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Effect of plant growth regulators (PGRs) and pinching on fresh weight and dry weight of plant and flower in gaillardia

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Abstract

The trial was carried out at Research block of College of Horticulture, Dapoli, Dist. Ratnagiri (Maharashtra state) in Rabi season of the year 2020- 21 to evaluate the of Gaillardia response to PGRs and pinching in relation to fresh weight and dry weight of plant and flower of gaillardia. The experiment was designed in FRBD comprising of three replications with seven treatments of plant growth regulator (PGRs) (Factor A) viz; Control (No spray of PGR), Ethephon (500ppm), Ethephon (1000 ppm), GA₃ (100 ppm), GA₃ (200 ppm), CCC (1000 ppm) and CCC (2000 ppm). The second factor was pinching practices as Pinching at 30 days after transplanting second was Control (No Pinching). The fresh weight of plant (1370.67 g) was found highest in T₅ (GA₃ 200 ppm) and it was at par with T₁ (Control). The least fresh weight (533 g) of plant was in T₃ (Ethephon 1000 ppm). Significantly highest fresh weight (975.29 g) of plant was noted in P₁ (pinching at 30 DAT). The maximum plant fresh weight (1477.00 g) was recorded in T₅P₁ (GA₃ 200 ppm + Pinching) and minimum fresh weight (458.00 g) of plant recorded in T₃P₂ (Ethephon 1000 ppm + no pinching) treatment. The maximum dry weight (258.33 g) of plant was perceived in T₅ (GA₃ 200 ppm) and was followed by T₄ (232.17 g) and Control (145.00 g). Minimum plant dry weight (98.88 g) was observed in T₂ (Ethephon 500 ppm). The maximum flower fresh weight (3.83 g) was recorded in T₁ (Control). The was P₁ (pinching at 30 DAT) maximum flower fresh weight (3.20 g) recorded and minimum fresh weight (2.99 g) was observed in no-pinching treatment. The maximum weight of dry flower (0.88 g) was recorded in T₁ (Control) and dry flower weight (0.44 g) was minimum in T₃ (Ethephon 1000 ppm) treatment. Significantly maximum dry weight (0.71 g) of flower was recorded pinching treatment and un-pinched treatment recorded least dry flower weight (0.63 g).

Keywords: Gaillardia fresh weight, dry weight, plant and flower

Introduction

Gaillardia (*Gaillardia pulchella*) is extensively grown annual flower in India. Among the Asteraceae family, Gaillardia is generally grown for its cut flowers. It is commonly called 'blanket flower'. The loose flowers of gaillardia are also utilized for making garlands in religious events and also for decoration in societal functions. Among the commercial flowers, this crop is easy to cultivate. Numerous factors like, environment, genetic behavior, and crop management influence the profitable cultivation of the flower crops. In the development of the sustainable package of practices for attaining high yield and quality of flowers, use of the growth regulators is one of the means (Kadam *et al.*, 2020)^[3].

Pinching is the cultural practice which is followed in flower crops to produce side branches in plant which ultimately produces higher yield of flowers with better quality. The influence of such practices viz; uses of plant growth regulator and pinching also influence the biomass of the plant as well as flowers which are also the important factors of plant development and flower quality. Higher fresh and dry weight in a plant generally indicates more biomass, suggesting vigorous growth and potentially more efficient resource utilization. With this outlook, the present experiment was formulated to evaluate the influence of plant growth regulator (PGRs) and pinching on fresh and dry weight of plant and flower in gaillardia crop.

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Materials and Methods

The field experiment was taken at Research block of College of Horticulture, Dapoli, Dist. Ratnagiri during *Rabi* season of the year 2020-21. The trial was formulated in Factorial Randomized Block Design comprising of three replications with seven treatments of plant growth regulator (PGRs) (Factor A) viz; Control (No spray of PGR), Ethephon (500ppm), Ethephon (1000 ppm), GA₃ (100 ppm), GA₃ (200 ppm), CCC (1000 ppm) and CCC (2000 ppm). The second factor was pinching practices as Pinching at 30 days after transplanting second was Control (No Pinching). After following preparatory tillage, the flat beds (1.2 X 1.8 m²) were made and 4 weeks old gaillardia seedlings were transplanted at 30 cm X 30 cm spacing. The intercultural operations were followed unvaryingly in all the treatment combination plots. The Sprays with different PGRs were given as per the treatments three times in growth period of crop i.e. 30, 45 and 60 days after transplanting. The pinching was also done as second factor treatment. The observations of weight (fresh and dry) of whole plant as well as flowers were noted. Statistical analysis of the data was carried out by method given by Panse and Sukhatme (1985)^[7].

Results and Discussion

The data regarding influence of PGRs and pinching on fresh weight and dry weight of plant in gaillardia is presented in Table 1.

The data regarding fresh weight of plant showed significant variation due to plant growth regulators. The highest fresh weight of plant (1370.67 g) was recorded in T₅ (GA₃ 200 ppm) and it was closely followed by Control (T₁). The fresh weight (533 g) of plant was found lowest in T₃ (Ethephon 1000 ppm).

Fresh weight of whole plant was directly associated with branching and leaves number. The increase in plant height, spread, number of branches and leaves enhanced the fresh weight of the plant. The maximum fresh weight of gaillardia was noted with GA₃ treated plant. The results were similar to Narute (2020)^[6] in marigold.

Significantly highest fresh weight (975.29 g) of plant was recorded P₁ (pinching at 30 DAT) where P₂ (no-pinching) treatment recorded lowest plant weight (936.48 g). The increase in fresh weight of plant in pinching treatment which may be because of enhanced growth of plants with pinching resulting more fresh weight of plant. Similar trend has also been reported by Joshi *et al.* (2002)^[2] and Rathore *et al.* (2011)^[8] in marigold.

The interaction effect between plant growth regulators and pinching on fresh weight of plant was found significant. The highest fresh weight (1477.00 g) of plant was recorded in T₅P₁ (GA₃ @200 ppm +Pinching at 30 DAT) and it was followed by T₁P₁ and T₁P₂. Minimum fresh weight (458.00 g) of plant recorded in T₃P₂ (Ethephon @ 1000 ppm + no pinching) treatment. In present, investigation maximum fresh weight of plant was observed in interaction between GA₃ @ 200 ppm and pinching. GA₃ treated plants with pinching had more branches, highest plant spread and leaf area which may be cause to increased fresh weight of plant.

The maximum dry weight (258.33 g) of plant was perceived in T₅ (GA₃ @ 200 ppm) and was followed by T₄ (232.17 g) and Control (145.00 g). Minimum plant dry weight (98.88 g) was observed in T₂ (Ethephon @500 ppm) at par with T₆ and T₃. Similar results were reported by Narute (2020)^[6] in marigold.

The variation in the dry weight of plant may be attributed with the depletion of moisture from the plant. The PGR exhibited synergetic effect on dry weight.

Pinching treatment did not significantly influence the dry weight of plant. Interaction effect between plant growth regulator and pinching on dry weight of plant was also found to be non-significant. Numerically maximum dry weight (281.67 g) was recorded in T₅P₁ (GA₃ @ 200 ppm along with pinching at 30 days after transplanting) and the minimum dry weight of plant (96.10 g) in T₂P₂ treatment. The dry weight was associated with fresh weight.

The data on effect of PGRs and pinching on fresh and dry weight of flower are presented in Table 2.

Fresh weight of single flower of gaillardia was significantly influenced due to the different PGRs. The maximum fresh weight of flower (3.83 g) was recorded in Control (T₁) which was followed by T₇, T₆ and T₄ treatments. The minimum flower weight (2.50 g) was recorded in T₂ (Ethephon 500 ppm). Treatment control (T₁) recorded maximum fresh weight of flower. the variation among flowers weight might be due to alteration in flower size and number of petals due to PGRs treatments. This difference in weight of flower among various PGRs treatments may be allied to the higher carbohydrate level and moisture content in flowers. Similar results were also noted by Makwana (1999)^[5] in gaillardia and Dani *et al.* (2010)^[1] in marigold.

Pinching significantly influenced on fresh weight of flower and maximum fresh weight (3.20 g) was recorded in P₁. Whereas, minimum fresh weight (2.99 g) was observed in control treatment. As the flower size in pinching treatment improved which ultimately complimentary for increase in flower weight. Similar findings are related to Rathore *et al.* (2011)^[8] in marigold and Khobragade *et al.* (2012)^[4] in China aster.

The non-significant effect on the fresh flower weight was observed between PGRs and pinching interaction.

Dry weight of single flower was significantly influenced by the different PGRs. The maximum weight of dry flower (0.88 g) was recorded in T₁ (Control) which was followed by the treatments T₇ and T₆ (0.80 g and 0.67 g). The minimum flower weight (0.44 g) was observed in T₃ (Ethephon 1000 ppm) treatment.

Pinching treatment significantly influenced the dry flower weight. Significantly maximum dry weight (0.71 g) of flower was registered in P₁. Where un- pinched treatment recorded least dry flower weight (0.63 g). Similar findings were related to Rathore *et al.* (2011)^[8] in marigold.

The effect between PGRs and pinching interaction on dry weight of flower was non-significant.

Table 1: Effect of plant growth regulators and pinching on Fresh weight and dry weight of Gaillardia plant

Treatment combinations	Fresh weight(g)			Dry weight(g)		
	P ₁	P ₂	Mean	P ₁	P ₂	Mean
T ₁	1356.00	1317.67	1336.83	155.00	135.00	145.00
T ₂	672.33	639.67	656.00	101.67	96.10	98.88
T ₃	458.00	609.00	533.50	111.83	104.10	107.97
T ₄	1169.33	1141.00	1155.17	233.67	230.67	232.17
T ₅	1477.00	1264.33	1370.67	281.67	235.00	258.33
T ₆	752.33	704.67	728.50	109.33	101.33	105.33
T ₇	942.00	879.00	910.50	150.33	139.00	144.67
Mean	975.29	936.48	955.88	163.36	148.74	156.05
	S.Em ±	C.D at 5%	Result	S.Em±	C.D at 5%	Result
T	19.42	56.46	SIG	2.35	6.84	SIG
P	10.38	30.18	SIG	0.67	-	NS
TxP	27.42	79.84	SIG	4.71	-	NS

DAT–Days After Transplanting

PGRs Treatments	Pinching Treatments
1) T ₁ –Control	2) T ₂ – Ethephon @ 500 ppm
3) T ₃ – Ethephon @ 1000 ppm	4) T ₄ – GA ₃ @ 100 ppm
5) T ₅ – GA ₃ @ 200 ppm	6) T ₆ – CCC @ 1000 ppm
7) T ₇ – CCC @ 2000 ppm	

Table 2: Effect of plant growth regulators and pinching on Fresh weight and dry weight of Flower

Treatment combinations	Fresh weight (g)			Dry weight(g)		
	P ₁	P ₂	Mean	P ₁	P ₂	Mean
T ₁	3.93	3.73	3.83	0.91	0.84	0.88
T ₂	2.70	2.30	2.50	0.61	0.50	0.55
T ₃	2.90	2.77	2.83	0.45	0.43	0.44
T ₄	3.03	2.97	3.00	0.71	0.58	0.63
T ₅	2.80	2.57	2.68	0.63	0.55	0.45
T ₆	3.42	3.06	3.24	0.87	0.76	0.67
T ₇	3.60	3.53	3.57	0.81	0.80	0.80
Mean	3.20	2.99	3.09	0.71	0.63	0.67
	S.Em ±	C.D at 5%	Result	S.Em±	C.D at 5%	Result
T	0.08	0.24	SIG	0.02	0.07	SIG
P	0.04	0.13	SIG	0.01	0.04	SIG
TxP	0.11	-	NS	0.04	-	NS

DAT–Days After Transplanting

PGRs Treatments	Pinching Treatments
1) T ₁ –Control	2) T ₂ – Ethephon @ 500 ppm
3) T ₃ – Ethephon @ 1000 ppm	4) T ₄ – GA ₃ @ 100 ppm
5) T ₅ – GA ₃ @ 200 ppm	6) T ₆ – CCC @ 1000 ppm
7) T ₇ – CCC @ 2000 ppm	

Conclusion

The present investigation revealed that, plant growth regulators had significant effect on fresh and dry weight of plant as well as flowers of gaillardia (*Gaillardia pulchella*). GA₃ 200 ppm treatment was having profound effect plant and flower weight. The pinching also improved the fresh weight of plant and flowers.

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