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INFLUENCE OF GROWTH RETARDANTS ON GROWTH AND FLOWERING IN BOUGAINVILLEA AFTER PRUNING

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ABSTRACT

The present investigation entitled "Study on influence of growth retardants on growth and flowering in bougainvillea after pruning" was carried out during the period December 2024 - April 2025 at Sri Konda Laxman Telangana Horticulture University, Floricultural Research Station, Rajendranagar, Hyderabad. The experiment was laid out in Completely Randomized Design (CRD) with nine treatments and three replications. The data recorded includes growth, floral and quality parameters. The floral parameter data was collected from the inflorescences that emerged following the application of growth retardants after planting. The Research findings revealed that T_3 with Single drenching of paclobutrazol at 20 ppm recorded early bud initiation (7 days), maximum number of inflorescence present on each branch (6.67), long duration of flowering (80.56 days), longevity of inflorescence (35.22 days), pot presentability card (98.44). The Research findings revealed that T_4 with Double drenching of paclobutrazol at 20 ppm recorded minimum inflorescence length (2.46 cm), peduncle length (0.78 cm), bract length and width (2.12 cm, 2.17 cm). Maximum peduncle length was recorded in T_5 (Single spray of mepiquat chloride at 150 ppm) at 3.47 cm. The results revealed that T_9 (Control) consistently exhibited highest values for these parameters, inflorescence length at 5.26 cm, bract length at 3.23 cm, bract width at 2.49 cm and low values exhibited for number of inflorescence on each branch (3.89), duration of flowering at 73.44 days, longevity of inflorescence on plant at 28.78 days, score card (75.11).

***Keywords*:** Bougainvillea, Plant growth regulators (PGRs), paclobutrazol, inflorescence, bract size, bud initiation, longevity of inflorescence, duration of flowering, pot presentability.

Introduction

Bougainvillea is a perennial ornamental shrub of the Nyctaginaceae family, native to South America, and widely used in tropical and subtropical landscaping (Datta *et al*., 2020). It serves various purposes as a climber, potted plant, bonsai, hedge, topiary and in pollution control and phytoremediation (Datta, 2022; Kumari *et al*., 2022). Among the 14 species, *B. spectabilis*, *B. glabra*, and *B. peruviana* are horticulturally important, with differences in hairiness and flowering behavior (Sahu and Saxena, 2012).

The plant thrives in full sun, well-drained acidic soil, hot and dry climates, with peak blooming in March–April and October–November (Gilman, 1999; Rohith, 2019). Its colorful bracts not true flowers are its main ornamental appeal (Mangroliya *et al*., 2023).

While bougainvillea is suitable for pot culture due to its compact and repeat-flowering nature, frequent pruning increases labor and maintenance costs. Plant growth retardants offer a sustainable alternative by inducing dwarfism and reducing internodal length, thus minimizing pruning and enhancing flowering (Jain and Janakiram, 2016).

- **Cycocel (Chlormequat chloride):** A quaternary ammonium salt that inhibits gibberellin biosynthesis, reduces stem elongation, strengthens stems, and enhances leaf greenness (Barrett, 2001; Kumar, 2016; Ghatas, 2016; Pirasteh *et al*., 2016).
- **Paclobutrazol:** A triazole compound that inhibits cytochrome P-450 enzymes in the gibberellin biosynthetic pathway, leading to reduced vegetative growth and increased flowering (Latimer, 2001; Tanimoto, 1987; Lever, 1986; Fletcher *et al*., 2000; Ahmad Nazarudin, 2012). It is absorbed mainly through stems and roots and has long soil persistence (Jackson *et al*., 1996; Jacyna and Dodds, 1995; Banon *et al*., 2013).
- **Mepiquat chloride:** Suppresses gibberellic acid synthesis, promoting compact growth and early flowering (Reddy *et al*., 1992; Arteca, 1996).
- **B-9 (Daminozide/Alar):** A foliar-applied retardant that controls vegetative growth and improves quality in ornamental plants. It is highly translocatable within plant tissues (Kumar, 2016).

Growth retardants influence morphology by reducing shoot elongation and increasing chlorophyll content, resulting in compact, robust, and floriferous plants (Cathey, 1975; Kumar *et al*., 2020).

Materials and Methods

The present study was conducted at Floricultural Research station, Sri Konda Laxman Telangana Horticultural University, Rajendranagar, Hyderabad, Telangana. The experiment was laid out in Completely Randomized Design (CRD) with nine treatments and replicated thrice.

Table 1: Treatment details

Treatments	Treatment
T_1	Single spray of cycocel (CCC) at 2000 ppm
T_2	Double spraying of cycocel (CCC) at 2000 ppm
T_3	Single drenching of paclobutrazol at 20 ppm
T_4	Double drenching of paclobutrazol at 20 ppm
T_5	Single spray of mepiquat chloride at 150 ppm
T_6	Double spraying of mepiquat chloride at 150 ppm
T_7	Single spray of alar (B-9) at 150 ppm
T_8	Double spraying of alar (B-9) at 150 ppm
T_9 (Control)	Control

The media was mixed thoroughly and filled in 10" pot. The ten months old bougainvillea plants were transplanted into the pots during early morning hours. Irrigation was given manually for every 2 days. Pruning was done 10 days after transplanting in order to allow proper growth and initial structure establishment. Pots were well watered before imposing treatments. First application of treatments was imposed 15 days after pruning and second application at 15 days after first application for double application needed treatments. The floral parameter data was collected from the inflorescences that emerged following the application of growth retardants after planting.

Results and Discussion

Floral parameters

Number of days taken for first bud initiation (Days):

Early bud initiation after pruning was seen in (T_3) Drenching of paclobutrazol at 20 ppm and (T_7) Single spray of alar (B-9) at 150 ppm for 7 days) which was presented in Table 2. The earliness in bud initiation with the use of paclobutrazol and alar may be attributed to the reduction in gibberellin synthesis which might have inhibited vegetative growth and promoted flower bud initiation similar findings of early flowering with the use of paclobutrazol P333 in marigold was reported by Hemalata and Singh (2017), Singh *et al*. (2016) in Geranium.

Inflorescence length:

Minimum inflorescence length was seen in (T_4) Double drenching of paclobutrazol at 20 ppm (2.46 cm) and maximum inflorescence length was recorded in (T_9) Control (5.26 cm) which was presented in Table 2. The minimum inflorescence length was found in plants treated with paclobutrazol 20 ppm double or by single drenching method as they retard plant growth by inhibition of gibberellins biosynthesis due to which elongation of cells is restricted. Moreover, drench application of Paclobutrazol may directly inhibit GA synthesis as roots synthesize large quantities of GA (Sopher *et al.*, 1999)

Peduncle length:

Minimum peduncle length was seen in (T_4) Double drenching of paclobutrazol at 20 ppm (0.78 cm) and maximum peduncle length was recorded in (T_5) Single spray of mepiquat chloride at 150 ppm (3.47 cm) which was presented in Table 2. The minimum peduncle length was found in paclobutrazol treated plants due to the inhibited effect of gibberellin production but cell division still occurs, but the new cells do not elongate. Gibberellins stimulate cell elongation (Desta and Amare, 2021). Paclobutrazol inhibits GA biosynthesis by blocking the oxidation of *ent*-kaurene (Barrett JE, 2001).

Number of inflorescence on each branch:

Maximum number of inflorescence on each branch were recorded in (T_3) Single drenching of paclobutrazol at 20 ppm (6.67) and minimum number of inflorescence on each branch were observed in (T_9) Control (3.89)) which was presented in Table 2.The increase in the number of inflorescence per branch by the use of paclobutrazol and alar may be due to their anti gibberellin biosynthesis effect which redirects assimilates toward reproductive development, thereby increasing the number of inflorescences per branch. Additionally, it stimulates lateral branching, leading to a denser floral display with compact blooms due to its growth-retardant action.

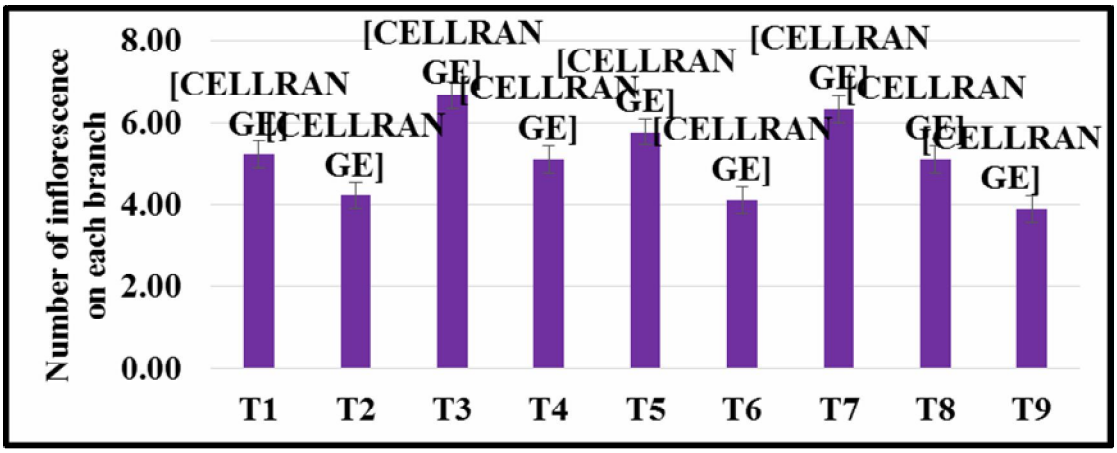

Fig. 1: Effect of growth retardants on number of inflorescence present on each branch in bougainvillea.

Table 2: Effect of growth retardants on number of days taken for first bud initiation, inflorescence length, peduncle length and number of inflorescence present on each branch in bougainvillea

Treatments (T)	Number of days taken for first bud initiation	Inflorescence length (cm)	Peduncle length (cm)	Number of inflorescence present on each branch
T_1	9.00	4.37	2.52	5.22
T_2	8.89	3.36	1.59	4.22
T_3	7.00	2.70	0.82	6.67
T_4	7.33	2.46	0.78	5.11
T_5	8.33	4.68	3.47	5.78
T_6	7.78	4.27	2.84	4.11
T_7	7.00	4.93	2.64	6.33
T_8	7.33	4.34	1.57	5.11
T_9	8.00	5.26	2.74	3.89
SE (m) ±	0.21	0.23	0.10	0.32
CD @ 5%	0.62	0.69	0.31	0.95

Number of bracts per inflorescence*:*

It is clear from the data that there is no change in number of bracts per cyme with or without application of growth retardants in bougainvillea inflorescence which was presented in Table 3. This can be a genetical attribute which was not influenced by the application of growth retardants and remained unaffected.

Bract length (cm):

Among all the treatments significantly minimum bract length is observed in (T_4) Double drenching of paclobutrazol at 20 ppm (2.12 cm) and maximum bract length was noticed in (T_5) Single spray of mepiquat chloride at 150 ppm (3.31 cm) which was presented in Table 3. The growth retardant effect of paclobutrazol on other flower parameter might have attributed in reduction of bract length as well. The compact and bushy appearance of inflorescence is mainly due to reduced bract character which is a suitable trait for pot presentability.

Bract width (cm):

Minimum bract width was observed in (T_4) Double drenching of paclobutrazol at 20 ppm (2.17 cm) and maximum bract width was recorded in (T_9) Control (2.49 cm) and (T_7) Single spray of alar (B-9) at 150 ppm (2.49 cm) which was presented in Table 2. The bract

width followed the same pattern as bract length with the use of paclobutrazol.

Duration of flowering (Days):

Maximum duration of flowering is seen in (T_3) Single drenching of paclobutrazol at 20 ppm and (T_4) Double drenching of paclobutrazol at 20 ppm that is 80.56 days and minimum flowering is seen in (T_8) Double spraying of alar (B-9) at 150 ppm (72 days) which was presented in Table 3. Paclobutrazol (PBZ) prolongs the flowering period by inhibiting the production of gibberellins, hormones that encourage vegetative growth, while possibly increasing cytokinin levels, which support flowering.

Longevity of inflorescence on plant (Days):

Maximum longevity of flowers on plant was seen in (T_3) Single drenching of paclobutrazol at 20 ppm (35.22 days) and minimum longevity of flowers on plant was seen for 28.78 days in both T_8 (Double spraying of alar (B-9) at 150 ppm) and T_9 (Control) which was presented in Table 2. Due to low levels of endogenous GA3 caused by paclobutrazol, which results in delayed flower withering (Rood *et al.*, 1989). As lesser surface area of bracts is exposed due to smaller and compact bracts to the environment by which longevity might also increase when compared with all other treatments. As duration of flowering and longevity is an important aspect which makes paclobutrazol best for usage as potted plant.

Table 3: Effect of growth retardants on Number of bracts/ inflorescence, Bract length, Bract width (cm), Duration of flowering (Days) and Longevity of inflorescence (Days)

Treatments (T)	Number of bracts/ inflorescence	Bract length (cm)	Bract width (cm)	Duration of flowering (Days)	Longevity of inflorescence (Days)
T_1	15.00	3.28	2.40	73.78	30.00
T_2	15.33	3.00	2.22	74.00	29.44
T_3	15.33	2.74	2.23	80.56	35.22
T_4	13.67	2.12	2.17	80.56	34.33
T_5	16.67	3.31	2.36	74.89	30.00
T_6	15.67	2.88	2.32	74.22	29.00
T_7	15.67	3.27	2.49	74.33	29.78
T_8	14.00	2.94	2.23	72.00	28.78
T_9	14.00	3.23	2.49	73.44	28.78
SE (m) ±	0.64	0.07	0.05	0.53	0.36
CD @ 5%	1.90	0.20	0.15	1.56	1.08

Plate 1: Effect of different growth retardants on inflorescence in bougainvillea (T1-T9)

Conclusion

Based on the above results, it can be concluded that there is no significant difference in terms of performance between single and double drenching of paclobutrazol due to which we can prefer single drenching of paclobutrazol as it has better pot presentability when compared with score card and overall attributes are good.

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