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EFFECT OF PINCHING AND PLANT GROWTH RETARDANTS ON VEGETATIVE GROWTH OF ANNUAL CHRYSANTHEMUM (*GLEBIONIS CORONARIA* L.) UNDER CENTRAL TELANGANA CONDITIONS

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ABSTRACT

The present investigation "Effect of pinching and plant growth retardants on vegetative growth of annual chrysanthemum (*Glebionis coronaria* L.) under Central Telangana conditions" was carried out during the *rabi* season of the year 2024-2025, at Post Graduate Institute for Horticultural Sciences, Sri Konda Laxman Telangana Horticultural University, Mulugu, Siddipet. The results related to vegetative parameters at 90 DAT indicated that, pinching (P_1) recorded maximum values for number of primary branches (18.05), number of secondary branches (64.83), stem diameter (14.27 mm) and plant spread (E-W, 39.08 cm) and (N-S 39.16 cm) than no pinching treatment (P_2) and no pinching recorded maximum plant height (62.33 cm) at 90 DAT. All growth retardants had significant differences on vegetative parameters at 90 DAT. Among them, Cycocel @ 1000 ppm registered best values with respect to number of primary branches (21.50), number of secondary branches (82.47), stem diameter (15.99 mm) and plant spread (E-W, 45.46 cm) and (N-S, 45.57 cm) over other treatments. Significant differences were observed among the treatment combinations on vegetative parameters at 90 DAT, P_1G_6 (Pinching + Cycocel at 1000 ppm) reported maximum number of primary branches (22.80), number of secondary branches (88.13), stem diameter (16.55 mm) and plant spread (E-W, 47.17 cm) and (N-S 47.05 cm) as compared to others.

Key words : Annual chrysanthemum, Pinching, Plant growth retardants, Cycocel, Vegetative Parameters.

Introduction

Annual chrysanthemum (*Glebionis coronaria* L.), formerly known as *Chrysanthemum coronarium* (2n = 4x = 34), is an aromatic, herbaceous annual plant in the Asteraceae family. Native to the Mediterranean, it has naturalized in parts of East Asia and North America. In India, it is cultivated widely under local names such as '*Bijli*' (Nagpur), '*Baboona*' (Haryana), '*Guldhak*' (Punjab), '*Market*' (Delhi) and '*Gendi*' (Uttar Pradesh) (Arora, 1990; Meshram *et al.*, 2008; Mishra *et al.*, 2002). The crop covers around 5% of total chrysanthemum cultivation across major states including Maharashtra, Karnataka, Punjab and Uttar Pradesh (Dorajeerao *et al.*, 2012).

Valued for its ornamental and medicinal uses, the young shoots are consumed as vegetables and the flowers added to salads (Mohanty *et al.*, 2023). It offers antioxidant properties and potential health benefits, including reduced risk of lung cancer, kidney stones, and cardiovascular diseases.

Its popularity in North India stems from its hardy nature, photoperiod insensitivity, short flowering duration and suitability for summer floral needs (Kedar *et al.*, 2022). With India producing 2.28 lakh tonnes of loose flowers and 9.47 lakh tonnes of cut flowers (NHB Database, 2023–24), annual chrysanthemum plays a vital role in the floral industry.

Crop management practices like pinching removal of terminal shoot tips are crucial for regulating plant growth, improving branching and enhancing flower yield and quality (Jindal *et al*., 2018; Sehrawat *et al*., 2003). Similarly, plant growth regulators (PGRs) such as Chlormequat chloride (Cycocel), Mepiquat chloride (MC) and Daminozide (B-Nine) are widely used to control vegetative growth by inhibiting gibberellin synthesis, promoting compact growth and flowering (Rademacher, 2000; Kumar *et al*., 2013). These practices are essential for improving the productivity, quality and marketability of annual chrysanthemum as a commercial flower crop.

Materials and Methods

The experimental site is located at the Post Graduate Institute for Horticultural Sciences, Sri Konda Laxman Telangana Horticultural University, Mulugu, Siddipet. The experimental site falls under a semi-arid tropical climate with an average rainfall of 615.6 mm, located at an altitude of 543.3 m above mean sea level on 78.62° East longitude and 17.72° North latitude. The experiment was laid out in Factorial Randomized Block Design (FRBD) with two factors in which the first factor consists of two levels of pinching *viz*., P_1: Pinching and P_2: No pinching and the second factor consisting of levels of growth retardants *viz*., G_1: Mepiquat chloride @ 500 ppm, G_2: Mepiquat chloride @ 1000 ppm, G_3 B-Nine @ 500 ppm, G_4 –B-Nine @ 1000 ppm, G_5 - Cycocel @ 500 ppm, G_6 - Cycocel @ 1000 ppm, G_7 – Control (No spray) with three replication. The number of treatment combinations- 14, Number of plants per plot- 15, Number of plants per treatment- 5. Pinching was performed at 21 days after transplanting (DAT), followed by foliar application of plant growth retardants - Mepiquat chloride, B-Nine and Cycocel - one week after pinching.

Plant height (cm)

It was measured from base of the plant to the growing tip at 30, 60 and 90 days after planting with the help of scale and result in centimeters (cm).

Number of primary branches per plant (no.)

The total number of main branches emerging from the primary stem was counted at 30, 60 and 90 days after transplanting and recorded as primary branches. The average number was calculated and expressed as the number of primary branches per plant.

Number of secondary branches per plant

The number of secondary branches emerging from the primary branches was counted and mean was calculated and expressed as the number.

Stem diameter (mm)

It was measured at the basal portion of the stem by using vernier calipers and the average value was expressed in millimeters.

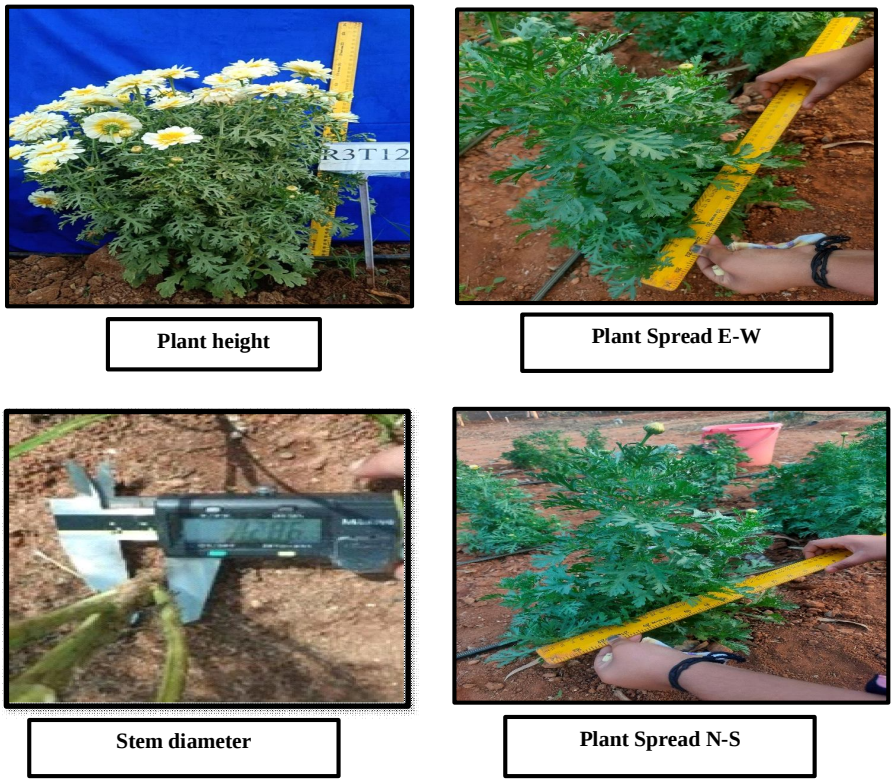

Plate 1 : Measurement of different parameters.

Plant spread (cm) (EW and NS Direction)

The plant spread was measured in both North-South and East-West directions with the help of a meter scale and averages were calculated.

Results and Discussion

Growth parameters

Documented the data concerning growth parameters such as plant height, number of primary branches per plant, number of secondary branches per plant, stem diameter and plant spread (E-W and N-S). The data was recorded at 90 days after transplanting (DAT), thus providing a comprehensive overview of the plant's growth progress.

Plant height (cm)

Both pinching and growth retardant treatments had a significant impact on plant height at 90 DAT. Between the pinching levels, P_1 (Pinching) recorded a notably lower height (54.01 cm) than P_2 (No pinching) (62.33 cm). Growth retardants also showed significant differences, with the shortest plants observed in G_1 (Mepiquat chloride @ 500 ppm) at 46.93 cm and the tallest in G_7 (Control) at

Table 1 : Effect of pinching and plant growth retardants on vegetative growth of annual chrysanthemum (*Glebionis coronaria* L.) under Central Telangana conditions.

Treatments	Plant height (cm)	Number of primary branches	Number of secondary branches	Stem diameter (mm)	Plant spread (E-W) (cm)	Plant spread (N-S) (cm)
Levels of pinching						
P_1	54.01	18.05	64.83	14.27	39.08	39.16
P_2	62.33	17.03	60.04	13.78	37.16	37.59
S.E(M)	0.65	0.21	0.88	1.15	0.42	0.36
CD@5%	1.89	0.60	2.24	0.45	1.23	1.04
Growth retardants						
G_1	46.93	16.40	53.50	13.07	35.80	35.80
G_2	49.20	16.00	54.40	13.70	36.01	36.34
G_3	53.33	17.53	63.07	14.43	36.48	37.15
G_4	55.13	18.37	67.10	14.38	37.17	37.51
G_5	63.44	19.37	77.70	15.22	41.58	41.25
G_6	67.77	21.50	82.47	15.99	45.46	45.57
G_7	71.40	13.60	38.80	11.42	34.36	35.03
S.E(M)	1.21	0.38	1.44	0.29	0.79	0.67
CD@5%	3.53	1.12	4.18	0.84	2.30	1.95
Interactions						
P_1G_1	45.47	15.80	53.20	12.51	35.79	35.79
P_1G_2	46.20	16.40	56.20	13.57	36.10	36.10
P_1G_3	48.40	17.67	65.80	14.54	36.55	37.55
P_1G_4	51.60	18.93	67.40	14.66	37.72	38.39
P_1G_5	55.21	19.93	83.40	15.75	45.39	44.05
P_1G_6	63.00	22.80	88.13	16.55	47.17	47.05
P_1G_7	68.20	14.80	39.67	12.34	34.84	35.21
P_2G_1	48.40	17.00	53.80	13.62	35.18	35.81
P_2G_2	52.20	15.60	52.60	13.84	35.91	36.58
P_2G_3	58.27	17.40	60.33	14.32	36.42	36.75
P_2G_4	58.67	17.80	66.80	14.10	36.62	36.62
P_2G_5	71.67	18.80	72.00	14.69	37.77	38.44
P_2G_6	72.53	20.20	76.80	15.42	43.74	44.08
P_2G_7	74.60	12.40	37.39	10.50	33.88	34.84
S.E(M)	1.72	0.54	2.03	0.41	1.12	0.95
CD@5%	4.99	1.58	5.91	1.19	3.25	2.77

71.40 cm, which was statistically similar to G_6 (Cycocel @ 1000 ppm) at 67.77 cm. A significant interaction was noted between pinching and growth retardant treatments. The combination P_1G_1 (Pinching + Mepiquat chloride) resulted in the minimum plant height (45.47 cm), whereas the maximum height (74.60 cm) was found in P_2G_7 (No pinching + Control).

At 90 DAT, the lowest plant height was observed in P_1 (Pinching) due to removal of apical meristem, which suppressed apical dominance and promoted lateral growth (Mutlu and Agan, 2015). Similar results were reported by Habiba *et al*. (2012), Khan *et al*. (2018), Chopde *et al*. (2019), Ullah *et al*. (2019) and Tirkey *et al*. (2023). G_1 (Mepiquat chloride @ 500 ppm) also showed minimum height due to inhibition of gibberellin biosynthesis, which restricted internode elongation (Laermann *et al*., 1992), in line with findings of Pinto *et al*. (2003) and Asgarian *et al*. (2013) in Zinnia.

Number of primary branches per plant

Significant differences were observed in the number of primary branches per plant at 90 DAT across all

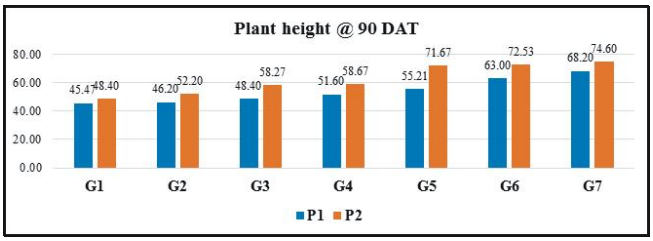

Fig. 1 : Effect of pinching and growth retardants on plant height (cm) at 90 DAT of annual chrysanthemum.

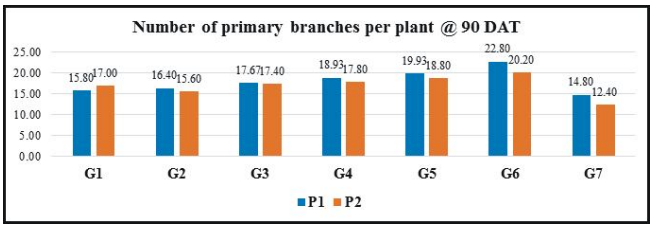

Fig. 2 : Effect of pinching and growth retardants on number of primary branches per plant at 90 DAT of annual chrysanthemum.

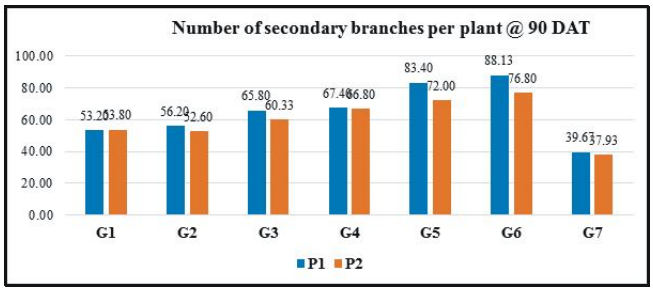

Fig. 3 : Effect of pinching and growth retardants on of secondary branches per plant at 90 DAT of annual chrysanthemum.

treatments. P_1 (Pinching) produced more branches (18.05) compared to P_2 (No pinching) (17.03). Among growth retardants, G_6 (Cycocel @ 1000 ppm) recorded the highest branch count (21.50), while G_7 (Control) had the lowest (13.60). The interaction between pinching and growth retardants was also significant, with the highest number of branches (22.80) in P_1G_6 (Pinching + Cycocel) and the lowest (12.40) in P_2G_7 (No Pinching + Control).

The highest number of primary branches was observed in P_1 (Pinching) due to the breaking of apical dominance, promoting axillary bud growth (Khan *et al*., 2018). Similar findings were reported by Rakesh *et al*. (2005) in Chrysanthemum. G_6 (Cycocel @ 1000 ppm) also increased branching by suppressing apical meristem activity and breaking dormancy (Hamza *et al*., 2019), aligning with results from Syamal *et al*. (1990) and Deotale *et al*. (1995).

Number of secondary branches per plant

The number of secondary branches per plant at 90 DAT was significantly affected by pinching, with P_1 (Pinching) producing more branches (64.83) than P_2 (No pinching) (60.04). Growth retardants also had a notable impact; G_6 (Cycocel @ 1000 ppm) recorded the highest count (82.47), similar to G_5 (77.70), while G_7 (Control) had the lowest (38.80). A significant interaction was observed, with the greatest number of branches (88.13) in P_1G_6 (Pinching + Cycocel) and the fewest (37.93) in P_2G_7 (No pinching + Control).

The highest number of secondary branches at 90 DAT was observed in P_1 (Pinching), likely due to the disruption of apical dominance, encouraging axillary bud sprouting. Similar results were reported by Khobragade *et al*. (2012) and Kumar *et al*. (2015) in China aster and Khan *et al*. (2018) in Marigold.

Stem diameter(mm)

Pinching and growth retardant treatments had a significant impact on stem diameter at 90 DAT. P_1 (Pinching) showed greater stem diameter (14.27 mm) than P_2 (No pinching) (13.78 mm). Among growth retardants, G_6 (Cycocel @ 1000 ppm) recorded the highest diameter (15.99 mm), comparable to G_5 (15.22 mm), while the lowest was in G_7 (Control) (11.42 mm). A significant interaction was observed, with P_1G_6 (Pinching + Cycocel @ 1000 ppm) recording the highest stem diameter (16.55 mm) and the lowest in P_2G_7 (No pinching + Control) (10.50 mm).

The greatest stem diameter at 90 DAT was observed in P_1 (Pinching), caused by reduced vertical growth that redirected metabolites to thicken the stem (Nathan *et*

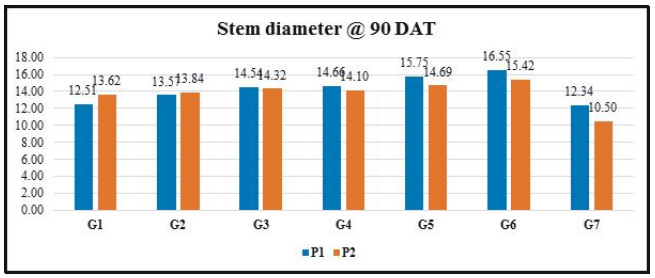

Fig. 4 : Effect of pinching and growth retardants on stem diameter (cm) at 90 DAT of annual chrysanthemum.

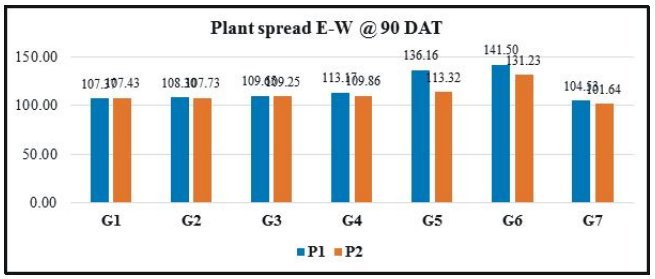

Fig. 5 : Effect of pinching and growth retardants on Plant spread(E-W) (cm) at 90 DAT of annual chrysanthemum.

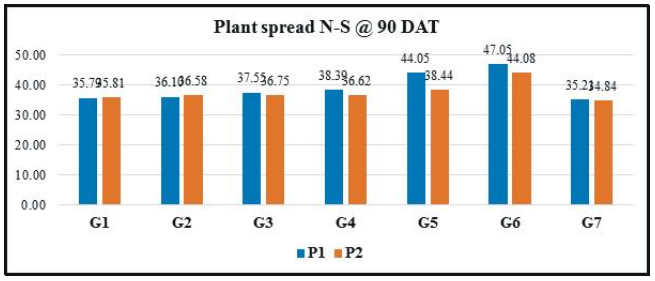

Fig. 6 : Effect of pinching and growth retardants on Plant spread(N-S) (cm) at 90 DAT of annual chrysanthemum.

al., 2019), consistent with Chopde *et al*. (2019). G_6 (Cycocel @ 1000 ppm) also produced thicker stems by inhibiting cell elongation as an anti-gibberellin, resulting in shorter but sturdier plants, similar to findings by Karagoz *et al*. (2022) and Singh *et al*. (2018).

Plant spread E-W (cm)

Significant differences in plant spread (E-W) were observed among treatments at 90 DAT. P_1 (Pinching) showed greater spread (39.08 cm) than P_2 (No pinching) (37.16 cm). Among growth retardants, G_6 (Cycocel @ 1000 ppm) had the highest spread (45.46 cm), while G_7 (Control) had the lowest (34.36 cm), similar to G_1G_4. A significant interaction was found, with P_1G_6 (Pinching + Cycocel) showing the widest spread (47.17 cm) and P_2G_7 (No pinching + Control) the narrowest (33.88 cm).

At 90 DAT, P_1 (Pinching) showed the greatest plant spread (E-W) due to redirected metabolites promoting unrestricted axillary bud growth and increased branching, consistent with Kumar *et al*. (2014), Wani *et al*. (2018) and Bhargavi *et al*. (2021). G_6 (Cycocel @ 1000 ppm) also increased spread by inhibiting apical dominance, resulting in more branches, as supported by Singh *et al*. (2018) in Chrysanthemum and Patel *et al*. (2022) in Bougainvillea.

Plant spread N-S (cm)

Plant spread (N-S) at 90 DAT showed significant variation between pinching treatments, with P_1 (Pinching) exhibiting greater spread (39.16 cm) than P_2 (No pinching) (37.59 cm). Growth retardants also affected spread, with G_6 (Cycocel @ 1000 ppm) having the highest value (45.57 cm) and G_7 (Control) the lowest (35.03 cm). A significant interaction showed P_1G_6 (Pinching + Cycocel) had the widest spread (47.05 cm), while P_2G_7 (No pinching + Control) had the narrowest (34.84 cm).

The highest plant spread (N-S) at 90 DAT was recorded in P_1 (Pinching), attributed to the same factors influencing the E-W spread. Similarly, G_6 (Cycocel @ 1000 ppm) exhibited the greatest N-S spread, consistent with its impact on E-W spread.

Conclusion

The study revealed that both pinching and application of plant growth retardants significantly influenced the vegetative growth of annual chrysanthemum under Central Telangana conditions. Pinching (P_1) alone enhanced key vegetative parameters compared to no pinching. Among growth retardants, Cycocel @ 1000 ppm showed the most favourable impact on plant growth. The combination treatment P_1G_6 (Pinching + Cycocel 1000 ppm) recorded the highest values for number of branches, stem diameter and plant spread at 90 DAT. Thus, P_1G_6 can be recommended for optimal vegetative growth in annual chrysanthemum cultivation.

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