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HortScience 16(3):343–344. 1981.

Vegetative Growth Control of *Hibiscus rosa-sinensis* Hedges with Chlormequat[1]

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Additional index words. maleic hydrazide, daminozide, ancymidol, growth retardant, landscape maintenance, growth inhibitor

Abstract. 2-Chloroethyl-trimethylammonium chloride (chlormequat) was the most effective of several growth retardants in retarding new growth of field-grown of *Hibiscus rosa-sinensis* L. without serious side effects. A reduction by one-third to one-half of non-treated growth occurred for 1000 and 3000 ppm (active ingredient), respectively. Over a 3½ year period of repeated shearings plus spray applications, 1500 ppm was the most satisfactory following each shearing, while 3000 ppm could be used with alternate shearings. The growth retarding effect of 3000 ppm chlormequat was carried over from previous applications when sheared growth was untreated.

Chemical growth retardation has been found effective for a number of hedge species (3, 5, 6, 7, 8, 9). Since chlormequat was identified as a potent retardant for potted hibiscus (1, 2, 4, 10), it seemed reasonable to determine if it would be as effective on much larger outdoor hedge plants.

Rooted cuttings of a clone of a single pink form of *H. rosa-sinensis* were planted at the Waimanalo Experiment Station on Oahu in 1969, and sheared regularly to develop a dense, compact hedge. Fertilizer (16N-6.9P-13.3K) was applied at the rate of 10 kg per 100 m of hedge row at 6 month intervals. A series of experiments were carried out between 1971 and 1977 to screen various inhibitors and retardants, to establish rates, and to determine the effect of repeated applications of chlormequat.

Aqueous sprays, containing 0.05% Tween 20, were applied from a small tank sprayer at 2.8 kg/cm² (40 psi). A volume of 1 liter was used to treat 6 m of hedge (top, both sides) to the point of run-off. Spray applications were made 4 weeks after shearing to ensure that there was adequate foliage present to absorb the spray and measurements were made after 6 weeks and later. A minimum of 10 shoots from the top of each treated section were measured from their point of origin at the shearing line to their apex.

In the first experiment, several chemicals were screened for their effectiveness. Chlormequat, ancymidol (α-cyclopropyl-α-(4 methoxyphenyl)-5-pyrimidine-methanol), maleic hydrazide, daminozide [butanedioic acid mono (2,2-dimethyl-hydrazide)]. NIA 10637 (ethyl hydrogen 1-propyl-phosphonate), and TD 1123 (potassium salt of 3,4-dichloro-isodiazole-5-carboxylic acid) treatments were duplicated on two 3 m sections of hedge (Table 1).

While ancymidol, NIA 10637, and TD 1123 reduced growth significantly (Table 1), the extent was not great enough in a practical sense to justify further evaluation. As a further consideration, supplies of ancymidol which could provide 1000 ppm were limited, and manufacturers of the other 2 materials indicated a lack of interest in developing this type of use for their products. NIA 10637 induced chlorosis and some leaf drop. Retardation to 80% or less of untreated growth was achieved only by chlormequat and maleic hydrazide. The maleic hydrazide-treated plants showed undesirable tip-dieback and yellowing of young leaves. Some chlorotic leaves appeared on chlormequat-treated plants within a week of treatment, but the leaves gradually regreened over the 6 week observation period.

Table 1. Growth of hibiscus 6 weeks after treatment with sprays of growth inhibitors and retardants, Spring 1971.

Treatment			
Retardant	Concn (ppm)	Length of growth (cm)	% of control
Control		33.1[z]a	100.0
Daminozide	5000	31.7ab	95.8
Ancymidol	1000	29.7bc	89.7
NIA 10637	2500	28.8bc	87.0
TD 1123	5000	26.6c	80.4
Chlormequat	3000	16.1d	48.6
Maleic hydrazide	5000	8.0e	24.3

[z]Mean separation in column by Duncan's multiple range test, 1%.

A concentration series with chlormequat at 0, 300, 500, 1000, 1500, and 3000 ppm was conducted in 1977. Each rate was applied to five 2-plant experimental units 4 weeks after shearing when regrowth was 13 cm long. Measurements were taken at 50 and 100 days following treatment. Average shoot length of the control was 52.3 and 103.7 cm at 50 and 100 days, respectively. Growth subsequent to chlormequat treatment was decreased by 30 to 50% of the control at concentrations between 1000 and 3000 ppm (Fig. 1).

The effect of long-term application of chlormequat was evaluated over a 3½ year period from 1971 to 1974. The experiment compared 1500 ppm application applied at each shearing with a 3000 ppm rate applied with each shearing or at alternate shearings. The schedule of treatments was:

1. Sheared only. Shearing was carried out 2 or 3 times a year as growth exceeded 0.5 m. Other treatments were

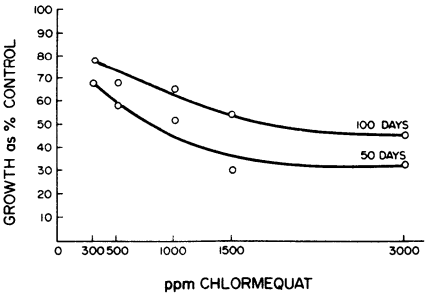

Fig. 1. Effect of chlormequat concentration on growth of hibiscus after 50 and 100 days, expressed as percent of control.

[1]Received for publication August 18, 1980. Journal Series No. 2541 of the Hawaii Agricultural Experiment Station.

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compared to this one which is referred to as the control.

2. Sheared once a year. Sprayed with 3000 ppm chlormequat to determine the duration of the retardation effect.

3. Sheared with No. 1. On alternate shearings 3000 ppm chlormequat was applied to observe any carryover effect.

4. Sheared with No. 1 and sprayed each time with 1500 ppm chlormequat.

5. Sheared with No. 1 and sprayed each time with 3000 ppm chlormequat.

Shoot lengths were measured at 6 weeks, at irregular intervals, and when shearing was necessary for the control (Treatment 1) portion of the hedge. There were duplicates of each treatment.

While control plants were sheared more frequently, growth on plants treated once a year with chlormequat remained at 40 to 50% of control shoots from the same shearing for up to 8 months (Fig. 2). When chlormequat was applied only with alternate shearings, growth was less retarded following non-sprayed shearings than sprayed ones (Fig. 3). The less pronounced carryover effect following non-sprayed shearings may have been due to removal of tissue containing chlormequat with repeated shearings. Repeated applications of 1500 and 3000 ppm chlormequat with each shearing also showed carryover effects as well as the effect of concentration (Fig. 4). Retardation was greater for the repeat treatments than for a single yearly application or applications made with every other shearing. Ultimately, poor regrowth and leaf loss for the repeated 3000 ppm treatment led to the conclusion that this was not a good long-term practice.

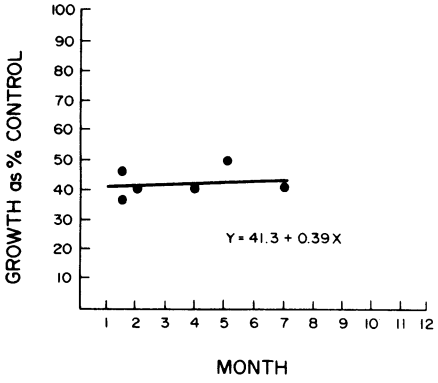

Fig. 2. Effect of a single 3000 ppm chlormequat spray on growth of hibiscus expressed as a percent of the control. Data points represent the same shearing day in each of 4 years with one or more observations that year for the control and this treatment.

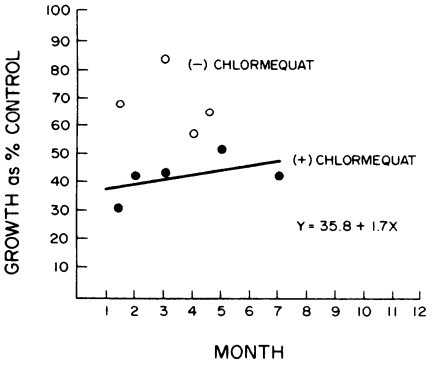

Fig. 3. Effect of 3000 ppm chlormequat sprays on growth of hibiscus when applied to alternate shearings (●). Data points designate by (○) represent growth following shearings to which chlormequat was not applied.

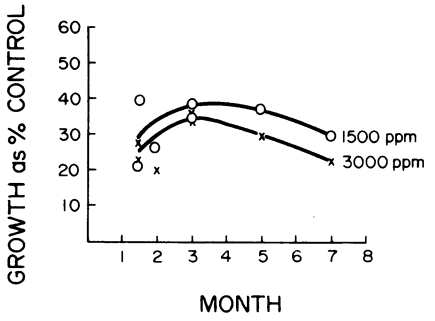

Fig. 4. Effects of 1500 and 3000 ppm chlormequat on growth of hibiscus when applied with each shearing.

As a result, 2 alternatives seem practicable for hibiscus. The 3000 ppm rate may be applied with alternate shearings with the assumption that there will be carryover during regeneration when none is applied. This may permit the healthiest growth of the hedge. Or, chlormequat at 1500 ppm may be applied each time the hedge is sheared. No adverse effect, other than slight chlorosis, was observed with this treatment over the 3½ years that this treatment was imposed. As a third, untried, alternative, it may be possible to use 1000 ppm instead of 1500 ppm.

During these experiments under conditions of regular irrigation and fertilization, growth of non-treated unsheared hibiscus could reach 2 m in 9 months. Growth on the once a year treatment could reach 1 m and still be less than half the control. Regular shearing would have been desirable as growth exceeded 0.3 m; this would have entailed shearing the controls about every 6 weeks. Since repeated chlormequat treatments held growth to between 28 and 33% of the control during the same period, at least two shearings were eliminated during this period. An added benefit was a more floriferous appearance to the hedge as flower-bearing nodes were closer together and there seemed to be less bud drop.

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HortScience 16(3):344–345. 1981.

Pollen Tube Growth following Self- and Interspecific Pollination of Three *Aphelandra* Species[1]

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Additional index words. Aphelandra squarrosa, A. sinclairiana, A. aurantiaca, unilateral interspecific incompatibility, seed

***Abstract. Aphelandra sinclairiana* Nees. and *A. aurantiaca* (Scheidw.) Lindl. 'Roezlii' were self-compatible, while *Aphelandra squarrosa* Nees. 'Dania' was pseudo-self-compatible and occasionally yielded seed after self pollination. Attempts at producing interspecific hybrids were unsuccessful; most pollen tubes failed to traverse more than 10% of the style. Bud pollination and pollination of amputated styles were unsuccessful.**

[1]Received for publication January 2, 1981. Florida Agricultural Experiment Stations Journal Series No. 2812.

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[2]The technical assistance of Mrs. Eleanor Rasmussen is gratefully acknowledged.