RESEARCH RESULTS FOR FLOWER GROWERS

Azalea Studies 1969 - 1971

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CONTENTS

Influence of Photoperiod, Temperature, and Node Position on Vegetative Shoot Growth of Greenhouse Azaleas, Rhododendron cv

William E. Barrick and Kenneth C. Sanderson[1/]

Nature of Work: The commercial azalea is grown as a pinched plant, thus maximum growth has to be made within a series of 2-3 pinches prior to flower bud development. The importance of shoot growth is emphasized by grading standards which specify a minimum number of flowering shoots per plant. The objectives of this study were to determine the effect of photoperiod and temperature regimes applied after shearing and node position (counting from the apex or shearing point) on vegetative shoot growth. Experiments were conducted in environmental chambers and greenhouses using the treatments shown in Tables 1 - 5.

Results: Generally, an increase in shoot length (Tables 1 and 2) and shoot dry weight (Table 3) and a decrease in number of shoots per lateral branch (Tables 1 and 2), with no effect on number of leaves per shoot (Table 3), was observed on sheared azaleas grown under increased daylengths in environmental chambers or greenhouses. Plants grown at low (24 - 18^{o} C.) temps in environmental chambers had greater shoot lengths, higher number of shoots, more leaves per shoot, and shoot dry weight occurred as node position for shearing increased (Tables 4 and 5). Thus, an inverse relationship apparently exists between node position for shearing and shoot growth in greenhouse azaleas. It is suggested that some environmental or chemical means be found to overcome apical dominance in order to stimulate shoot development from all positions regardless of their nearness to the shearing point or shoot apex.

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Table 1. Mean Shoot growth of azalea at various photoperiod and temperature treatments in environmental chambers

Cultivar	Experiment	Temperature (C)	Photoperiod Shoot length (mm)				Photoperiod Number of shoots			
			9[z]	14	24	Average	9	14	24	Average
Kingfisher	1	24-18	65.7c[y]	71.0b	87.2a	74.6a	2.1a	2.0a	1.9a	2.0a
Kingfisher	2	35-29	65.0c	69.5b	85.4a	73.3a	2.3a	2.2a	2.2a	2.2a
Average			65.3c	70.3b	86.3d		2.2a	2.1a	2.0a	
Red Wing	3	24-18	36.1c	48.2b	62.6a	49.0	2.0a	2.1a	2.1a	2.1
			8	12	24	Average	8	12	24	Average
Kingfisher	4	24-18	51.1a	53.1a	59.2a	54.5a	4.1a	3.4b	3.5b	3.7a
Kingfisher	5	29-24	31.4a	30.3a	37.5a	33.1b	2.0a	1.9a	1.8a	1.9b
Average			41.2b	41.7b	48.3a		3.0a	2.7b	2.6b	

[z] Basic photoperiod of 8 hr. (26,910 lux) supplemented with (646 lux) 4 hr. (12 hr.) in the middle of the night or 16 hr. (24 hr.).

[y] Mean separation, in rows for cultivar (experiment) and photoperiod average and in columns for temperature averages, by Duncan's multiple range test at the 5% level.

Table 2. Shoot growth of azalea at various photoperiods in greenhouses

Cultivars	Experiment	Photoperiod Shoot length (mm)			Photoperiod Number of shoots (mm)		
		9[z]	14	24	9	14	24
Kingfisher & Roadrunner	1	64.2c[y]	69.9b	72.6a	3.3a	3.1b	3.0b
Redwing	2	34.8c	39.6b	46.2a	2.4a	2.5a	2.5a
		8	12	24	8	12	24
Kingfisher	3	25.8a	30.2a	27.7a	2.5a	2.2b	2.1b
Red American Beauty	4	31.8a	39.3a	41.7a	7.9a	7.3a	7.4a

[z] Natural photoperiod (9 or 8 hr.) supplemented with incandescent light in the middle of the night (14-12 hr.) and at end of controlled natural period (24 hr.).

[y] Mean separation, in rows, by Duncan's multiple range test at the 5% level.

Table 3. Growth variables of azalea, cv. Kingfisher, at indicated photoperiod and temperature treatments in environmental chambers, Experiments 4 and 5

Vegetative growth	Photoperiod	Temperature (°C)		Average
		24 - 18	29 - 24	
Number of leaves	8[z]	6.2a[y]	3.7b	4.9b
	12	5.7a	3.9b	4.8b
	24	6.5a	5.0a	5.8a
	Average	6.1a	4.2b	
Dry wt. (g)	8	0.07c	0.11b	0.09b
	12	0.09b	0.10b	0.10b
	24	0.12a	0.16a	0.14a
	Average	0.09b	0.13a	

[z] Basic photoperiod of 8 hr. (26,910 lux) supplemented with (646 lux) 4 hr. the middle of the night or 16 hr. (24 hr.).

[y] Mean separation, in columns and rows, by Duncan's multiple range test at the 5% level.

Table 4. Growth variables of azalea, cv. Kingfisher, at indicated node positions in environmental chambers, Experiments 4 and 5

Vegetative growth	Node	Temperature (°C) 24 - 18	Temperature (°C) 29 - 24	Average
Shoot length (mm)	1	68.5a[z]	66.7a	67.6a
	2	70.3a	67.5a	68.9a
	3	63.2ab	45.0b	54.1b
	4	52.6bc	7.2c	29.9c
	5	50.1c	11.9c	31.0c
	6	22.1d	0.0c	11.1d
Number of shoots				
	1	6.0a	6.0a	6.0a
	2	5.8ab	3.6b	4.7b
	3	5.3b	1.4c	3.4c
	4	2.9c	0.1d	1.5d
	5	1.4d	0.2d	0.8e
	6	0.6e	0.0d	0.3f
Number of leaves	1	8.6a	9.5a	9.1a
	2	7.9ab	7.9b	7.9b
	3	7.0b	5.4c	6.2c
	4	5.5c	0.9d	3.2d
	5	5.0c	1.4d	3.2d
	6	2.8d	0.0d	1.4e
Dry wt. (g)				
	1	0.15a	0.22a	0.19a
	2	0.13a	0.22a	0.17ab
	3	0.09b	0.20a	0.15b
	4	0.06bc	0.04b	0.05cd
	5	0.07cd	0.07b	0.07c
	6	0.04d	0.00b	0.02d

[z] Mean separation, in columns, by Duncan's multiple range test at 5% level.

Table 5. Growth variables of azalea at various node positions in greenhouses

Node	Shoot length (mm)	Number of shoots	Number of leaves	Dry wt. (g)
Exp. 3 cv. Kingfisher				
1	49.0a[z]	5.8a	8.5a	0.14a
2	54.7a	4.9b	7.7a	0.13a
3	41.4b	2.1c	5.9b	0.07b
4	9.8c	0.3d	1.3c	0.01c
5	10.8c	0.3d	1.2c	0.01c
6	1.8d	0.0d	0.2d	0.00c
Exp. 4 cv. Red American Beauty				
1	57.1a	7.7a	7.7a	0.17a
2	55.6a	7.8a	7.0ab	0.13b
3	52.8a	7.1b	6.1bc	0.10bc
4	51.5a	2.6d	5.3c	0.09c
5	48.6a	3.3c	5.3c	0.08c
6	8.5b	0.1e	0.8de	0.02e
7	21.7b	0.4e	2.6d	0.07cd
8	16.8b	0.3e	1.9e	0.03de

[z] Mean separation, in columns for experiment, by Duncan's multiple range test at 5% level.

Publications:

Barrick, W. E. and K. C. Sanderson. 1973. Influence of photoperiod, temperature and node position on vegetative shoot growth of greenhouse azaleas *Rhododendron* cv. J. Amer. Soc. Hort. Sci. 98(4).

Table 6. Growth of 'Red American Beauty' Azaleas as influenced by mean shoot length, number of shoots, and number of leaves, at indicated photoperiodic treatments

Photoperiod (hr.)	Vegetative growth			
	Shoot length	Number of shoots	Number of leaves	Dry wt.
	mm	No.	No.	g
8	31.83a[z]	7.88a	4.19a	0.070a
12	39.3a	7.31a	4.49a	0.087a
16	43.89a	7.06a	4.80a	0.085a
20	37.44a	6.81a	4.30a	0.081a
24	41.71a	7.44a	5.00a	0.104a
8+4 (in middle of night)	39.31a	7.25a	4.73a	0.090a

[z] Means in columns followed by the same letter are not significantly different at 5% level.

Publications:

Barrick, W. E. and K. C. Sanderson. 1973. Effect of photoperiod and node position on shoot development in greenhouse forcing azaleas, Rhododendron cv. Red American Beauty. (Submitted for publication).

Effect of Mist and Photoperiod on Shoot Development in Greenhouse Forcing Azaleas, Rhododendron cv

William E. Barrick and Kenneth C. Sanderson[1/]

Nature of Work: Effects of photoperiod and mist treatments applied after shearing on shoot development were studied on forcing azalea cultivars, 'Gloria', 'Red Wing','Coral Bells' and 'Anytime' grown in a lightly shaded greenhouse under prevailing summer temperatures. Treatments included: (1) mist with supplemental light, (2) supplemental light only, (3) mist only, and (4) check - which received neither. A mist line above the greenhouse bench provided intermittent mist (2.5 sec. of mist every 100 sec.) between 8:30 a.m. and 4:30 p.m. Natural light occurred from 8:30 a.m. to 4:30 p.m. Supplemental light used to extend this 8 hr. daylength was provided by 3 100-watt incandescent light bulbs placed 83 cm above each bench to give a light intensity of 40-55 ft-c measured with a Weston 756 illumination meter with quartz filter at the rim of the pot. Black cloth separated lighted from non-lighted benches. Shoot number and length were determined 8 weeks after shearing.

Results: Shoot number and length were not increased under supplemental light and mist treatments (Table 7). Cultivars differed in shoot number and length. Misted plants were darker green and more luxuriant than non-misted plants.

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Table 7. Vegetative growth of azalea cultivars as influenced by photoperiod and mist

Treatment	Cultivar				Mean
	'Gloria'	'Red Wing'	'Coral Bells'	'Any-time'	
Number of Shoots					
Supplemental light, mist. . . .	2.4	2.1	2.6	2.4	2.4a[x]
Supplemental light only	2.2	2.1	2.4	2.2	2.2a
Mist Only	2.3	2.3	2.4	2.3	2.3a
Check	2.3	2.1	2.3	2.2	2.2a
Mean	2.3ab[z]	2.2b	2.4a	2.3ab	
Shoot Length (mm)					
Light, no mist	67.0	54.1	35.5	54.0	52.8a
Light, no mist	59.6	62.9	48.5	58.6	57.4a
No light, mist	63.4	49.0	37.8	43.7	48.5a
No light, no mist	66.9	46.6	32.8	48.5	48.7a
Mean	64.2a	53.1b	38.7c	51.3b	

[z] Means in rows followed by the same letter or letters are not significantly different at the 5% level. Interactions were not significant.

Publications:

Barrick, W. E. and K. C. Sanderson. 1973. Effects of mist and photoperiod on shoot development in greenhouse forcing azaleas, Rhododendron, cv. (Submitted for publication).

Evaluation of Several Growth Regulators on the Rooting of Three Azalea Cultivars

Terril A. Nell and Kenneth C. Sanderson[1/]

Nature of Work: The use of root inducing substances in the propagation of vegetative cuttings has become an accepted commercial practice. Research in the 1930's revealed that indole-butryic acid and napthalene acetic were the most effective root inducing chemicals; however, the search for new materials continues. Several new chemicals have recently become available and this research's objective was to evaluate several of these chemicals as root-inducing substances on azaleas.

Four-inch softwood cuttings of the azalea cultivars Evensong, Kingfisher and Red American Beauty were cut at an angle to the plane of the stem and the base of the cutting dipped for 5 sec. in one of the following liquid treatments: (1) check, no treatment; (2) 2,500 ppm B-Nine; (3) 50 ppm Bayer 102612; (4) 40 ppm 2,4-D;; (5) 125 ppm Ancymidol; (6) 1,000 ppm Ethephon; (7) 1,000 ppm Nia 10637; (8) 1,000 ppm NAA; (9) 5,000 ppm NAA; (10) 1,000 ppm Uni-F 529. Propagation was carried out in a 1:1 sand and vermiculite media under mist and with bottom heat. Cuttings were graded 8 weeks after sticking as follows: 0 = no rooting, 1 = callused, no roots, 2 = poor rooting, 3 = average rooting, 4 = good rooting, 5 = excellent rooting.

Results: Bayer 102612 burned the apical meristem on Evensong and Red American Beauty and curled the leaves on Kingfisher 3 weeks after treatment. NAA at 1,000 ppm produced the largest quantity of roots on Evensong and Kingfisher, while Uni-F 529 has the highest rooting score on Red American Beauty. Bayer 102612 yielded the poorest rooting on all 3 cultivars.

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Nia 10637, Ancymidol and Ethephon showed promise as root inducing substances, and further research is warranted. Cultivars differed statistically in rooting with 'Kingfisher' and 'Evensong' yielding the best and poorest rooting scores, respectively.

This investigation demonstrated the value of choosing a cultivar that produces a good quick root system. The choice of a root inducing substance was dependent on the cultivar. Other researchers have shown that growth retardants such as B-Nine, Uni-F 529, Ethephon and Cycocel have root inducing properties; however, more research is needed on these compounds and materials such as Ancymidol and Nia 10637.

Publications:

Nell, T. A. 1971. The Effect of Several Growth Regulators on the Rooting of Three Azalea Cultivars. Proc. So. Agr. Workers. 68th. Ann. Conven. 189.

Nell, T. A. and K. C. Sanderson. 1972. Effect of Several Growth Regulators on the Rooting of Three Azalea Cultivars. Florist Rev. 150: 21-22, 52-53.

Comparison of Various Morphactin Sprays and Node Position on Mean Shoot Length of Azalea, cv. Kingfisher

Kenneth C. Sanderson and William E. Barrick 1/

Nature of Work: Morphactins constitute a new group of plant growth regulators which influence growth patterns of plants. Concentration determines effect; however, morphactins have been reported to dwarf, delay and inducing branching in plants. Six-inch pot size 'Kingfisher' azaleas were sprayed with the morphactins listed in Table 8 on March 23, 1970. The plants were sheared 4

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weeks prior to spraying. Six lateral branches on 6 plants were selected for data at 6 node positions (node position 1 was closest to the shearing point and node 6 the furthest). Data on shoot length were taken May 19, 1970. The plants were grown in a shaded fiberglass greenhouse during the experiment.

Results: Morphactins at the concentrations used in this experiment caused severe distortion of the leaves on azaleas. The distortion was still evident approximately 9 months after treatment. Leaves appeared crinkled and mis-shapen. New leaves were smaller in size and initially light green in color. The Bayer 102614 had the greatest shoot length (Table 8). Ortho's "Maintain" had the shortest shoots. The Bay 102614 produced longer shoots at node 2 than at node 1 (counting from the shearing point) at both 50 and 100 ppm. However, in most cases, an inverse relationship between node position and shoot length existed. Shoot length decreased with increases in node position. Further research is warranted on the influence of morphactins on shoot development in azaleas.

Table 9. Comparison of various morphactin sprays on mean shoot length (mm) at various nodes on azalea, cv. Kingfisher

Treatment	Node 1	2	3	4	5	6	Mean
Check	34.5	30.7	15.7	2.6	5.6	3.0	15.4
100 ppm Bay 102612 . .	7.1	6.0	1.3	0.0	0.0	1.1	2.6
100 ppm Bay 102613 . .	1.1	1.0	0.4	0.7	1.6	1.5	1.1
100 ppm Bay 102614 . .	28.3	34.7	15.5	6.6	1.9	0.3	14.6
100 ppm Ortho	0.8	0.4	0.1	0.0	0.0	0.0	0.2
50 ppm Bay 102612 . . .	0.0	0.2	0.2	0.3	0.4	0.3	0.4
50 ppm Bay 102613 . . .	2.1	8.1	6.6	3.0	2.7	1.3	4.0
50 ppm Bay 102614 . . .	36.2	44.1	14.1	1.0	1.2	0.2	16.1
50 ppm Ortho	1.0	1.6	0.3	0.1	0.0	0.0	0.5
Mean	12.4	12.7	6.0	1.6	1.5	0.9	5.9

Publications: None

Effect of Various Growth Regulator Sprays on Shoot Development of Azalea, cv. Kingfisher

Kenneth C. Sanderson 1/

Nature of Work: Growth regulator sprays evaluated on shoot development of azaleas were 10 ppm Bayer 102613, 50 ppm Bay 102613, 5,000 ppm B-Nine, 2,500 ppm Ethephon, 6 ppm Ancymidol, 23 ppm Ancymidol, 6,000 ppm Niagara 10637, 2,500 ppm UNI-F-529. Liners of the azalea cultivar Kingfisher were sprayed 4 week after shearing with a mist blower until the leaves glistened. Five lateral shoots were measured prior to retardant spraying and then re-measured at the end of the experiment. There were four plants per treatment and two replications. The experiment was conducted in a fiberglass greenhouse with a light intensity of approximately 5,000 ft-c. The retardant sprays were applied on July 31, 1970, and measurements were made on October 7, 1970.

Results: Bay 102612 and Niagara 10637 distorted the leaves of the azaleas. Bay 102613 at 50 ppm yielded the least increase in shoot length (Table 9). Check plants had the greatest mean increase in shoot length (2.11 cm). All retardants except Ancymidol at 6 ppm reduced shoot length.

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Table 9. Comparison of various growth retardant sprays on shoot development of azalea, cv. Kingfisher

Treatment	Increase in shoot length (cm)
Check	2.11
10 ppm Bayer 102613	1.74
50 ppm Bayer 102613	.54
5,000 ppm B-Nine	1.70
2,500 ppm Ethephol	1.33
6 ppm Ancymidol	2.00
23 ppm Ancymidol	1.84
1,000 ppm Niagara 10637	1.17
6,000 ppm Niagara 10637	1.53
2,500 ppm Uniroyal F 529	1.33

Publications: None

Evaluation of Several Growth Retardants on Azaleas

Kenneth C. Sanderson [1/]

Nature of Work: 'Kingfisher' azaleas, 6-inch potted plants, received the following spray treatments on August 16, 1971: (1) check, none, (2) 100 ppm Ancymidol, (3) 200 ppm Ancymidol, (4) 3,000 ppm Cycocel, (5) 1,500 ppm B-Nine, (6)1,500 ppm Uni-F 529, (7) 750 ppm B-Nine plus 750 ppm Uni-F 529, (8) 200 ppm Nia (Niagra) 10637, (9) 200 ppm Nia 10656, (10) 1,500 ppm Cycocel plus 750 ppm B-Nine, (11) 2.5g/liter Dupont DPX and (12) 1.25g/liter DPX.

Results: Phytotocicity was observed with Cycocel and DPX. Cycocel caused a severe chlorosis of the leaves when applied alone or in combination with B-Nine. Dupont's DPX caused the new leaves to be rolled upward, off color and severely dwarfed. DPX treated plants had a wilted appearance 4 weeks after treatment. At the rate of 2.5g/liter DPX reduced leaf size an estimated 75 per cent on shoots developing after treatment. DPX treated plants produced shoots approximately half the length of the untreated check plants (Table 10). Differences among most of the retardants were not great. NIA 10637 produced considerable reduction without injury and deserves further study.

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Table 10. Mean shoot length of Kingfisher azaleas after treatment with various growth retardants

Treatments z/	Mean shoot length (cm) x/
Check	8.5
100 ppm Ancymidol	7.2
200 ppm Ancymidol	7.9
3,000 ppm Cycocel	6.0
1,500 ppm B-Nine	9.0
1,500 ppm Uni-F 529	8.3
750 ppm B-Nine plus 750 ppm Uni-F 529	7.4
200 ppm Nia 10637	6.4
200 ppm Nia 10656	7.0
1,500 ppm Cycocel plus 750 ppm B-Nine	6.3
2.5g/L DPX	4.0
1.25g/L DPX	4.4

z/ Plants sprayed until run-off.

x/ Mean of 25 shoots from 5 plants selected at random from 3 replications.

Publications: None

Rooting Response of Azalea Cuttings Treated with Various Growth Regulators

Kenneth C. Sanderson 1/

Nature of Work: Three experiments on root-inducing compounds were conducted on azaleas, cv. Evensong during May to Oct. 1970, in a lightly shaded greenhouse. Propagation was carried out under mist (2.5 sec. every 100 sec. 8 a.m. to 4:30 p.m.) using a 1:1 sand and peat media with bottom heat (70 degrees F.). All liquid treatments were applied as 5 sec. dips. Following rooting, cuttings were scored for rooting using the following relative scoring system for each experiment and species: 0 = dead; 1 = alive, not callused; 2 = callused; 3 = light rooting; 4 = medium rooting and 5 = heavy rooting.

Experiment 1. Cuttings received the following basal dip treatments (10 per treatment) prior to sticking: (1) none; (2) Hormodin No. 2; (3) 1,000 ppm Ethephon; (4) 2,500 ppm B-Nine; (5) 50 ppm Bay 102612 and (6) 1,000 ppm IBA. Cuttings were treated and stuck on May 21, 1971. Treatments were

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replicated twice. Records were taken after 8 weeks.

Experiment 2. On August 7, 1970 the following treatments were applied to cuttings: (1) none; (2) 1,000 ppm Ethephon; (3) 2,500 ppm B-Nine; (4) 1,000 ppm Uni-F 529; (5) 40 ppm 2,4,5-TP; (6) 50 ppm Bay 102612; (7) 1,000 ppm Nia 10637; (8) 125 ppm Ancymidol (A-Rest); (9) 1,000 ppm IBA and (10) 5,000 ppm IBA. Five cuttings were used in each treatment which was replicated twice. Rooting scores were recorded after 8 weeks on October 7, 1970.

Experiment 3. Various strengths of 3 commercial root-inducing compounds were compared with 2,4,5 TP, B-Nine and Ethephon for root inducing activity. Treatments applied on May 14, 1970 were (1) check; (2) Hormodin No. 1; (3) Hormodin No. 2; (4) Hormodin No. 3; (5) Rainbow Tender; (6) Rainbow Woody; (7) Rootone; (8) Rootone No. 10; (9) 5 ppm 2,4,5-TP; (10) 40 ppm 2,4,5-TP; (11) 1,000 ppm Ethephon; (12) 2,500 ppm B-Nine. Treatments were replicated twice using 5 cuttings per treatment. Rooting scores were recorded after approximately 8 weeks.

Results: Hormodin No. 2 yielded the highest rooting scores in Experiment 1 (Table 11). Cuttings treated with Bay 102612 averaged the poorest rooting scores. In Experiment 2, azalea cuttings rooted best when treated with 125 ppm Ancymidol, 40 ppm 2,4,5-TP and 1,000 Ethephon (Table 11).

No treatment, Hormodin No. 1, Hormodin No. 3, Rootone and 2,500 ppm B-Nine produced the best overall rooting scores in Experiment 3 (Table 11). Rootone and the check scored the highest rooting for azalea cuttings in Experiment 3.

Table 11. Rooting scores of azalea, Rhododendron cv. Evensong, cutting treated with various growth regulators. Experiments 1-3 2/

Treatment	Experiment 1	Experiment 2	Experiment 3
Check.	4.3	4.0	3.7
Hormodin No. 1	---	---	3.3
Hormodin No. 2	4.6	---	2.6
Hormodin No. 3	---	---	2.9
1,000 ppm Ethephon	3.8	4.2	2.7
1,000 ppm IBA	3.7	4.1	---
5,000 ppm IBA	---	4.1	---
50 ppm BAY-102612	2.4	3.5	---
2,500 ppm B-Nine	3.8	3.5	3.3
1,000 ppm UNI-F529	---	4.0	---
5 ppm 2,4,5-TP	---	---	2.7
40 ppm 2,4,5-TP	---	4.3	2.6
1,000 ppm NIA-10637	---	3.8	---
125 ppm Ancymidol	---	4.4	---
Rainbow Tender	---	---	3.0
Rainbow Woody	---	---	2.8
Rootone	---	---	3.6
Rootone No. 10	---	---	3.0
Mean	3.8	4.0	3.0

2/ Cuttings were rated: 0 = dead, 1 = alive, not rooted or calluses, 2 = callused, 3 = light rooting, 4 = medium rooting, 5 = heavy rooting.

The outstanding root-inducing properties of Ethephon are the most important findings of this research. Ancymidol, Bay 102612, Nia 10637, 2,4 5-TP and B-Nine also had exceptional root inducing properties in some instances. Further testing of all these materials is needed.

Publications: None

Chemical Pinching of Azaleas with Ethrel and Offshoot-O

Kenneth C. Sanderson and William E. Barrick 1/

Nature of Work: Ethrel, a new growth regulator, has been reported to exert a synergistic effect on the action of other growth regulators. Experiments were conducted on azaleas to determine the effect of Ethrel alone and in combination with the chemical pinching agent, Offshoot-O, on the number of breaks per shoot. One experiment was conducted on the cultivar 'Chimes' during September-October, 1969, and another experiment was conducted on the cultivar 'Kingfisher' during March-May, 1970. Treatments consisted of (1) hand sheared; (2) 2,500 ppm Ethrel spray; (3) 5,000 ppm Ethrel spray; (4) 2,500 ppm Ethrel plus 3.5% Offshoot-O spray; (5) 5,000 ppm Ethrel plus 3.5% Offshoot-O spray; (6) 3.5% Offshoot-O spray; and (7) 4.5% Offshoot-O spray. Sprays were applied to run off with a Halaby mist blower.

Results: A reddish discoloration of the leaves was observed on some leaves in both cultivars of Ethrel treated plants. Older, lower leaves fell off both cultivars soon after Ethrel spraying. Plants usually recovered from leaf discoloration and produced new leaves after leaf drop. A combined spray of 5,000 ppm Ethrel and 3.5% Offshoot-O averaged the most number of breaks (3.4) per shoot in 'Chimes'. 'Kingfisher' had the most breaks (2.9) when sprayed with 2,500 ppm Ethrel plus 3.5% Offshoot-O. Fewest number of breaks (2.3) per shoot was obtained with 2,500 ppm Ethrel in 'Chimes' and with 4.5% Offshoot-O in 'Kingfisher' (1.6). A 5,000 ppm Ethrel spray averaged 2.6 breaks in both cultivars. Both cultivars produced 2.8 breaks when sprayed with 2,5000 ppm Ethrel plus 3.5% Offshoot-O. 'Chimes' and 'Kingfisher' had 2.9 and 2.6 breaks, respectively, when sprayed wtih 3.5% Offshoot-O. A 4.5% Offshoot-O spray yielded 2.8 and 1.6 breaks with 'Chimes'

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and 'Kingfisher', respectively. Ethrel sprays seemed to have some influence on the number of breaks produced. Combined with Offshoot-0, Ethrel increased the number of breaks per shoot. The small increase in breaks, cost of materials and initial plant damage would probably rule out commercial use of the Ethrel-Offshoot-0 sprays.

Publications:

Sanderson, K. C. 1969. Growth Retardants for Florist Crops A to Z. Florist Rev., Vol. 145, No. 3757. Annual Progress Reports available from authors.

Chemical Flowering of Azaleas

Kenneth C. Sanderson

Nature of Work: The use of chemicals to induce flowering in azaleas has required repeated applications of massive dosages and often has only partially substituted for low temperature storage. It might be more practical to reduce the number of applications by utilizing chemicals in combination with short-term low temperature storage. Experiments were conducted in 1970-71 with non-refrigerated plants and plants refrigerated half the required time.

Shadehouse grown, budded, azaleas 25 cm top diameter, of the cultivars 'Redwing' and 'Roadrunner' were divided into two groups: (1) not refrigerated, left in the shadehouse and (2) refrigerated at 45° F under approximately 20 f.c. of light continuously for 3 weeks. On Oct. 30, 1970, the plants were placed in a 62° F greenhouse and the following spray treatments applied: (1) check, no spray, (2) 100 ppm NAA, (Naphalene Acetic Acid), (3) 100 ppm KGA, (Gibberellic Acid Potassium salt), (4) 2,500 Ethephon, (5) 100 ppm NAA plus 100 ppm KGA, (6) 100 ppm NAA plus 2,500 ppm Ethephon, (7) 100 ppm KGA plus 2,500 ppm Ethephon and (8) 100 ppm NAA, 100 ppm KGA plus 2,500 ppm Ethephon. Spray treatments were applied weekly for 3 weeks.

Results: The buds of all plants sprayed with Ethephon were killed with 4 exceptions, (Table 12). Ethephon also caused a reddish discoloration, chlorosis of leaves and leaf abcission. Plants sprayed with NAA had the best looking foliage and had the least leaf drop. Chemical sprays did not cause earlier flowering in unrefrigerated plants (Table 12). Unrefrigerated Redwing plants flowered almost as soon as refrigerated plants. A combination of refrigeration and NAA plus KGA sprays caused the earliest flowering in 'Redwing' azaleas. Refrigeration and NAA sprays caused the earliest flowering in 'Roadrunner' azaleas.

Table 12. Days to flowering of treated azaleas after placement in a 62° F greenhouse

Treatment z/	Refrigerated 3 weeks		Non-refrigerated	
	'Redwing'	'Roadrunner'	'Redwing'	'Roadrunner'
Check, no spray	65	126	67	107
100 ppm NAA	61	77	70	86
100 ppm KGA	65	104	67	89
2,500 ppm Ethephon	Buds killed	Buds killed	67	88
100 ppm MAA + 100 ppm KGA . .	58	107	70	Buds killed
100 ppm NAA + 2,500 ppm Ethephon . .	Buds killed	Buds killed	Buds killed	Buds killed
100 ppm KGA + 2,500 ppm Ethephon . .	59	Buds killed	Buds killed	Buds killed
100 ppm KGA + 100 ppm NAA + 2,500 ppm Ethephon	59	Buds killed	Buds killed	Buds killed

z/ Plants sprayed until runoff.