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Studies on effect of plant growth regulators on growth and yield of Gaillardia (*Gaillardia pulchella* L.)

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Abstract

The present study entitled “Studies on effect of plant growth regulators on growth and yield of Gaillardia (*Gaillardia pulchella* L.)” was conducted during Rabi season 2023-24 at the Pt. K.L.S. College of Horticulture and Research Station, Rajnandgaon (C.G.). The field experiment was conducted in Randomized Block Design (RBD) with thirteen treatment and three replication. The treatment includes, T₁ (NAA 100 ppm), T₂ (NAA 150 ppm), T₃ (NAA 200 ppm), T₄ (GA₃ 100 ppm), T₅ (GA₃ 200 ppm), T₆ (GA₃ 250 ppm), T₇ (MH 50 ppm), T₈ (MH 100 ppm), T₉ (MH 150 ppm), T₁₀ (PBZ 150 ppm), T₁₁ (PBZ 250 ppm), T₁₂ (PBZ 500 ppm) and T₁₃ control (Distilled water) as foliar application at 30, 45 and 60 days. The results showed significantly better performance at vegetative parameter like maximum plant height (73.30 cm), number of branches per plant (74.26) and as well as yield parameter like number of flower/plant (75.51) and flower yield/plant (177.90 g) was recorded in treatment T₅ (GA₃ 200 ppm). Whereas minimum plant height (47.15 cm) was recorded in treatment T₇ (MH 50 ppm), while lowest number of branches (55.99) and as well as yield parameter like minimum number of flower/plant (61.46), minimum flower yield/plant (122.30 g), was recorded in treatment T₁₃ control (Distilled water).

Keywords: Gaillardia, plant growth regulators, foliar application, vegetative growth, yield, flowering

Introduction

Gaillardia (*Gaillardia pulchella* L.) belong to Asteraceae family native of South Western United States and Mexico and chromosome number is $2n = 36$. Popularly known as blanket flower due to its coloration and spreading addiction. It's far one of the most popular plants in India because of its clean cultivation, sizable adaptability to diverse soils and climatic situations with prolonged duration of flowering and attractive flower colour. The increase of plant is hairy with spreading branches having thin, long and barely bushy leaves. Flower colour consists of very appealing vivid yellow, crimson, cream, yellow, orange, scarlet, copper and bronze. Out of the 30 species *G. pulchella*, *G. aristata* and *G. grandiflora* keep enormous horticultural importance being annual, biennial and perennial forms.

The Gaillardia is in particular grown for its reduce plant life and the unfastened vegetation are used for making garlands, utilized in spiritual event and for decoration at some stage in social capabilities. Its gorgeously colored flora are amazing prepared in copper bowls or simple simple-colored vases. The plants are grown in herbaceous borders and flower beds. In addition to aesthetic price in landscape Gaillardia pulchella is useful for controlling erosion in coastal dune areas. Gaillardia aristata is well desirable for dryland areas and require low upkeep (Cox and Klett, 1984)^[3].

In India, the main nation for flower manufacturing are, Karnataka, Maharashtra, Andhra Pradesh, West Bengal, Tamil Nadu, Jammu & Kashmir, Sikkim, Rajasthan, Uttar Pradesh, Delhi, Haryana and Kerala. The region below Floriculture production in India turned into 309 thousand hectares with a production of 2246 thousand MT (NHB, 2016-17). Maharashtra, contributes for the 12.23 thousand ha vicinity and 106 thousand MT productions (Anon; 2017)^[2].

Gaillardia is grown as reduce plant life and unfastened plant life in Chhattisgarh; the districts that domesticate it the most are Bilaspur, Mungeli, Dantewada, Raigarh and Raipur with a floor

place of 184 ha and a manufacturing of 1108 MT in Chhattisgarh (Anon; 2019) ^[2]. Plant growth regulators (PGRs) provide a greater threat of growing the excellent and yield of *Gaillardia* within the confined cultivated region of Chhattisgarh. *Gaillardia* has a whole lot of potential to capture the flower market and the monetary increase of farmers, however within the nation of Chhattisgarh, it covers a completely small vicinity and produces little.

Gibberelic acid has been located to play a great position in promoting plant increase with the aid of stimulating the development of an multiplied extensive style of primary and secondary branches and contributes to enhancing flower quality by using ensuring uniformity in flower length and range this effect in the end outcomes in higher flower production (Acharya *et al.* 2021) ^[1].

Paclobutrazol reduces plant peak by way of suppressing the apical dominance, increases the number one and secondary branches there via the use of increasing the flower huge range with discount of flower diameter. on the other hand, maleic hydrazide falls in increase inhibitor corporation of plant growth retardants. it's miles one of the first growth inhibitors to reap the market. Maleic hydrazide prevents mobile elongation, initiation of leaf and flower and can delay the flowering time. any other boom promoter hormone is auxin. NAA is one of the most significantly used artificial auxin. it's far used for the purpose of inducing flowering, preventing losing of flower buds.

Materials and Methods

The experiment was conducted at experimental farm, under Pt. Kishori Lal Shukla College of Horticulture and Research Station, Pendri, Rajnandgaon Chhattisgarh during the year 2023-2024. The experiment was laid out in Randomized Block Design (RBD) with thirteen treatments and three replications. The treatment includes, T₁ (NAA 100 ppm), T₂ (NAA 150 ppm), T₃ (NAA 200 ppm), T₄ (GA₃ 100 ppm), T₅ (GA₃ 200 ppm), T₆ (GA₃ 250 ppm), T₇ (MH 50 ppm), T₈ (MH 100 ppm), T₉ (MH 150 ppm), T₁₀ (PBZ 150 ppm), T₁₁ (PBZ 250 ppm), T₁₂ (PBZ 500 ppm) and T₁₃ Control (Distilled water). The preparatory tillage became executed and flat beds of 1.5 m X 2 m² had been organized and one month antique seedlings of *gaillardia* have been transplanted at spacing of forty X 30 cm. The recommended interculture operations have been followed uniformly to experimental plots. The Spraying with exclusive increase regulators became accomplished three times i.e. 30, 45 and 60 days after transplanting. The observations on increase and flowering parameters viz; plant height (cm), number of branches in keeping with plant, range of flower/plant and flower yield/plant (g) have been recorded and analyzed statistically as technique defined.

Results and Discussion

Plant height (cm)

Findings on effect of different plant growth regulators on plant height of *gaillardia* has been presented in Table 1. It is clear from the table that the application of different plant growth regulators, showed significant effect in plant height. The maximum plant height (49.40 cm and 73.30 cm) at 60 DAT and 90 DAT was recorded in treatment T₅ (GA₃200 ppm), which was statically at par with treatments T₄(GA₃ 100 ppm). Whereas, minimum plant height (22.10 cm and 47.15 cm) at 60 and 90 DAT respectively were recorded in treatment T₇ (MH 50 ppm). The maximum plant height was observed in treatment T₅(GA₃ 200ppm) might be due to GA₃ was known to improve the plant height by influence the inter nodal length, its property to both

cell division and cell elongation (Reddy and Sulladmath, 1983) ^[19]. These results are in closed confirmatory with Patel (1997) ^[15], Patil (2002) ^[16], Makwana *et al.* (1999) ^[13], Delvadia *et al.* (2009) ^[5], Ghadage *et al.* (2010) ^[6] and Kadam *et al.* (2020) ^[8] in *Gaillardia*. Where as, plant height (47.15 cm) was retarded by treatments T₇MH (50 ppm). might be due to the antiauxin effect on MH with stimulation of dwarfing qualities and nullification of apical dominance (Crafts *et al.*, 1950) ^[4]. MH reduce plant height by preventing cell division in the sub-apical meristem without impacting the apical meristem. The result in accordance with the findings of Khimani *et al.* (1994) ^[10] and Patel (1997) ^[15] in *gaillardia*.

Number of branches per plant

Findings on effect of different plant growth regulators on number of branches per plant of *gaillardia* has been presented in Table 1. The result revealed that the application of different plant growth regulators, showed significant effect on number of branches per plant. The maximum number of branches per plant (35.38 and 74.26) at 60 DAT and 90 DAT was recorded in treatment T₅ (GA₃200 ppm), which was statistically at par with treatments T₄ (GA₃ 100 ppm), T₆ (GA₃ 250 ppm). While, minimum number of branches (23.87 and 55.99) at 60 and 90 DAT respectively were recorded with treatment T₁₃ (control). Treatment T₅ (GA₃ 200 ppm) recorded the highest number of branches per plant might be due to GA₃ enhanced the number of internodes and improved the plant's photosynthetic efficiency by increasing chlorophyll. As a result, those nodes produced more dormant buds, which may additionally have been the source of the principle branches (Krishna kumar and Ughreja, 1998) ^[11]. comparable end result were reported via Vijay kumar *et al.* (2017) ^[22] in china aster, Delvadia *et al.* (2009) ^[5] and Ghadage *et al.* (2010) ^[6] in *Gaillardia*, Kanwar and Khandelwal (2013) ^[9] in marigold and Shinde *et al.* (2010) ^[20] in chrysanthemum. The minimum variety of branches (55.99) became recorded with treatments T₁₃ (control). comparable end result had been said by way of Vijay kumar *et al.* (2017) ^[22] in China aster, Delvadia *et al.* (2009) ^[5] and Ghadage *et al.* (2010) ^[6] in *gaillardia*, Kanwar and Khandelwal (2013) ^[9] in marigold and Shinde *et al.* (2010) ^[20] in chrysanthemum.

Number of flower/plant

Findings on effect of different plant growth regulators on number of flower/plant in *gaillardia* has been presented in Table 1. The data on number of flowers also showed significant differences among the treatments. Maximum number of flowers (75.51) were recorded under the treatment T₆ (GA₃ @ 200 ppm) which was statistically at par with treatment T₄(GA₃100ppm), T₆(GA₃ 250ppm), Where as, minimum number of flowers per plant (61.46) recorded in treatment T₁₃ (Control). Maximum number of flowers/plant was recorded in treatment T₅(GA₃200ppm) might be due to the production of more number of branches and more plant spread which lead to increase in the number of flowers. After successful vegetative phase only, the plant could step in to reproductive phase with better yield. Similar results were found by Poshiya *et al.* (1995), ^[17] Ramdevputra *et al.* (2009) ^[18] and Salem *et al.* (2016) in gerbera.

Flower yield/plant (g)

The data on flower yield per plant is presented in Table revealed that flower yield per plant in different PGR treatment showed variation. Highest flower yield/plant (177.90 g) was recorded in treatment T₅ (GA₃ 200ppm), which was followed by treatments T₄ (GA₃ 100 ppm), Whereas, lowest flower yield per plant

(122.30 g) was recorded in treatment T13(Control). Highest flower yield/plant was recorded in treatment T5 (GA₃ 200ppm) might be because of greater variety of plants in step with plant and improvement in weight of plant life in step with plant and production of massive range of laterals at early level of increase which had enough time to build up carbohydrate for correct

flower bud differentiation due to stronger reproductive efficiency and photosynthesis restrictive plant kind. The results are in agreement with the findings of Munikrishnappa and Chandrashekar (2014)^[14], Vijayakumar *et al.* (2017)^[23], Imandi and Subba Reddy (2017)^[7] in marigold, Sindhuja *et al.* (2018)^[21] and Kuri *et al.* (2018)^[12] in china aster.

Table 1: “Studies on effect of plant growth regulators on growth and yield of Gaillardia (*Gaillardia pulchella* L.)”

Treatment notation	Treatment details	Plant height (cm)		Number of branches per plant		Number of flower/plant	Flower yield/plant (g)
		60 DAT	90 DAT	60 DAT	90 DAT		
T ₁	NAA 100 ppm	39.82	64.50	26.96	59.36	64.19	146.34
T ₂	NAA 150 ppm	43.05	65.80	28.12	60.39	64.79	148.81
T ₃	NAA 200 ppm	44.88	66.20	28.86	64.86	66.99	151.26
T ₄	GA ₃ 100 ppm	47.56	72.10	34.52	72.23	74.40	170.06
T ₅	GA ₃ 200 ppm	49.40	73.30	35.28	74.26	75.51	177.90
T ₆	GA ₃ 250 ppm	46.17	70.30	32.52	71.46	73.26	167.66
T ₇	MH 50 ppm	22.10	47.15	27.43	62.46	60.33	152.95
T ₈	MH 100 ppm	23.33	48.95	28.33	67.46	64.66	154.21
T ₉	MH 150 ppm	24.33	49.42	28.91	68.39	67.33	161.40
T ₁₀	PBZ 150 ppm	37.26	48.23	30.63	69.23	69.86	158.30
T ₁₁	PBZ 250 ppm	38.33	50.16	31.19	70.26	71.26	162.69
T ₁₂	PBZ 500 ppm	39.13	51.20	31.64	70.53	72.56	164.22
T ₁₃	Control (Distilled water)	25.39	55.40	23.87	55.99	61.46	122.30
SE(m±)		1.85	2.77	1.49	3.01	3.21	6.32
C.D. at 5%		5.40	8.09	4.34	8.78	9.39	18.47
CV%		8.66	8.18	8.61	7.81	8.16	6.99

Conclusion:

According to the research findings application of different plant growth regulators had a significant impact on growth and flowering of gaillardia. Among the different plant growth regulators, application of GA₃ 200 ppm (T₅) recorded the maximum plant height (cm) at 60 and 90 DAT, number of branches per plant at 60 and 90 DAT, number of flower per plant and flower yield per plant (g). Considering the effect of different plant growth regulators, the treatment T₅ (GA₃ 200 ppm) showed a significant impact on vegetative growth of gaillardia over the rest of the treatment. Hence, the treatment T₅ (GA₃ 200 ppm) may be recommended as foliar spray for improvement of growth and flowering of Gaillardia.

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