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Rooting Cuttings of *Gardenia jasminoides, Duranta repens,* and *Bougainville glabra* with Growth Retardants

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Key words: **Growth retardants; butanedioic acid mono-2(2, 2-dimethyl hydrazide) (Alar); α-cyclopropyl – α (p-methoxyphenyl) – 5-pyrimidinemethanol (Ancymidol); 2-chloroethyl-trimethyl – ammonium chloride (Cycocel); gardenia; duranta; bougainville; cuttings; adventitious roots.**

RINGKASAN

Satu kajian telah dilakukan untuk mengkaji kesan-kesan Alar, Ancymidol dan Cycocel keatas sifat-sifat pembentukan akar dari keratan-keratan Gandenia jasminoides, Duranta repens *dan* Bougainville glabra.

Alar dan Ancymidol mengeluarkan bilangan akar luarbiasa yang tinggi pada keratan gardenia, tetapi tidak pada keratan duranta dan bougainville. Keputusan-keputusan yang bermakna telah diperolehi dengan kepekatan 2500 bsj bagi Alar dan 200 bsj bagi Ancymidol. Akar-akar keratan gardenia dengan rawatan Amcymidol didapati lebih banyak bersabut dan halus, manakala akar-akar dari keratan baugainville lebih besar saiznya. Kepekatan cycocel dari 2500 bsj nampaknya menghalang pembentukan akar pada keratan-keratan gardenia.

Tumbesaran akar dan peratus pembentukan akar dari ketiga-tiga spesis yang dikaji adalah tidak diganggu oleh pembantut-pembantut tumbesaran.

SUMMARY

Effects of Alar, Ancymidol, and Cycocel on the rooting characteristics were studied on cuttings of Gardenia jasminoides, Duranta repens, *and* Bougainville glabra.

Alar and Ancymidol produced a greater number of adventitious roots in gardenia but not in duranta cuttings. The most significant results were obtained with Alar and Ancymidol at 2500 ppm and 200 ppm respectively. The roots of Ancymidol-treated gardenia cuttings were observed to be more fibrous and thinner whilst those of bougainville cuttings were larger in size. Cucocel at 2500 ppm seems to have a inhibitory effect on root formation in gardenia cuttings. Root growth and rooting percentage of the three species studied were not affected by the growth retardants.

INTRODUCTION

Synthetic growth regulators are commonly used in the propagation of vegetative cuttings of ornamental plants. Treatment of cuttings with growth hormones has resulted in earlier rooting, more roots, increased percentage and uniformity of rooting (Rudnicki, 1979; Weaver, 1972; Wittwer 1968). The auxins, indolebutyric and napthaleneacetic acids, are the most effective in the promotion of rooting of cuttings of a wide range of plant species (Hartman and Kester, 1975).

In recent years a new class of plant growth regulators defined as growth retardants (Cathey, 1964) has been reported to stimulate adventitious root initiation in cuttings taken from a number of herbaceous ornamental plants. Read (1968) and Read and Hoysler (1969) reported that B-Nine (Alar) promoted root growth on geranium, chrysanthemum and dahlia cuttings. A higher percentage of rooting was also obtained with Alar-treated greenwood tea cuttings (Haridas, 1975). Cycocel was shown to have a retarding effect on the rooting of cuttings of several herbaceous

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ornamental species (Read and Hoysler, 1969). However, such a retarding effect was not observed in mango. Stock plants pretreated with cycocel induced rooting of cuttings and air-layers of mango (Sadhu, 1979). Similarly, cuttings taken from stock plants of *Impatiens balsamina* cv. peppermint treated with Ancymidol exhibited improved root formation (Johnson and Smith, 1976). Another growth retardant, Amo-1618, was demonstrated to inhibit root formation or delayed root development (Cathey and Stewart, 1961).

This study was undertaken to ascertain the rooting response of three woody ornamental shrub species *(Gardenia jasminoides, Duranta repens* and *Bougainville glabra* to the growth retardants, butanedioic acid mono-2(2, 2-dimethyl hydrazide) (Alar), α-cyclopropyl – α (p-methoxyphenyl) – 5-pyrimidinemethanol (Ancymidol), and 2-chloro-ethyl-trimethyl-ammonium chloride (Cycocel).

MATERIALS AND METHODS

Vegetative terminal cuttings of gardenia, duranta, and bougainvillea were cut uniformly to 15 cm in length. Leaves at the basal half of the cuttings were removed while those at the top were retained. The basal 5 cm of the cuttings was dipped for 60 secs. in the growth retardants. The concentration of the retardants tested were Alar at 500, 1000 and 2500 ppm; Cycocel at 500, 1000 and 2500 ppm; and Ancymidol at 50, 100 and 250 ppm. Each treatment consisted of five cuttings and was replicated four times in a completely randomized block design.

The cuttings were planted in a raised and shaded propagation bed filled to a depth of 20 cm with coarse river sand, equipped with overhead sprinklers. The sprinklers were operated twice daily, once in the early morning and once in the late afternoon, for a period of 30 mins. each time. Supplementary manual watering was done once daily in the late evening to keep the cuttings turgid and propagation medium moist.

The experiment was terminated when control (distilled water) cuttings were observed to have rooted sufficiently for transplanting into pots. Sand adhering to the roots were gently removed by rinsing in water. The percentage of rooted cuttings, number, length, fresh and dry weight of roots was determined. All the roots were carefully excised and blotted dry for fresh weight determination, after which they were placed in a 70° C oven for 48 hrs. for dry weight measurement. The results were analyzed statistically by analysis of variance for each of the rooting variable and mean separation done according to Duncan's Multiple Range Test.

RESULTS AND DISCUSSION

Table 1 shows that Alar (2500 ppm) and Ancymidol (100 and 200 ppm) enhanced adventitious root formation in *Gardenia jasminoides* cuttings while Cycocel at 2500 ppm seems to have

TABLE 1
Rooting response of *Gardenia jasmindides* cuttings to alar, ancymidol and cycocel

TREATMENT	CONCN (ppm)	ROOT[z] No.	ROOT[y] LENGTH (cm)	FRESH[z] Wt. (g)	DRY[z] Wt. (g)	ROOTING[z] (%)
CONTROL	–	15a	7.03a	0.39a	0.10a	65a
ALAR	500	11a	8.28a	0.31a	0.08a	50a
	1000	18a	7.30a	0.43a	0.12a	60a
	2500	30b	6.58a	0.58b	0.19b	50a
ANCYMIDOL	50	14a	5.98a	0.42a	0.07a	45a
	100	23b	7.15a	0.48a	0.11a	50a
	200	28b	6.68a	0.53a	0.12a	50a
CYCOCEL	500	14a	7.98a	0.33b	0.11a	65a
	1000	10a	5.70a	0.20a	0.09a	50a
	2500	8a	5.80a	0.13a	0.03b	55a

y Mean of five longest roots per cutting.

z Means of treatment with the same letter as control within each column is not significantly different at the 5% level according to DMRT.

a depressive effect. Similar responses have been observed with Ancymidol on *Impatients balsamina* (Johnson and Smith, 1976), Alar on chrysanthemum, geranium and dahlia (Read, 1968; Read and Hoysler, 1969), and Cycocel on a number of herbaceous ornamental species (Read and Hoysler, 1969).

The number of roots produced per cutting by Alar and Ancymidol treatment was greater than cuttings which were not treated. The most significant results were obtained with Alar at the highest concentration of 2500 ppm (Table 1). Read and Hoysler, (1969) too demonstrated that concentrations of 1000 and 5000 ppm Alar were effective in stimulating adventitious roots formation, with 2500 ppm being the optimum. The greater number of roots produced by Alar at 2500 ppm is reflected in the fresh and dry weight data determined. The fresh and dry weight of the roots were the highest, and significantly different as compared to control.

The number of roots formed per cutting was observed to increase as the concentration of Ancymidol increased from 50 to 200 ppm. The most effective concentrations were 100 and 200 ppm. These levels caused a marked increase in the number of roots formed per cutting. However, the increased root production obtained was not accompanied by an increase in their fresh and dry weight. This was due to the fact that the roots of Ancymidol-treated cuttings were more fibrous and thinner in size as visually observed. Cycocel at the highest concentration of 2500 ppm seems to depress root production. The number of roots formed (8) was much less than that for non-treated cuttings (15). The reduction in root number was accompanied by a decline in their fresh and dry weight. The same depressive effect on root formation was achieved by Cycocel with herbaceous geranium and chrysanthemum cuttings at concentrations ranging from 1000 to 2500 ppm (Read and Hoysler, 1969), as seen by the percentage and root length obtained. Obviously an increase in the formation of adventitious roots achieved with Alar and Ancymidol bears no relationship to the rooting capacity of the cuttings. However, a better established root system would enable the cutting to recover more rapidly upon transplanting.

Alar, Anycymidol and Cycocel did not have a stimulatory or inhibitory effect on the production of aventitious roots in *Duratan repens* (Table 2) and *Bougainville glabra* cuttings (Table 3). This is in contrast to the response obtained with the study on gardenia, and that of a number of floricultural species as demonstrated by other workers (Johnson and Smith, 1976, Read and Hoysler, 1969).

Among the rooting characteristics studied, only a significant difference in the fresh and dry weight of roots was obtained with Ancymidol-

TABLE 2
Rooting response of *Duranta repens* cuttings to alar, ancymidol and cycocel

TREATMENT	CONCN (ppm)	ROOT[z] No.	ROOT[y] LENGTH (cm)	FRESH[z] Wt. (g)	DRY[z] Wt. (g)	ROOTING[z] (%)
CONTROL	–	8a	4.50a	0.08a	0.02a	40a
ALAR	500	7a	4.28a	0.10a	0.02a	55a
	1000	7a	4.13a	0.06a	0.02a	50a
	2500	5a	3.45a	0.08a	0.03a	40a
ANCYMIDOL	50	10a	4.30a	0.08a	0.02	50a
	100	11a	6.10a	0.09a	0.02	45a
	200	12a	5.60a	0.12a	0.03a	50a
CYCOCEL	500	9a	5.10a	0.14a	0.03a	50a
	1000	6a	3.80a	0.05a	0.01a	35a
	2500	8a	4.93a	0.06a	0.02a	45a

y Mean of five longest roots per cutting.

z Mean of treatment with the same letter as control within each column is not significantly different at the 5% level according to DMRT.

TABLE 3
Rooting response of *Bougainvillea glabra* cuttings to alar, ancymidol and cycocel

TREATMENT	CONCN (ppm)	ROOT[z] No.	ROOT[y] LENGTH (cm)	FRESH[z] Wt. (g)	DRY[z] Wt. (g)	ROOTING[z] (%)
CONTROL	–	6a	2.63a	0.09a	0.03a	90a
ALAR	500	7a	1.90a	0.08a	0.02a	85a
	1000	8a	2.95a	0.08a	0.02a	95a
	2500	6a	2.45a	0.14a	0.03a	90a
ANCYMIDOL	50	6a	3.00a	0.09a	0.02a	95a
	100	5a	3.10a	0.15a	0.03a	90a
	200	6a	3.48a	0.32b	0.09b	95a
CYCOCEL	500	7a	3.10a	0.09a	0.02a	85a
	1000	6a	3.30a	0.14a	0.04a	95a
	2500	7a	3.10a	0.06a	0.02a	90a

y Mean of five longest per cutting.
z Means of treatment with the same letter as control within each column is not significantly different at the 5% level according to DMRT.

treated bougainville cuttings at the highest concentration of 200 ppm. The increase in root weight was due to an increase in the size of roots as visually observed rather than to a greater number of roots formed per cutting or an increase in the length of roots. The higher percentage of rooting obtained with Alar on tea cuttings by Haridas (1975) was not evident in this study with duranta and bougainville.

The different response of duranta and bougainville to the growth retardants as compared to that of gardenia is not unexpected as it is known that growth retardants are highly selective in their action. Also, it has been reported that the effects exerted by growth retardants on the rooting of cuttings differed within and among species of ornamental plants (Cathey, 1964). The variable rooting response obtained with Alar, Ancymidol and Cycocel in this study indicate that their being used as a general purpose hormone like the auxins (Hartman and Kester 1975) to improve the rooting of cuttings of ornamental species is limited.

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