

DWARFING OF SHRUBS BY USING CHEMICALS

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ABSTRACT

Ten species of popular flowering shrubs e.g., (1) *Hibiscus rosa-sinensis* var. My Beauty, (2) *H. syriacus* var. Double Mauve, (3) *Tabernaemontana coronaria*, (4) *Jasminum sambac* var. Khoya, (5) *Ixora singaporensis*, (6) *Lantana camara* var. Sanguinea, (7) *Cestrum nocturnum* (8) *Galphimia gracilis*, (9) *Allamanda grandiflora*, (10) *Clerodendron macrosiphon* were grown in pots and treated with Cycocel (CCC) as foliar spray in 8000, 4000 and 2000 ppm and also as dust in the soil @ 8 gms 4 gms and 2 gms per pot.

H. rosa-sinensis and *H. syriacus* in all concentrations markedly inhibited shoot growth ranging from 49.8%-68.3% in case of foliar spray and 40.6%-76.5% in case of dust depending on the concentrations. Appreciable reduction of shoot length and increased flowering were also recorded in *Tabernaemontana coronaria*, *Jasminum sambac*, *Ixora singaporensis*, *Lantana camara*, *Cestrum nocturnum* and *Galphimia gracilis*. Cycocel in 8000 ppm also improved flowering in *Allamanda grandiflora* and more than 100% increase in the number of flowers was recorded in *Clerodendron macrosiphon*. Inhibition of shoot growth was also observed in these two species of plant as a result of the treatment.

INTRODUCTION

Growth retarding chemicals are now being widely used to control growth and flowering of ornamental plants, vegetables and fruit plants. Most effective and useful results have, however, been obtained on some ornamental plants using growth retardants like Cycocel (2-Chloroethyl trimethylammonium chloride), B-Nine (N-dimethylamino succinamic acid) and Phosfon (2, 4-dichlorobenzyl tributyl phosphonium chloride).

Cycocel (CCC) has shown inhibition of shoot growth and increased number of flowers in *Azalea* (Stuart, 1962). Height of *Poinsettia* and *Chrysanthemum* has been effectively controlled by the application of CCC (Brown, 1964; Shanks, 1965 and Lemper, 1964). Poole (1963) has recorded increased number of flowers in *Gardenia jasminoides*. Beneficial effect of CCC in formation of dwarf and bushy plants has been reported in *Bougainvilleas* (Bose and Hore, 1967) and also in different species of ornamental plants belonging to the family Malvaceae (Bose, Hore and Mukherjee, in press). In view of the great possibility offered by the growth retardants an extensive investigation has been taken up to study the efficacy of these chemicals on a large number of species and varieties of tropical ornamental plants at the garden of the Royal Agri-Horticultural Society of India, Alipore. Hereunder are presented the results on the effect of Cycocel on growth and flowering of ten species of popular ornamental shrubs.

MATERIALS AND METHODS

Ten species of popular flowering shrubs e.g. *Hibiscus rosa-sinensis* var. My beauty, *Hibiscus syriacus* var. Double Mauve, *Tabernaemontana coronaria*, *Jasminum sambac* var. Khoya, *Ixora singaporensis*, *Lantana camara* var. Sanguinea, *Cestrum nocturnum*, *Calphimia gracilis*, *Allamanda grandiflora* and *Clerodendron macrosiphon* were used in this experiment.

All the species except *Galphimia gracilis* were propagated by air or ground layering. Plants of each species were more or less uniform in shape and size. *Galphimia gracilis* were raised from seeds. One plant was potted in a 18 cm pot and the compost consisted of 2 parts garden soil, 1 part each of leaf mould and well-rotted cowdung manure and a table-spoonful of steramex in each pot. The plants were then pruned on the main shoot to a height of 15-20 cm depending on species and variety. Equal number of branches were retained on each species of plants, cycocel was applied once as foliar spray in 8000, 4000 and 2000 ppm when the shoots attained a length of 5-7 cm. In another set of plants, Cycocel powder was mixed with soil at the rate of 8 gms, 4 gms and 2 gms per pot. Untreated plants served as control and ten plants were used for each treatment. Data were collected on length of shoots, number of leaves, branches and flowers at an interval of 15 days. Soil application was not done in *Tabernaemontana* and *Allamanda grandiflora*.

RESULTS

Results of the experiments on the effects of Cycocel recorded on 90th day after the treatment are presented in tables I and II.

All the concentrations of Cycocel used both as foliar spray and dust in soil markedly inhibited shoot growth of *H. rosa-sinensis*, ranging from 64.6% to 68.3% in case of foliar spray and 69.5% to 76.5% in case of dust depending on the concentrations. Cycocel in certain concentrations also produced greater number of branches and flowers than the untreated plants. Treated plants also

showed greater resistance to drought in comparison to the untreated plants.

In *H. syriacus* all the concentrations of CCC, used as foliar spray caused appreciable reduction in plant height but marked inhibition (64.8%) was noted with 8000 ppm followed by 2,000 ppm and 4,000 ppm which showed 54.6% and 49.8% reduction in shoot growth, respectively. Retardation of shoot growth was also noticed (67.8%) with 8 gms of CCC used as dust in the soil. Appreciable increase in the number of flowers was noted with 4,000 ppm.

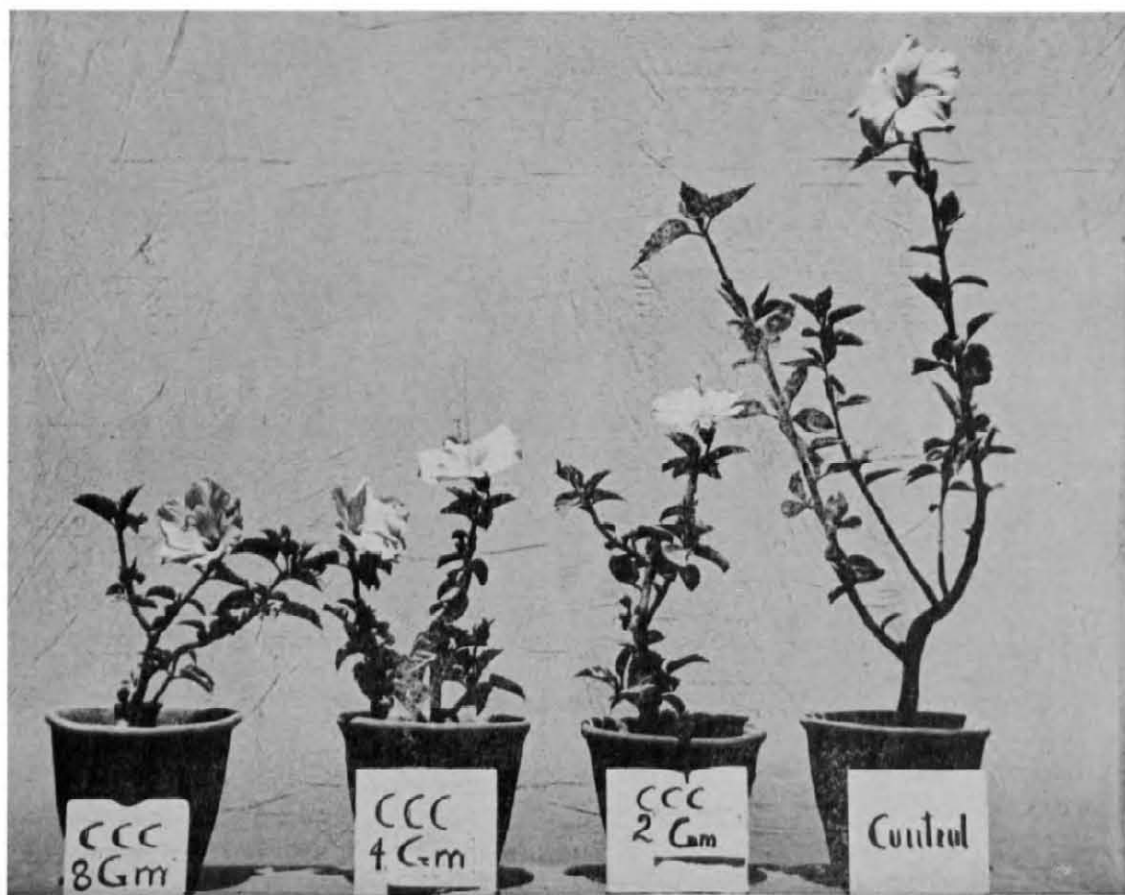


Plate showing Plants of *Hibiscus rosa-sinensis* var. My Beauty treated with Cycocel as foliar spray.

In *Tabernaemontana coronaria* 13.5%, 1.2% and 6.5% inhibition of shoot growth was recorded under 8,000, 4,000 and 2,000 ppm respectively. About 60% increase in the number of flowers was recorded when treated 8000 ppm solution.

In *Jasminum sambac* 2000 ppm caused appreciable retardation of shoot growth. It also en-

couraged formation of larger number of flowers. Application of Cycocel dust at the rate of 4 gms per pot inhibited length of shoot by 35.8% without showing any increase in the number of flowers. Earlier and increased flowering were also observed due to foliar spray.

All the concentrations of Cycocel applied both as

TABLE I : *Effects of Cycocel on Growth and Flowering in some Shrubs*

Sl. No.	Name of the Species and varieties	CONTROL			USED AS FOLIAR SPRAY								
					8000 ppm			4000 ppm			2000 ppm		
		Av. length of each shoot (cm)	Av. No. of branches/shoots	Av. No. of flowers/shoots	% of inhibition in length of each shoot	Av. No. of branches/shoots	Av. No. of flowers/shoots	% of inhibition in length of each shoot	Av. No. of branches/shoots	Av. No. of flowers/shoots	% of inhibition in length of each shoot	Av. No. of branches/shoots	Av. No. of flowers/shoots
1.	<i>Hibiscus rosa-sinensis</i> var. My Beauty	24.3	0.6	1.2	68.3	2.7	1.0	65.4	4.6	2.0	64.6	3.0	2.0
2.	<i>Hibiscus syriacus</i> var. Double Mauve	33.5	2.1	5.0	64.8	4.5	5.2	49.8	5.3	6.3	54.6	4.0	5.0
3.	<i>Tabernaemontana coronaria</i>	24.5	—	11.0	13.5	—	18.5	1.2	—	12.0	6.5	—	11.5
4.	<i>Jasminum sambac</i> var. Khcya	14.5	—	3.0	4.8	2.0	6.5	13.1	2.0	3.2	15.2	1.5	5.6
5.	<i>Ixora singaporensis</i>	9.5	1.0	—	26.3	2.0	—	8.4	1.5	—	16.8	2.0	—
6.	<i>Lantana camara</i> var. Sanguinea	22.6	2.0	100.0	14.6	4.8	173.0	11.5	4.0	145.0	*6.6	2.5	105.0
7.	<i>Cestrum nocturnum</i>	32.4	1.2	25.7	21.6	2.0	28.0	28.0	2.0	34.5	32.7	2.5	29.5
8.	<i>Galphimia gracilis</i>	36.7	2.4	90.0	17.7	4.5	145.0	8.7	3.0	160.0	5.4	3.2	140.0
9.	<i>Allamanda grandiflora</i>	26.8	—	12.5	13.0	0.8	17.2	6.0	0.6	16.2	4.8	0.6	14.0
10.	<i>Clerodendron macrosiphon</i>	19.0	0.8	11.5	5.2	1.6	18.0	14.7	2.3	22.2	13.2	1.8	22.5

*Indicate promotion of shoot growth.

TABLE II : Effects of Cycocel on Growth and Flowering in some Shrubs

Sl. No.	Name of the Species and varieties	CONTROL			USED AS DUST IN SOIL								
					8 gms			4 gms			2 gms		
		Av. length of each shoot (cm)	Av. No. of branches/shoots	Av. No. of flowers/shoots	% of inhibition in length of each shoot	Av. No. of branches/shoots	Av. No. of flowers/shoots	% of inhibition in length of each shoot	Av. No. of branches/shoots	Av. No. of flowers/shoots	% of inhibition in length of each shoot	Av. No. of branches/shoots	Av. No. of flowers/shoots
1.	<i>Hibiscus rosa-sinensis</i> var. My Beauty	24.2	0.6	1.2	76.6	1.0	0.3	69.5	1.5	2.0	70.3	0.8	1.6
2.	<i>Hibiscus syriacus</i> var. Double Mauve	33.5	2.1	5.0	67.8	4.6	4.7	54.6	3.7	4.2	40.6	2.5	3.5
3.	<i>Tabernaemontana coronaria</i>	24.5	—	11.0	—	—	—	—	—	—	—	—	—
4.	<i>Jasminum sambac</i> var. Khoya	14.5	—	3.0	11.7	2.5	3.0	35.8	3.0	2.5	—	—	—
5.	<i>Ixora singaporensis</i>	9.5	1.0	—	45.3	2.3	—	50.5	2.5	—	—	—	—
6.	<i>Lantana camara</i> var. Sanguinea	22.6	2.0	100.0	14.2	4.0	115.0	16.4	4.3	120.0	0.4	2.5	105.0
7.	<i>Cestrum nocturnum</i>	32.4	1.2	25.7	33.9	2.2	38.5	21.0	2.0	44.5	16.3	1.8	35.2
8.	<i>Galphimia gracilis</i>	36.7	2.4	90.0	22.9	3.5	120.0	13.3	2.8	160.0	6.0	2.5	150.0
9.	<i>Allamanda grandiflora</i>	26.8	—	12.5	—	—	—	—	—	—	—	—	—
10.	<i>Clerodendron macrosiphon</i>	19.0	0.2	11.5	20.0	2.2	23.5	33.7	1.8	16.5	—	—	—

foliar spray and dust markedly suppressed the shoot growth in *Ixora singaporensis*, ranging from 8.4%-26.3% in case of foliar spray and 45.3%-50.5% in case of dust depending on the concentrations.

In *Lantana camara*, 14.6% and 11.5% inhibition of shoot growth was recorded by 8000 and 4000 ppm respectively. The lowest concentration viz., 2000 ppm showed slight elongation of shoots. All the concentrations of Cycocel applied as dust in the soil, showed reduction of shoot growth ranging from 5.4% to 16.4% depending on the concentrations. Early flowering and increased number of flowers were also observed due to foliar application.

In *Cestrum nocturnum*, all the concentrations used both as spray or dust showed inhibition of shoot growth ranging from 21.6%-32.7% in case of foliar spray and 16.3%-33.9% in case of dust. It was observed that greater retardation of shoot growth was recorded with lower concentration when applied as foliar spray and in case of soil application inhibition of shoot length was more pronounced with higher concentrations. Early flowering and larger number of flowers were observed in treated plants.

In *Galphimia gracilis*, Cycocel showed marked reduction in shoot growth, ranging from 5.4% to 17.7% in case of foliar spray and 6.0%-22.9% in case of dust. Maximum inhibition (22.9%) in the height of plants was observed with 8 gms of Cycocel when used as dust in the soil. It not only encouraged early flowering on smaller shoots but also showed increased number of flowers per shoot.

All the concentrations of Cycocel showed reduction of shoot growth in *Allamanda grandiflora*, maximum inhibition (13.0%) was caused by 8000 ppm solution, followed by 4000 ppm (6.0%) and 2000 ppm (4.8%). Earlier and increased number of flowers were also recorded in the treated plants.

In *Clerodendron macrosiphon*, all the concentrations of Cycocel showed inhibition of shoot length and maximum inhibition (14.7%) was noted in 4000 ppm followed by 2000 ppm, which showed 13.2% inhibition. Maximum inhibition (33.7%) in shoot length was caused by Cycocel used as dust at the rate of 4 gms per pot and maximum number of flower was formed in plants treated with 8 gms of the chemical.

DISCUSSION

From the results of the experiment it has been found that Cycocel is effective as a growth retard-

ants in all the species of plants used in this experiment. Species of plant, concentration, and method of application also greatly influence the degree of response. The two species of *Hibiscus* have been found to show marked inhibition of shoot growth without affecting the size of flowers due to the treatments. Both foliar spray and soil application have been found to be effective, but the latter method of treatment has shown greater response than foliar spray. Greater inhibition of shoot growth is noted by soil application in *Jasminum sambac*, *Ixora singaporensis* and *Clerodendron macrosiphon*. The effect due to foliar application is quicker, but the action of the retardant lasts for a longer period, when used in the soil as dust. Marked retardation of shoot growth has been reported by Bose, Horé and Mukherjee (in press) on different varieties of *H. rosa-sinensis* and some species of plants belonging to the family Malvaceae. In *Jasminum sambac*, *Allamanda grandiflora*, *Ixora singaporensis*, *Lantana camara*, *Cestrum nocturnum* and *Galphimia gracilis* it has not only shown earliness of flowering but also increased the number of flowers. Flowering has also been found to improve in all the species and varieties of plants as a result of treatment, but the optimum concentration varies in the different species and method of application. Poole (1963) has reported increased number of flowers by using cycocel in *Gardenia jasminoides*. It is also noted that the improvement in flowering is not always related to the degree of retardation of vegetative growth. In almost all the plants, treatment has produced greater number of branches than the untreated plants. Results of the experiment thus indicate the possibilities of developing bushy and compact pot plants by standardising the use of Cycocel.

SUMMARY

Ten species of popular flowering shrubs e.g. (1) *Hibiscus rosa-sinensis* var. My Beauty, (2) *H. syriacus* var. Double Mauve, (3) *Tabernaemontana coronaria*, (4) *Jasminum sambac* var. Khoya, (5) *Ixora singaporensis*, (6) *Lantana camara* var. Sanguinea, (7) *Cestrum nocturnum*, (8) *Galphimia gracilis*, (9) *Allamanda grandiflora*, (10) *Clerodendron macrosiphon* were grown one in a 18 cm pot containing rich compost. When the branches attained a length of 5-7 cms, Cycocel (2-chloroethyl trimethylammonium chloride) was applied as foliar spray in 8000, 4000 and 2000 ppm and also in dust

form in soil at the rate of 8 gms, 4 gms and 2 gms per pot.

H. rosa-sinensis and *H. syriacus* in all concentrations markedly inhibited shoot growth ranging from 49.8%-68.3% in case of foliar spray and 40.6%-76.5% in case of dust depending on the concentrations. The treated plants produced larger number of branches and increased flowering was also noted under certain concentrations without effecting the size of the flowers. High concentration of Cycocel caused appreciable reduction of shoot length and increased flowering in *Tabernaemontana coronaria*. Application of 4 gms of dust in the soil greatly inhibited (35.8%) length of shoot in *Jasminum sambac* but foliar application improved flowering. Soil application also showed about 50% inhibition of shoot growth in *Ixora singaporensis*. High concentration of the growth retarding chemical showed about 75% increase in the number of flowers in *Lantana camara* together with appreciable reduction of vegetative growth. Similar beneficial effect was also recorded in *Cestrum nocturnum* and *Galphimia gracilis*. Treatment with Cycocel in 8000 ppm also improved the flowering in *Allamanda grandiflora* and more than 100% increase in the number of flowers was recorded in *Clerodendron*

macrosiphon. Inhibition of shoot growth was also observed in these two species of plant as a result of the treatment.

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