

Original Research Article

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Effect of Pinching and Paclobutrazol Application on Plant Growth, Yield and Quality of African Marigold cv. Pusa Narangi

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ABSTRACT

A field experiment was conducted to evaluate the response of pinching and paclobutrazol on growth and yield of African marigold cv. Pusa Narangi in modern floriculture centre, G. B. Pant university of agriculture and technology, pantnagar, Uttarakhand. The experiment was laid out in Randomized Block Design (Factorial) with twelve treatment combinations consisting 3 different concentration of paclobutrazol viz. PBZ @ 30, 60, 90 ppm and each concentration tried on pinched and non pinched plants. Pinching was done at 35 and 45 days after transplanting along with control (without pinching). The results revealed that pinching 45 days after transplanting significantly influenced several vegetative parameters like plant height (79.70 cm), primary branches per plant (15.80) and yield (427.50 g) and among the different concentration of paclobutrazol 90 ppm shows the best result.

Keywords

African marigold, Paclobutrazol, Pinching, Pusa Narangi, Plant growth, Flower yield

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Introduction

In India marigold ranks first among the loose flowers followed by chrysanthemum, jasmine and tuberose. Marigold [*Tagetes erecta* (L.) Asteraceae] in India has high demand because of its orange to mahogany red coloured flowers, which are used for garland market, decoration in religious and social functions. The aromatic oil extracted from marigold is called as "tagetes oil". It is used in

preparation of high grade perfumes. It is native of south and central America. The genus *Tagetes* comprises about 33 species. In African marigold, apical dominance plays a crucial role in accelerating axillary branches and flower production. Its plants first grow upward to their final height and after the formation of flower buds, axillary buds develops into branches which also bear flowers. However, if apical portion of shoot is pinched early, large number of axillary shoots

arises resulting in to well branched plants with more number of uniform flowers. It is shallow rooted crop, therefore, plants become lanky if they are not pinched at proper stage. It is observed that exogenous foliar application of paclobutrazol stimulates growth and flowering to get maximum yield of flowers (Paliwal, 2000). In most of the flower crops, the flower yield is mainly dependent on number of flowers bearing branches which can be manipulated by checking vertical growth of plants and encouraging side shoots by means of apical bud pinching but studies on influence of pinching of apical bud in African marigold and its effect on flower yield and quality are meagre. Growth regulators are used to overcome the factors limiting the growth and yield to harness maximum benefit from marigold flower production. It is also observed that exogenous foliar application of growth regulators simulates growth and flowering to get maximum yield of flower (Dagoudar *et al.*, 2002).

Materials and Methods

The present investigation conducted at Model Floriculture Centre, Department of Horticulture, G B Pant University of Agriculture and Technology, Pantnagar, Uttarakhand to ascertain the response of pinching and paclobutrazol on performance of African marigold cv. Pusa Narangi during 2013-14. The experiment consist of pinching (non pinching, pinching at 35 days after transplanting and 45 days after transplanting) and different concentration of paclobutrazol (control spray, PBZ @ 30, 60 and 90 ppm) as second factor with twelve treatment combinations in three replication under Randomized Block Design (factorial). The experimental site is located at 29 °N latitude, 79.3°E longitude and at an altitude of 243.84 m amsl. Observations were recorded on plant height, stem diameter (cm), number of

primary branches per plant, number of secondary branches per plant, days taken for first flower bud initiation, days taken for first flowering, days to 50 per cent flowering, flowering duration (days) and number of flower per plant. For recording observations five plants were randomly selected and tagged from each plot and their mean was calculated. To raise a successful crop, all standard cultural practices were followed. Data were subjected to Fisher's analysis of variance and interpretations were made as per Gomez and Gomez (1983).

Results and Discussion

The plant height was significantly influenced by both pinching and foliar application with paclobutrazol. The plants pinched at 45 days after transplanting reduced the plant height (81.04) followed by the plants pinched 35 days after transplanting (87.34). The reduction in plant height and increased plant spread in pinched plants is mainly due to apical meristematic tissue, inhibiting apical dominance and diverting plant. Among the different PBZ concentrations 90 ppm found most effective (84.09) compare to other treatments. The reduction in plant height and increased plant spread in pinched plants is mainly due to apical meristematic tissue, inhibiting apical dominance and diverting plant. metabolites from vertical growth to horizontal growth.

These findings are in line with previous researches (Pushkar and Singh 2012). The reduced plant height due to paclobutrazol might be through inhibition of gibberallin biosynthesis and restricted growth of the internodes. The results are in conformity with the findings of Singh (2004) in marigold. Plants treated with 90 ppm PBZ and pinched at 45 days after transplant reduced the plant height(79.70cm).

Table.1 Effect of pinching and Paclobutrazol on vegetative and growth attributes of African marigold cv. Pusa Basanti Narangi

Treatments	Plant height (cm)	Stem diameter (cm)	Primary branches per plant	Secondary branches per plant	Days taken for first bud initiation	Days taken for first flower	Days taken for 50 percent flowering	Flowering duration (days)	Flower diameter (cm)	Number of flowers per plant	Yield per plant (g)
Pinching											
No pinching (P1)	90.05	1.99	8.59	33.07	53.96	65.98	94.05	71.91	4.28	42.62	266.82
35 DAT (P2)	87.34	2.13	10.78	43.04	63.05	75.09	107.69	80.05	4.84	51.63	330.66
35 DAT (P3)	81.04	2.09	14.86	47.05	70.40	82.45	118.09	85.39	5.60	63.18	402.06
CD at 5%	0.181	NS	0.047	2.561	0.159	0.164	0.158	0.120	0.016	0.024	1.162
Paclobutrazol (PBZ)											
Control (T1)	87.79	1.87	10.34	38.66	61.13	73.16	105.23	77.26	4.65	50.64	302.99
PBZ@30ppm (T2)	85.91	2.09	11.25	39.96	62.01	74.05	106.14	78.63	4.84	51.76	324.84
PBZ@60ppm (T3)	84.81	2.14	11.70	43.18	63.06	75.10	107.22	79.53	5.01	53.17	343.19
PBZ@90ppm (T4)	84.09	2.18	12.32	42.41	63.67	75.71	107.87	81.03	5.14	54.33	361.70
CD at 5%	0.210	0.162	0.054	2.957	0.184	0.189	0.183	0.139	0.018	0.028	1.341
Interaction											
P ₁ XT ₁	93.55	1.75	7.15	31.41	52.75	64.76	92.79	69.32	4.13	40.77	225.69
P ₁ XT ₂	89.72	1.99	8.64	32.35	53.06	65.08	93.15	71.43	4.22	42.44	153.15
P ₁ XT ₃	88.80	2.09	9.01	33.16	54.64	66.66	94.75	72.82	4.33	43.13	185.94
P ₁ XT ₄	88.12	2.12	9.54	35.56	55.40	67.42	95.53	74.07	4.45	44.13	302.52
P ₂ XT ₁	87.34	2.08	9.98	41.45	61.84	73.88	106.44	78.83	4.65	49.78	311.15
P ₂ XT ₂	86.33	2.11	10.43	42.32	62.25	74.29	106.87	79.55	4.77	50.25	321.93
P ₂ XT ₃	85.30	2.15	11.06	43.61	63.76	75.80	108.41	80.35	4.94	52.65	334.48
P ₂ XT ₄	84.45	2.18	11.63	44.78	64.34	76.38	109.05	81.47	5.01	53.85	335.08
P ₃ XT ₁	82.47	1.78	13.91	43.14	68.79	80.85	116.46	83.63	5.18	61.37	372.13
P ₃ XT ₂	81.67	2.17	14.68	45.21	70.73	82.78	118.41	84.92	5.52	62.58	399.45
P ₃ XT ₃	80.32	2.19	15.03	53.78	70.79	82.84	118.49	85.43	5.75	63.74	409.15
P ₃ XT ₄	79.70	2.24	15.80	47.07	71.28	83.33	119.01	87.55	5.95	65.02	427.50
CD at 5%	0.363	NS	0.095	NS	0.318	0.327	0.317	0.240	0.310	0.049	2.323

The highest stem diameter was recorded when plants were pinched 35 days after transplant (2.13 cm) as compared to non pinched plants (1.99 cm) and the plants pinched 45 days after transplant (2.09 cm). PBZ@90 ppm (T4) foliar spray recorded maximum stem diameter (2.18 cm), which was statistically at par with (T1) without PBZ (1.87 cm). The interaction effect due to pinching and PBZ on stem diameter was found to be non-significant. Increase in stem diameter might be due to the fact that at low plant height better growth was observed due to availability of less vegetative growth and sufficient space and less competition among the adjacent plants, which helped the individual plant to utilize more water, air, and light to put better growth. These results are in conformation with the earlier reports in dahlia and African marigold (Bhattacharjee 1984, Chauhan *et al.* 2005). while, the plants pinched 45 DAT recorded significantly (Table 1) more number of primary branches (14.86) as compared to unpinched plants (8.59). The reduction in plant height in pinched plants is mainly due to removal of terminal growing part which resulted into inhibiting apical dominance and diverting plant metabolites from vertical growth to horizontal growth. Pinching of apical bud resulted in increase in number of primary branches (14.86) which may be attributed to breaking of apical dominance and sprouting of auxillary buds. Similar findings were reported by Sehrawat *et al.* (2003) in African marigold. Significantly more number of primary branches (38.46) was recorded with PBZ @ 90 ppm (Table 1) compared to other treatments. More number of primary branches at high concentration of PBZ might be due to it being readily absorbed by the leaves and translocated almost exclusively to the meristematic region resulted into more number of primary branches. Among the interactions plants treated with PBZ @90 ppm 45 DAT shows maximum number of primary branched (15.80). Plants pinched 45 days after

transplant takes maximum days for flower bud initiation (70.44) compared to unpinched plants (53.96). For the same treatment plants takes 82.45 days to appear the first flower 50 % flowering was noticed by 118.09 days. Among the interactions plants treated with PBZ @ 90 ppm and pinched 45 days after transplanting takes 71.28 days for flower bud initiation, same combination takes the maximum days for first flower (83.33) and stage of 50 % flowering (119.01). The flower yield per plant was more (402.06 g) in plants pinched 45 days after transplanting as compared to no pinching treatment (266.82 g). These results are in agreement with those of Levonen (1971) in carnation. The maximum flower yield per plant (361.70 g) was observed with 90 ppm PBZ compared to other treatments. The pinched plants increased in yield might be due to increased in plant spread, number of branches and number of flowers per plant. Similar results were obtained in chrysanthemum, marigold (Rathore and Mishra 2014, Badge *et al.* 2014).

In conclusion, application of PBZ @90 ppm coupled with pinching AT 35 DAT improved vegetative growth as well as flower yield. So, it is recommended for commercial cultivation of African marigold.

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