Research Article

Effect of Plant Growth Retardants on the Growth and Flowering of Nerium (*Nerium Oleander* L.) Cv. Red

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Abstract

An investigation was carried out to study the effect of plant growth retardants on the growth and flowering of Nerium (*Nerium oleander* L.) cv. Red under open condition. The experimental results revealed that among all growth retardants, paclobutrazol @ 100 ppm drastically suppressed plant height (35.17cm and 38.83 cm) at 6 and 9 MAP. Application of paclobutrazol @ 100 ppm resulted in maximum number of primary branches (4.0) and reduced internodal length (1.92 cm). In general, delayed flowering (100 days) was observed in plants treated with growth retardants when compared to control (90.9 days). Flower stalk length (6.33 cm) and number of inflorescence per plants (2.1) was found to be significantly reduced when compare to with control (15.65 cm and 5.3). Number of flowers per inflorescence (6.1) was increase observed to in the application of mepiquat chloride 1500ppm. Based on the results obtained, soil drenching of paclobutrazol @ 100 ppm has shown positive influence in modifying the plant architecture by inducing dwarfness with improved flower quality and yield.

Keywords: Nerium, Growth retardants, Paclobutrazol – PBZ, Mepiquate chloride-MPC, Chloromequat Chloride - CCC

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Introduction

The key uses of plant growth regulators in ornamental horticulture and floriculture includes regulation of plant height, to induce profuse branching, propagation of cuttings and control the flowering [16]. Plant growth retardants are synthetic compounds used to retard the shoot length of plant in a desired way without changing developmental patterns. This has been achived not only by reducing cell elongation but also lowering the rate of cell division and regulating the plant height physiologically [14]. Most of plant growth retardants inhibit the formation of growth promoting compounds like gibberellins (GA_3) and can be used to reduce unwanted shoot elongation [10].

Oleander is a native of the Mediterranean area and much appreciated for its ornamental value. However, its ornamental use is restricted to gardens and landscaping and it is less used as a potted plant because of its strong vertical growth. It is well known that, among the most important qualities looked for in the production of oleander for pot growth is a small, compact form, as has been demonstrated by the good commercial acceptance of dwarf oleander and the flowers are available throughout the year.

The most effective type of height control in plants requires the application of chemicals acting as plant growth retardants like mepiquat chloride, paclobutrazol and chlormequat chloride [8]. Among them, paclobutrazol (triazole) group compounds are the most widely used for greenhouse grown floriculture crops [20]. Paclobutrazol has demonstrated to provide height control, enhanced flowering and foliage colour in a large number of floriculture crops, including several flowering potted plants [19] and [8]. Mepiquat chloride is a gibberellic acid biosynthesis inhibitor mostly absorbed by the green parts of the plant, which makes it an inhibitor of cell elongation [7]. Cycocel is known to restrict GA_3 synthesis process and also acts as an anti-auxin substance. Similarly, it breaks the apical dominance and increases the lateral branches [19].

Materials and methods

Planting material

Uniform and healthy rooted seedlings (20-25cm) of *Nerium oleander* were used for the present study. The cuttings were treated with 1500 ppm of IBA planted in polybags with sand as medium in mist chamber at Department of Floriculture and Landscaping, Botanical garden**,** Horticultural College and Research Institute, Tamil Nadu

Agricultural University, Coimbatore. Watering was done daily once and polyfeed was drenched at 3g/L at 15 days intervals. Cuttings were allowed to sprout and grow for about 45 days. Plants were then hardened for 15 days by keeping under direct sunlight. Plants were transplanted to earthen pots of uniform diameter, having a soil mixture of red soil: sand: FYM: vermicompost in the ratio of 2:1:1:1. Plants were then allowed to establish for a month. Four pots per treatment and the three replications were maintained.

Applications of growth retardants

The seedlings were treated with different growth retardants at 30. Treatment details are; as follows: T_1- Paclobutrazol (75ppm),T_2- Paclobutrazol (100ppm),T_3- CCC (1000ppm), T_4- CCC (2000ppm), T_5- Mepiquate chloride (1000ppm), T_6- Mepiquate chloride (1500ppm), T_7- Control, T_8- Field control. Paclobutrazol was given as soil drenching, while CCC and mepiquate chloride were given as foliar sprays at 15 days interval.

Visual observations were recorded throughout the research period. Observations on plant height, number of laterals, stem diameter, internodal length, first flower initiation, number of inflorescence per plant, number of flower per inflorescence, flower stalk length and shelf life were recorded at regular intervals.

Results and Discussion

Effect of PGRs on growth parameters

Vegetative parameters like plant height, number of branches, intermodal length and stem diameter were observed at 6 and 9MAP and the data are presented in **Table 1**. Minimum plant height (38.83 cm) was recorded in plants drenched with 100 ppm paclobutrazol (T_2) and the maximum plant height (70.48 cm) was observed in control (T_8) (**Figure 1**). Minimum intermodal distance (1.92cm) was noticed in plants treated with paclobutrazol @ 100 ppm (T_2) and the maximum internodal distance was noticed in control (3.92 cm). Plant growth retardants can delay cell division and elongation of plant aerial parts as well restrict gibberellin biosynthesis, thereby resulting in reduced internodal length and vegetative growth [10]. Paclobutrazol have been shown to reduce the stem elongation and inhibit GA biosynthesis resulting in lower quantities of GA like substances [3]. Rduction in internodal length has led to dwarfing of the plant (Lee *et al*., 1999). A similar report on retardation of plant height has been reported in *Dianthus caryophyllus* [15] and *Tagetes erecta* [12].

Table 1 Effect of plant growth retardants on growth parameters of cv. Red

Treatments	Plant height (cm)		No. of primary branches		Intermodal length(cm)	Stem diameter (mm)
	6 MAP	9 MAP	6 MAP	9 MAP		
T_1-PBZ (75 ppm)	36.67	41.17	3.00	3.50	2.00	5.39
T_2-PBZ (100 ppm)	35.17	38.83	3.83	4.00	1.92	5.20
T_3-CCC (1000 ppm)	53.83	65.67	2.33	2.83	2.58	6.66
T_4- CCC (2000 ppm)	47.50	54.83	2.67	2.83	2.48	6.10
T_5- MPC (1000 ppm)	57.00	67.00	2.83	2.33	2.88	6.01
T_6- MPC (1500 ppm)	49.83	64.83	2.17	2.83	2.74	6.77
T_7- Control	60.67	66.50	1.83	2.67	3.48	6.23
T_8- Field control	64.17	70.48	1.67	3.00	3.92	5.39
Mean	50.60	58.66	2.54	3.00	2.75	5.97
SE d	0.75	1.52	0.05	0.07	0.05	0.12
CD (0.05)	1.59	3.23	0.11	0.15	0.10	0.25

* MAP-Month after planting

Increased stem diameter was obtained in plants sprayed with mepiquate chloride at 1500 ppm (T_6) and lowest stem diameter was recorded in plants treated with paclobutrazol at 100 ppm (T_2).

This may be attributed to reduced gibberllin content which in turn leads to decreased cell elongation [17]. Acceleration in the number of branches was noticed due to the effect of drenching of plant growth retardant paclobutrazol @ 100 ppm (T_2). Increase in number of branches may be due to a check in apical dominance, which could be due to lower levels of endogenous production of auxins and in turn the sprouting of vegetative bud as reported by [5] in China aster.

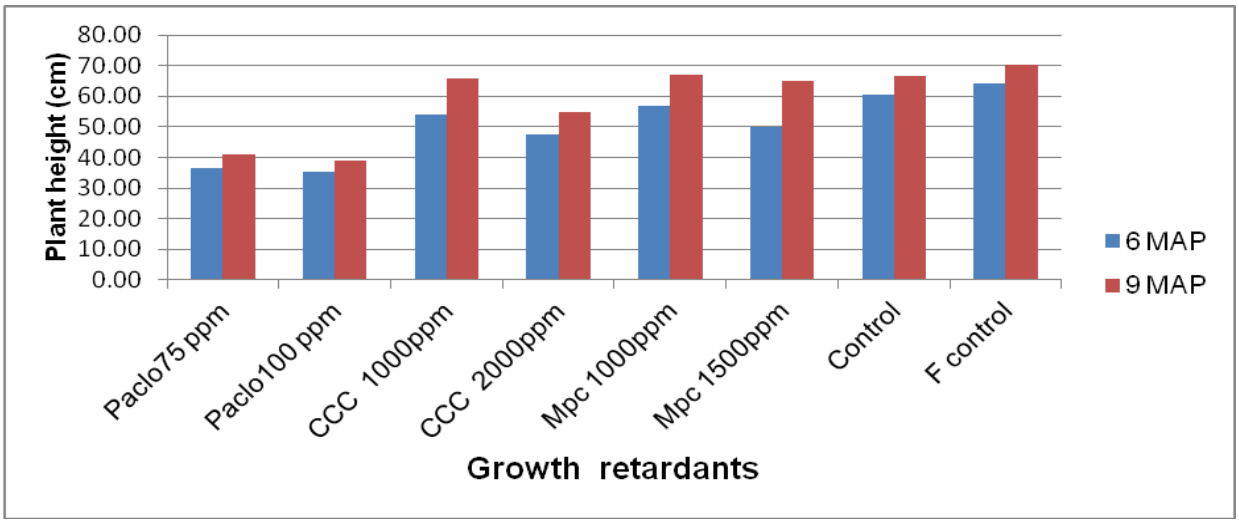

Figure 1 Effect of plant growth retardants on plant height of Nerium cv. Red

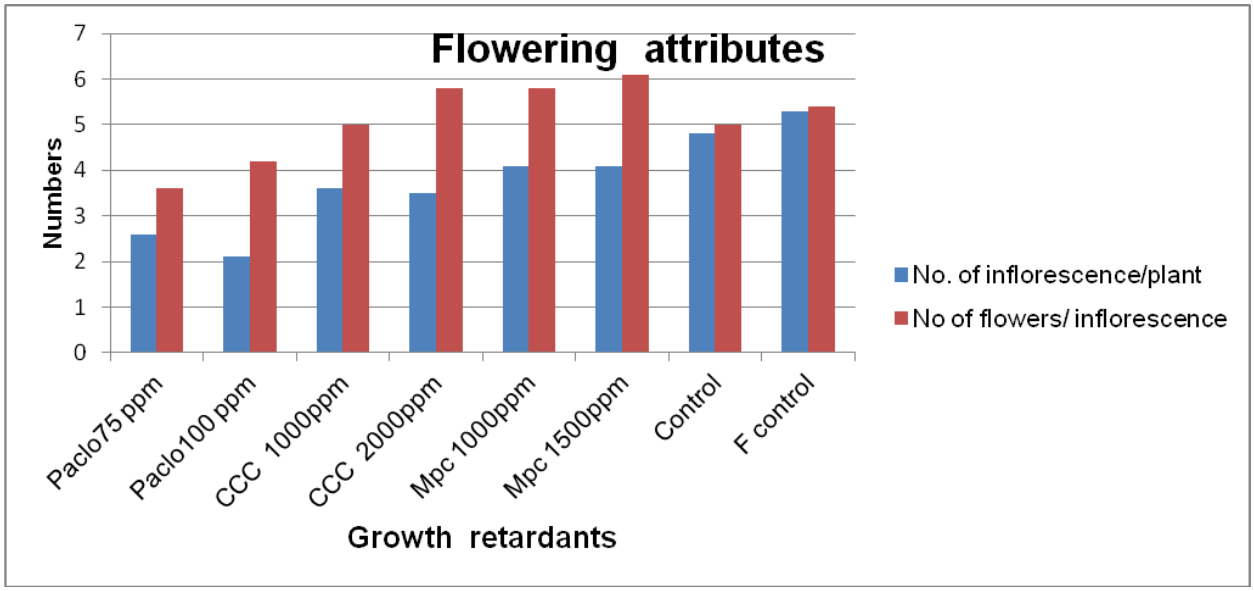

Figure 2 Effect of plant growth retardants on flowering attributes of Nerium cv. Red

Table 2 Effect of plant growth retardants on flowering parameters of Nerium cv. Red

Treatments	First flower initiation (Days)	Flower stalk length(cm)	No. of inflorescence/ plant		No of flowers/ inflorescence		Shelf life (Days)
			6 MAP	9 MAP	6MAP	9 MAP	
T_1-PBZ (75 ppm)	97.4	6.75	1.4	2.6	3.3	3.6	2.40
T_2-PBZ (100 ppm)	100.6	6.33	1.6	2.1	2.3	4.2	2.83
T_3-CCC (1000 ppm)	106.3	8.75	1.4	3.6	3.4	5.0	2.03
T_4- CCC (2000 ppm)	104.7	8.53	1.2	3.5	3.9	5.8	2.30
T_5- MPC (1000 ppm)	119.3	11	1.2	4.1	2.7	5.8	2.40
T_6- MPC (1500 ppm)	113.2	10.78	1.0	4.1	3.9	6.1	2.57
T_7- Control	94.1	15.25	1.2	4.8	4.9	5.0	2.03
T_8- Field control	90.9	15.65	1.2	5.3	5.2	5.4	2.07
Mean	103.31	10.38	1.27	3.76	3.70	5.11	2.33
SE d	2.75	0.15	0.03	0.08	0.08	0.11	0.05
CD (0.05)	5.83	0.33	0.06	0.18	0.17	0.23	0.11

Effect of growth retardants on flower characteristic

The floral parameters like first flower initiation, number of inflorescence per plant, number of flower per inflorescence, flower stalk length and shelf were found to be significantly influenced with the application of PGRs.

Days to flowering were earlier in control plants compared to the treatments. This delay in flowering is attributed to general property of retardants to reduce the indigenous level of GA to a permissible concentration required for flowering [2]. On the contrary, application of paclobutrazol at 100ppm delayed flowering (**Table 2**) by 12.30 days. This delay in flowering may be attributed to the reduced GA synthesis and prolonged vegetative phase by paclobutrazol application. Paclobutrazol delayed flowering in Fuchsia cv. Beacon [7].

The maximum flower stalk length was found in field control plants (T_8) and minimum flower stalk length was in application of Paclobutrazol @ 100 ppm (T_2). This enlargement is caused by drawing of photosynthates to the flower as a consequence of intensification of the sink. Further, other scientists have reported suppression in vegetative parameters with the application of growth retardants but not on flowering parameters [1] and [6].

The number of inflorescences and number of flower **(Figure 2)** showed a quadratic response with mepiquat chloride (T_6) when compared to control plants. This response may be due the relationship between source/drain, wherein the reduction of elongation caused by growth regulators decreases the demand of photoassimilates for growth, which are used in higher proportion by the plant reproductive organs [17].

Conclusion

Considering the above results, it was observed that the plants treated with paclobutrazol at 100 ppm as soil drenching influenced significantly reduction in plant height, intermodal length and maximum number of primary branches. Also mepiquat chloride at 1500 ppm as foliar spray increased the number of inflorescence per plant and number of flowers per inflorescence in nerium. Hence, growth retardant applications influence in modifying the plant architecture by inducing dwarfness with improved flower quality in the case of nerium used as a good quality potted plant.

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