the control was 20.6% with the application of 60 ppm of Sumagic but 12.4% or less with rates of 20 ppm or less.

Flowering, as indicated by flower and flower bud number, increased from 3.8 per plant for the control to a high of 8.1 per plant with the 20 ppm treatment. This change represented a 113.2% increase in flowering. Even with the lowest rate of Sumagic, 5 ppm, flower number increased 52.6% relative to the control. Time to first flower increased with increasing rates of Sumagic, although treatment means were similar for rates of 20 ppm or less. Flower diameter was not affected by Sumagic rate.

A maximum increase in flower and flower bud number of 113.2% occurred when plants were treated with 20 ppm of Sumagic. Growth indices of these plants were 12.4% smaller than nontreated plants. Greater compaction and enhanced flowering of plants treated with 20 ppm of Sumagic suggest this treatment may be useful in the commercial production of camellias for temporary use as interior flowering plants before later planting in the landscape.

Plants treated with 5 ppm of Sumagic produced 52.6% more flowers than control plants, and plants were similar in size. Increased flowering with low rates of Sumagic, coupled with darker foliage and little or no reduction in growth relative to control plants, should produce a more marketable plant for the retail and wholesale nurserymen.

Significance to Industry: In the commercial production of camellias, growers encourage vigorous growth to produce larger plants in a shorter period of time. Plants with flowers or flower buds present when marketed sell more readily; however, vigorously growing plants tend not to set flower buds. A single foliar spray of 5 ppm sumagic can increase flower or flower bud number 52.6% without reducing growth indices or flower size or delaying flowering. A sumagic spray of 20 ppm may increase flower or flower bud number 113.2% without affecting time of flowering or flower size; however, growth indices may be reduced as much as 21%. Sumagic rates above 5 ppm may be useful in producing compact indoor flowering pot plants which would subsequently be transplanted into the landscape.

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Table 1. Influence of Sumagic on growth and flowering of 'Shishi-Gashira' camellia.

Sumagic rate (ppm)	Growth indices[z] 5/26/89	6/23	7/21	8/18	9/15	11/30	5/30/90	Flower number[y]	Days to first flower[x]	Flower diameter[w] (cm)
0	17.6	21.1	24.3	27.6	28.2	29.0	37.8	3.8	167	6.8
5	16.7	20.2	24.2	27.1	28.6	29.0	39.2	5.8	164	6.5
10	15.7	17.9	21.4	24.5	26.1	26.5	35.7	5.1	165	6.7
15	16.9	17.8	19.8	22.4	24.0	24.2	33.9	5.9	168	6.6
20	18.0	18.2	20.9	21.8	22.9	23.0	33.1	8.1	168	6.5
40	17.5	17.8	19.2	21.0	21.9	22.1	30.5	6.9	171	6.3
60	17.4	18.0	19.1	20.2	20.5	20.8	30.0	7.6	176	6.8
Significance[v]										
Linear	NS	*	**	**	**	**	**	*	**	NS
Quadratic	NS	**	*	NS	NS	**	NS	NS	NS	NS
Cubic	NS	NS	NS	**	NS	NS	NS	NS	NS	NS

[z] Growth indices = (height + width at the widest point + width 90Â to the widest point) + 3, in cm; treatments were applied on May 26, 1989.

[y] Flower and flower bud number determined when first flower fully opened.

[x] Days to first flower after treatment application.

[w] Diameter of first fully open flower on each plant.

[v] NS, *, **: non-significant or significant at 5% (*) or 1% (**) level.

Evaluation of B-Nine, Bonzi, ans Sumagic on some Nursery-grown Bedding Plants

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Nature of Work: Growth of bedding plants in the nursery can be very rapid as spring days get warmer and day-length increases. Chemical growth regulators are applied to control stem elongation and to maintain attractive plant appearance during production. A compact growth habit also makes it easier to transport plants without damage. B-Nine (daminozide) and Cycocel (chlormequat) are well-known growth retardants commonly used for bedding plant production. However, not all bedding plants respond to these chemicals. Bonzi (paclobutrazol) and Sumagic (uniconazole) are newer retardants that have been shown to be much more active over a wider range of species (1,2,3). Bonzi is currently labelled for bedding plant production. Sumagic is expected to be available soon for bedding plant use. The objective of this study was to evaluate these growth retardants, with B-Nine, on selected bedding plants under commercial nursery conditions.

In mid-March, 1991, plugs of Antirrhinum majus 'Tahiti Yellow' (snapdragon), Celosia cristata 'New Look', Impatiens wallerana 'Dazzler White', Tagetes patula 'Yellow Boy' (marigold), Petunia x hybrida 'Burgundy Madness', and Salvia farinacea 'Victoria Blue' were transplanted into 2.5 qt. pots with Hyponex all-bark medium amended with 8 lbs/yd^3 Osmocote 18-6-12, 1 lb/yd^3 Coors C-Trail, and 4 lbs/yd^3 dolomitic limestone. The plants were grown in polyethylene-covered quonset-type houses at a wholesale nursery in Suffolk, Va. Irrigation was daily with overhead sprinklers. Each species was grown separately, and treated as a separate experiment. A completely randomized design was used with 3 replicates per treatment and 4 or 5 plants per experimental unit. Varying rates of Sumagic, Bonzi, or B-Nine (Tables 1 and 2) were applied 5 April, 1991, with a CO_2 sprayer at 30 psi with a volume of 1 gallon per 200 ft^2. Measurements were taken 3-4 weeks later, depending on the species.

Results and Discussion: Both the Sumagic and the Bonzi sprays caused a significant reduction in plant growth for all species tested except for Antirrhinum (Tables 1 and 2). Although Sumagic controlled the size of Petunia, it caused noticeable leaf distortion with all rates tested. This could be a varietal response. Sumagic also caused a slight but significant delay in flowering of Tagetes and Impatiens (data not shown). B-Nine was as effective as Sumagic or Bonzi in contralling the diameter of Petunia without causing any leaf distortion or delay in flowering. For the other species, the mean heights with the B-Nine treatment were slightly less than those of the controls, however, this was not consistent enough to be statistically significant.

Significance to Industry: This research shows that the heights of Impatiens, Salvia, Celosia, Tagetes and Petunia can be adequately controlled with spray treatments of Sumagic or Bonzi. However, Sumagic caused some leaf distortion on Petunia 'Burgundy Madness' used in this study. B-Nine effectively controlled the growth of Petunia without causing leaf distortion.

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Table 1. Effect of growth retardants on growth of Antirrhinum and growth and flower development of Petunia.

		Antirrhinum	Petunia	
Treatment	Rate (ppm)	Height (cm)	Diameter (cm)	No. of open Flowers/pot
Control	0	17.3	37.4	2.1
Sumagic	25	14.6	26.4	1.6
	35	15.4	24.4	1.3
	45	15.8	24.2	0.9
Bonzi	32	17.6	29.6	1.9
	48	14.9	31.1	2.6
	64	17.9	27.4	2.9
B-Nine	5000	14.8	25.0	3.1
Significance of Contrasts[z]				
Sumagic vs. control		NS	***	NS
Bonzi vs. control		NS	**	NS
B-Nine vs. control		NS	***	NS
Sumagic vs. Bonzi	*	*	*	
Sumagic vs. B-Nine		NS	NS	*
Bonzi vs. B-Nine	NS	NS	NS	

[z] Single degree of freedom orthogonal contrasts:*** = 0.1%, ** = 1%, * = 5%, NS = not signigicant at 5%.

Table 2. Effect of growth retardants on height of Impatiens, Salvia, Celosia, and Tagetes.

Treatment	Rate (ppm)	Plant height (cm)			
		Impatiens	Salvia	Celosia	Tagetes
Control	0	17.7	13.7	12.8	22.7
Sumagic	5	13.4	10.3	10.1	19.3
	10	13.3	8.3	10.4	18.1
	15	11.8	7.2	8.9	17.4
	20	11.6	8.2	9.9	17.4
Bonzi	16	14.5	11.0	11.2	19.8
	32	17.0	17.9	12.2	21.3
	48	17.3	11.6	9.2	19.1
	64	14.9	12.7	10.0	20.6
B-Nine	5000	15.9	11.9	10.8	18.9
Significance of contrasts[z]					
Sumagic vs. control		***	***	***	***
Bonzi vs. control		*	*	**	*
B-Nine vs. control		NS	NS	NS	*
Sumagic vs. Bonzi		***	***	NS	**
Sumagic vs. B-Nine		***	**	NS	NS
Bonzi vs. B-Nine		NS	NS	NS	NS

[z] Single degree of freedom orthogonal contrasts: *** = 0.1%, ** = 1%, * = 5%, NS = not significant at 5%.

Effects of Sumagic on Seed-propagated Physostegia virginiana 'Alba'

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Alabama

Nature of Work: The market for herbaceous perennials could be expanded by using them in the home for several weeks before planting in the landscape. Consumer interest in herbaceous perennials should increase because of the increased value, usefulness, and enjoyment of the plants (Holcomb and Beattie, 1988). However, many herbaceous perennials are too tall; generally, height for potted plants should be no more than 2 times the diameter of the pot (Beattie, 1982).

Physostegia virginiana (obedient plant or falsedragon head) is a herbaceous perennial that has potential for use as a potted plant. White or pink florets are arranged on a densely flowered raceme in summer on plants 2 to 4 feet tall. The florets are unusual in that they can be repositioned on the raceme, which is beneficial in cut flower arrangements and interesting to flower enthusiasts. Plants have few disease or insect problems but can be invasive in the landscape.

Floricultural crops are often treated with plant growth retardants to control height. Sumagic (uniconazole), which is a member of the triazole family of growth retardants like Bonzi (paclobutrazol), has not yet been registered for use on horticultural crops. Growth of vegetatively propagated physostegia 'Summer Snow' and 'Vivid' was restricted with a 2.5 mg active ingredient (a.i.) per plant drench of Sumagic; foliar application of either 0.125 mg a.i. per plant Sumagic or 0.250 mg a.i. per plant Bonzi or drench application of 5.0 mg per plant Bonzi had little effect on plant height of either cultivar (Beattie et al., 1990). The objective of this research was to evaluate drench applications of Sumagic in restricting vegetative growth in seed-propagated physostegia 'Alba'.

Seeds of physostegia 'Alba' were sown on January 12, 1990, transplanted into cell packs on January 30, and repotted into 5-inch pots on February 19. A soilless medium of 7 pine bark: 1 sand amended per cubic yard with 6 lb. dolomitic limestone, 2 lb. superphosphate, 1.5 lb. Micromax, and 6 lb. Osmocote 14-14-14 was used. Plants were maintained in a greenhouse with a minimum night temperature of 70°F. Night-break incandescent light'ing from 10:00 p.m. to 2:00 a.m. was used since long-day photoperiods enhance flowering (Beattie et al., 1989). On March 6, Sumagic was applied as a drench of 0, 0.75, 1.50, 2.25, 3.00, or 3.75 mg a.i. per pot.

Results and Discussion: Drench applications of Sumagic from 1.50 to 3.75 mg a.i. per plant restricted vegetative growth (Table 1). Plant height decreased linearly as drench rate increased. No plants exhibited phytotoxicity symptoms.

Increasing drench rates decreased the number of lateral shoots, and thereby decreased the number of lateral inflorescences. The highest application rate of 3.75 mg a.i. per plant was judged to result in plant heights proportional to the 5-inch container size; however, flowering quality, as determined by the number of inflorescences per plant, was reduced. A drench application of 2.25 mg a.i. per plant was the best treatment for controlling plant height without adversely affecting flowering quality.

Time to flower was not affected by application rate, and most plants flowered within 14 weeks of treatment. In contrast, Beattie et al. (1990) observed a 5 to 23 day delay in flowering for 'Summer Snow' and 'Vivid', respectively, when a 2.5 mg a.i. per plant Sumagic drench was compared to the control. These differences in delay of flowering by Sumagic may be attributed to different cultivars or propagation methods used.

There was noticeable variation within all treatments for time to flowering and plant height. A problem with producing physostegia from seed, as well as many other species of herbaceous perennials, is the large variation in a number of plant characteristics that we assume to be genetically influenced. Pinnell (1985) noted that many herbaceous perennials do not come true from seed.

Significance to Industry: Herbaceous perennials frequently are too tall for use as flowering potted plants. Drench application of 1.50 to 3.75 mg a.i. Sumagic per plant restricted excessive vegetative growth of physostegia 'Alba'. However, the number of lateral inflorescences was decreased as the application rate increased. Application of 2.25 mg a.i. per plant resulted in plants that were judged to be marketable as 5-inch flowering potted plants. Seed-propagated physostegia exhibit much variation in several plant characteristics.

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Table 1. Comparison of drench rates of Sumagic on seed-propagated physostegia 'Alba'. Data taken when the first floret opened on the inflorescence.

Drench rate (mg a.i. per plant)	Flowering (%)[z]	Days to flower	Plant height (inches)	Lateral shoot number
0	100	69	28	6
0.75	90	69	30	4
1.50	90	72	26	3
2.25	100	68	21	2
3.00	80	73	19	1
3.75	90	73	13	1
Significance[y]		NS	linear***	linear*

[z] Percentage of plants to flower within 14 weeks of treatment.
[y] NS=not significant; *** or *=significant at 0.001 or 0.05 level, respectively.

Chemical Growth Regulation of Container-Grown Ornamental Groundcovers

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Nature of Work: Production and management of ornamental groundcovers can be difficult due to many species possessing strong apical dominance (3). Production efficiency and consumer appeal may be enhanced if better control were possible over branch induction and overall growth rates in ornamental groundcovers (2,5). Some work has demonstrated the potential use of plant growth regulators in management of groundcovers and woody ornamentals (1,4). The objective of this study was to survey plant growth regulator activity on multiple growth characteristics of ornamental groundcovers. The data presented focus upon the lateral branch production of two species tested within a broader study.

Dormant, rooted cuttings of Hypericum (Hypericum calycinum) and Asiatic jasmine (Trachelospermum asiaticum) were selected and treatments initiated on 8 Dec. 1990. Two jasmine plants or one hypericum plant pot (2.25 inch) were used as treatment units. Treatments involved spraying foliage to the point of wetness with high and low rates of Atrimmec (dikegulac sodium), Cutless 50W (flurprimidol), Bonzi (paclobutrazol), Royal Slo-Gro (maleic hydrazide), and B-Nine (daminozide). An untreated control group was included in the randomized complete block experimental design.

Plants were grown under polyethylene greenhouses using standard practices for groundcover production. Effects of chemical growth regulators on number of lateral branches induced were evaluated 4, 5 and 6 months after treatment application.

Results and Discussion: Jasmine treated with Slo-Gro tripled the number of laterals compared to the control plants at 5 months (Table 1). The high rate of Slo-Gro increased the number of laterals by 33% over the lower rate, and up to four times over the control at 6 months. Application of Atrimmec at both concentrations significantly increased the number of lateral branches.

Bonzi increased the number of laterals formed on Jasmine relative to the control at 4 months after treatment, but plants treated with the high rate exhibited lateral death or decline at 6 months. Plants treated with B-Nine and Cutless did not show appreciable increase in number of laterals but Cutless-treated plants exhibited a noticeable reduction in shoot elongation.

Hypericum treated with Slo-Gro and Atrimmec exhibited increases in lateral branch development at 4 months, but due to cultural problems and variation within plants, these differences were not significant after 5 months growth. Slo-

Gro, especially at the high rate, delayed development of lateral branches as indicated at 4 months after treatment (Table 2). No other chemical affected lateral production in Hypericum. However, plant variability was high and we recommend additional testing of Slo-Gro and perhaps Atrimmec as branching inducers for Hypericum.

In conclusion, Slo-Gro, and Atrimmec may have potential for use in management programs where increase in the number of lateral branches produced for cutting is important. Increased lateral branch production may also improve plant appearance and coverage in the landscape. Work continues to ascertain appropriate concentrations for maximal survival of induced branches.

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Table 1. Chemical induction of lateral branching of Asiatic Jasmine.

	Concn	Number lateral branches per cutting		
Treatment	(ppm)	4 mo.[z]	5 mo.	6 mo.
Control		2.2	2.3	2.7
Atrimmec	800	3.4***[y]	3.6**	3.6[NS]
	1600	4.2***	5.9***	6.2***
Cutless	100	3.0*	3.2*	- -
	500	2.9	2.9[NS]	- -
Slo-Gro	2700	3.1	7.7	9.8
	5400	2.6[NS]	6.7	12.O
Bonzi	500	3.1	3.4	- -
	1000	3.5***	3.2*	- -
B-Nine	7400	2.8[NS]	2.8[NS]	- -
	10000	2.7[NS]	2.9[NS]	- -

[z] Treatments applled 8 Dec. 1990. Data collected 4, 5 and 6 months after application. (n = 10).

[y] Data subjected to square root transformation for analysis by orthogonal contrasts (each treatment vs. control only). Original data presented. Significance: *, **, ***; 5%, 1%, 0.1%; NS, not significant at 5% level.

Table 2. Chemical induction of lateral branching of Hypericum.

Treatment	Concn (ppm)	Number lateral branches per cutting 4 mo.[z]	5 mo.	6 mo.
Control		1.9	2.0	2.1
Atrimmec	1600	2.7[NSy]	2.5	2.5
	3200	1.3[NS]	3 0	2 4
Cutless	100	2.1[NS]	2.0	- -
	500	1.8[NS]	2.7	- -
Slo-Gro	2700	1.3	1.7	2.5
	5400	0.6**	1.2	- -
Bonzi	500	1.3[NS]	1.4	- -
	1000	2.0[NS]	1 9	- -
B-Nine	7400	2.2[NS]	2.2	- -
	10000	2.4[NS]	2.2	- -
			NS	NS

[z] Treatments applled 8 Dec. 1990. Data collected 4, 5 and 6 months after application.

[y] Data subjected to square root transformation for analysis by orthogonal contrasts (each treatment vs. control only). Original data presented. Significance: *, **, ***; 5%, 1%, 0.1%; NS, not significant at 5% level.