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Effect of plant growth regulators on the performance of African marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gainda

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ABSTRACT

Effect of time of application and plant growth regulators on the performance of African marigold (Tagetes erecta L.) cv. Pusa Narangi Gainda was investigated. During 2021–2022, a field experiment in RBD two factors with three replications was conducted at the Research Farm, Department of Horticulture, School of Agricultural Sciences and Rural Development (SASRD), Nagaland University, Medziphema.The eexperimental factors include two time of application such as (i) at 25 DAT, (ii) at 50 DAT, and seven sprays of PGRs such two doses of MH (1000 ppm and 2000 ppm), GA_3 (150 ppm and 250 ppm) and B-9 (50 ppm and 100 ppm) +and control. The results showed that the application of growth regulators at 25 days after transplanting (DAT) provided greater values for all of the vegetative and yield criteria. Amongst the plant growth regulators, it was found that spray of 250 ppm GA_3 increased plant height, plant spread, number of flowers per branch, number of flowers per plant, dry weight and fresh weight of single flower, dry weight and fresh weight of flower per plant and, flower yield per hectare except number of primary branches per plant and number of leaves per plant which was maximum with B-9 @ 100 ppm under study.

Keywords: GA_3, growth regulators, *Tagetes erecta*, yield parameters

INTRODUCTION

There is a high demand of marigold for decorative purposes at different religious and social gatherings as loose flowers, garlands, and garden displays. In the United States, however, marigold powder and extract are the only approved colors in poultry feed. Yellow and orange color of marigold flower is due to the presence of lutein pigment hence marigold flower is added in poultry diet to increase the yellow color of egg yolks and broiler skin. Recently the marigold flower is the marketable source of lutein. Petals of marigold are luxuriant in esters of lutein fatty acids and lutein, representing more than 90% of the pigments identified in *Tagetes* plant (Becerraa *et al.*, 2020). Plant growth and yield are mostly affected by two main factors such as management and genetic factors. However, the plant growth is now regulated using PGRs and is considered as third furthermost important advanced technology to improve growth and flowering parameters in flowering plants (Kumar *et al.,* 2015). Plant growth regulators change plant physiological processes inside the plant that finally influenced plant growth and development. The main objectives of experiment were to see the effect of PGRs on the performance of *Tagetes erecta* cv. Pusa Narangi Gainda.

MATERIALS AND METHODS

The field trail was conducted during 2021-2022 at the instructional cum research farm of SASRD, Nagaland University (a central university), Medziphema, which is located at an altitude of 305 meters above sea level at latitude 25°45’43’N and longitude 93°53’04’E. The climatic conditions of the experimental site was typically a humid sub-tropical zone with an average temperature between 12.53^0C to 26.24^0C and average rainfall was 12.21 mm. Soil of trail site was sandy loam with a pH of 5.5, with organic carbon 1.5%, available NPK 298 kg ha^{-1}, 48.5 kg ha^{-1} and 90.4 kg ha^{-1}, respectively. A field trail with three replicates was performed in RBD two factors. Treatment consists of time of application (25 DAT and 50 DAT) and different PGRs (MH 1000 ppm and 2000 ppm, GA_3 150 ppm and 250 ppm, B-9 50 ppm and 100 ppm) and was control. DAT mean days after transplanting of seedlings. Seeds of *Tagetes erecta* cv. Pusa Narangi Gainda was sown in flower pots on 12 November 2021. Soil mixture comprising of garden soil, sand and well-rotted farmyard manure in the ratio of 1:1:1 was mixed thoroughly and added into the pots, followed by sowing. Light irrigation was carried out immediately after sowing. 30-day-old plants were transplanted into the trail field. The size of the plot was kept at 1.6 m x 1.6 m and the spacing was kept at 40 cm x 40 cm. Besides the application of well-rotted farmyard manure @ 22 t/ha, fertilizers were used at a rate of 120 kg ha^{-1} N, 100 kg ha^{-1} P_2O_5, and 100 kg ha^{-1} K_2O. Well-rotted farmyard manure was mixed well when preparing the bed. Nitrogen was applied in two divided doses i.e., 50 percent N at time of bed preparation and remaining 50 percent N was used at 45 DAT as top dressing in form of urea. Full dose of P_2O_5 and K_2O was used at the time of final bed preparation, P_2O_5 in form of SSP and K_2O in form of MOP. Good cultural practices were followed during the entire crop period. Observations on vegetative (at 60 DAT) and yield parameters were observed and analysed statistically using the analysis technique of variance with factorial RBD (Gomez and Gomez, 1985). The level of significance of t-test and F-test was kept at 5%. (P=0.05).

RESULTS AND DISCUSSION

Vegetative parameters

Plant height and plant spread

Time of application, and PGRs had a profound effect on the plant height, which is summarized in (Table 1); a higher plant height (49.57cm) was obtained when foliar sprays of PGRs at 25 DAT, followed by the application of PGRs at 50 DAT (47.55 cm). In case of PGRs, the data also showed that a highest plant height (59.43 cm) was noted with sprays of 250 ppm GA_3 (G_4) while, lowest (42.30 cm) plant height was noted with application of 2000 ppm MH (G_2). The interaction between time of application and PGRs was noted to be significant. Highest plant height (60.40 cm) was noted on application of 250 ppm GA_3 at 25 DAT while the lowest plant height (41.26 cm) was noted by spray of 2000 ppm MH at 50 DAT. The plant spread was not significantly influenced time of application, whereas PGRs significantly influenced as represented in (Table 1). With regards to time of application, maximum plant spread (50.98 cm) was registered when applied at 25 DAT whereas; least plant spread (49.73cm) was noted when application of PGRs at 50 DAT. A cursory glance of data revealed that greater plant spread (56.54cm) was noted with foliar application of 250 ppm GA_3 (G_4) however; least plant spread (44.57 cm) was registered with foliar sprays of 2000 ppm MH (G_2). The interaction amid time of application and PGRs also failed to markedly affect the plant spread of marigold. When the PGRs were applied at 25 DAT, growth and yield increased due to beneficial effect of PGRs and that was also noted by Kumar *et al.* (2020) in African marigold. The results indicated that application of PGRs at 25 days after planting showed maximum vegetative growth and yield. The GA_3 increased plant height because GA_3 persuaded the active cell division and cell elongation (Anuradha *et al.*, 2017)). Sheng *et al.* (2022) stated that gibberellins (GA_1,GA_3 and GA_4) regulates plant height especially GA_3 increased plant height. Comparable finding was stated by (Arti *et al.*, 2019) in African marigold cv. Lemon Yellow. Comparable finding was stated by (Arti *et al*., 2019) in African marigold cv. Lemon Yellow.

Number of leaves per plant and primary branches per plant

Data showed that, the maximum number of leaves (133.60) were obtained when PGRs were applied at 25 DAT, whereas PGRs applied at 50 DAT noted the lowest number of leaves (132.56). Among the different PGRs, maximum number of leaves (138.63) was noted with spray of 100 ppm of B-9 (G_6) however, lowest number of leaves (127.87) was registered with control (G_0). Interaction effect of time of application and PGRs was significantly. A greater number of leaves (139.47) was noted by application of 100 ppm of B-9 (G_6) at 25 DAT, whilst; minimum number of leaves (127.67) was noted, with no application of PGRs (G_0) at 50 DAT (Table 1). Among the time of application, a greater number of primary branches per plant (11.51) were noted when applied at 25 DAT, whereas applying at 50 DAT noted minimum number of primary branches per plant (11.06). The maximum number of primary branches

Table 1: Effect of PGRs on the vegetative parameters of *Tagetes erecta*cv. Pusa Narangi Gainda

Treatments	Plant height (cm)	Plant spread (cm)	Number of leaves per plant	Number of primary branches per plant
T_1(25 DAT)	49.57	50.98	133.63	11.51
T_2(50 DAT)	47.55	49.73	132.58	11.06
SEm(±)	**0.44**	**0.49**	**0.20**	**0.10**
C.D at 5%	**1.29**	**NS**	**0.60**	**0.29**
G_0(Control)	48.97	50.78	127.87	10.40
G_1(1000 ppm MH)	44.13	44.92	134.00	11.32
G_2(2000 ppm MH)	42.30	44.57	133.26	11.44
G_3 (150 ppm $GA_{3)}$	54.87	54.10	129.10	11.14
G_4(250 ppm $GA_{3)}$	59.43	56.54	132.38	11.20
G_5(50 ppm B-9)	45.60	50.20	136.50	11.52
G_6(100 ppm B-9)	44.63	51.35	138.63	11.96
SEm(±)	**0.62**	**0.26**	**0.11**	**0.05**
C.D at 5%	**0.69**	**0.77**	**0.32**	**0.15**
T_1G_0	49.46	51.68	128.07	10.60
T_1G_1	44.67	45.73	134.20	11.51
T_1G_2	43.33	45.10	133.60	11.61
T_1G_3	57.47	54.75	129.80	11.26
T_1G_4	60.40	57.33	132.56	11.37
T_1G_5	46.20	50.38	137.73	11.90
T_1G_6	45.47	51.86	139.47	12.29
T_2G_0	48.47	49.89	127.67	10.20
T_2G_1	43.60	44.11	133.80	11.12
T_2G_2	41.26	44.05	132.93	11.28
T_2G_3	52.26	53.45	128.40	11.02
T_2G_4	58.46	55.75	132.20	11.04
T_2G_5	45.00	50.01	135.27	11.13
T_2G_6	43.80	50.83	137.80	11.63
SEm (±)	**0.62**	**0.69**	**0.29**	**0.14**
C.D at 5%	**1.82**	**NS**	**0.84**	**NS**

T= Time of application, G= PGRs

per plant (11.96) was registered with foliar application of 100 ppm of B-9 (G_6) whereas; a lowest number of primary branches per plant (10.40) was registered in control (Table 1). Due to a decrease in stem growth and a rise in the number of branches per plant, B-9 and MH treatments produce a greater number of leaves and primary branches per plant. B-9 and MH are related to anti-auxins and perhaps also anti-gibberellins that have reduced the height of plant leading to an increase in the number of branches and the formation of a greater number of leaves. Comparable finding was noted by Mahalle *et al.* (2001) in *Chrysanthemum indicum*.

Yield parameters

Number of flowers per branch and flowers per plant

Analysis of data showed in Table 2 that time of application was insignificant, a greater number of flowers per branch (6.67) was noted when sprayed at 25 DAT and the minimum number of flowers per branch (6.49) was noted at 50 DAT. The different PGRs had a marked influence on the

Table 2: Effect of PGRs on the yield parameters of *Tagetes erecta* cv. Pusa Narangi Gainda

Treatments	Number of of flowers per branch	Number of flowers per plant	Fresh weight of a single flower (g)	Fresh weight of flower per plant (g)	Dry weight of a single flower (g)	Dry weight of flower per plant (g)	Estimated flower yield per hectare (q)
T_1(25 DAT)	6.67	76.44	7.62	592.37	1.18	93.12	511.96
T_2 (50 DAT)	6.49	72.08	7.43	545.70	1.06	79.42	471.34
SEm(±)	**0.06**	**1.60**	**0.08**	**12.09**	**0.08**	**5.44**	**10.37**
C.D at 5%	**NS**	**NS**	**NS**	**35.33**	**NS**	**NS**	**30.30**
G_0(Control)	5.22	54.24	6.26	339.87	0.75	40.76	294.58
G_1(1000ppm MH)	6.18	68.88	7.11	490.06	0.90	61.62	423.28
G_2(2000ppm MH)	6.03	67.65	7.20	495.25	0.93	63.12	427.76
G_3(150 ppm $GA_{3)}$	7.97	89.63	8.25	739.40	1.40	125.23	638.70
G_4(250 ppm $GA_{3)}$	8.11	92.15	9.24	851.61	1.56	143.78	735.60
G_5(50 ppm B-9)	6.35	73.16	7.27	527.56	1.08	79.50	455.66
G_6(100 ppm B-9)	6.20	74.10	7.31	539.49	1.21	89.87	465.98
SEm(±)	**0.03**	**0.85**	**0.11**	**6.46**	**0.04**	**2.91**	**5.54**
C.D at 5%	**0.10**	**2.49**	**NS**	**18.89**	**NS**	**8.50**	**16.19**
Interaction (TxG)							
T_1G_0	5.23	55.49	6.33	351.46	0.83	46.20	305.64
T_1G_1	6.23	70.16	7.16	502.33	0.96	67.50	433.90
T_1G_2	6.10	69.42	7.31	513.57	0.95	66.29	443.60
T_1G_3	8.10	91.74	8.40	770.28	1.47	134.43	665.36
T_1G_4	8.28	94.02	9.31	875.80	1.59	149.20	756.50
T_1G_5	6.5	77.34	7.38	565.60	1.20	92.239	488.53
T_1G_6	6.26	76.85	7.40	567.53	1.25	95.96	490.20
T_2G_0	5.20	52.97	6.20	328.27	0.67	35.36	283.52
T_2G_1	6.13	67.59	7.06	477.79	0.83	55.74	412.66
T_2G_2	5.97	65.88	7.10	476.92	0.91	59.94	411.93
T_2G_3	7.84	87.51	8.10	708.52	1.33	116.03	612.03
T_2G_4	7.94	90.28	9.16	827.42	1.53	138.35	714.70
T_2G_5	6.20	68.97	7.16	489.51	0.96	66.76	422.80
T_2G_6	6.13	71.35	7.23	511.45	1.16	83.77	441.76
SEm (±)	**0.03**	**2.26**	**0.12**	**17.10**	**0.11**	**7.69**	**14.66**
C.D at 5%	**0.10**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

T- Time of application, G- PGRs

number of flowers per branch, a greater number of flowers per branch (8.11) was registered with application of 250 ppm GA_3(G_4) while minimum number of flowers per branch (5.22) was noted with control (G_0). Interaction effect between time of application and PGRs was significantly registered. More number of flowers per branch (8.28) was noted by foliar application of 250 ppm GA_3 at 25 DAT while the minimum number of flowers per branch (5.20) was registered with control at 50 DAT (Table 2). Highest number of flowers per plant (76.44) was noted with application at 25 DAT and lowest number of flowers per plant (72.08) at 50 DAT. Maximum number of flowers per plant (92.15) was registered with spray of 250 ppm GA_3 (G_4) whereas, lesser number of flowers per plant (54.24) was noted by control (G_0). The interaction effect between the time of application and PGRs was shown significant difference for number of flowers per branch and failed to reach the level of significance for number of flowers per plant as per the data represented in (Table 2). A greater number of flowers per branch by the application of GA_3 might be due to highest auxin activity in the floral buds (Sajid *et al.,* 2016). The gibberellins are well recognised for their promoter effects on cell division and cell elongation. B-9 is anti-auxin and possibly anti-gibberellin properties would have decreased flower size and numbers. (Murali *et al.*, 1988). Comparable findings were stated by Kanwar and Khandelwal, 2013; Kumar *et al*., 2014) in African marigold (*Tagetes erecta* L.). Increase in number of flowers per plant lends support from previous discussion on the flowering parameter such as number of flowers per branch. Comparable finding was stated by Sathappan (2018) in *Tagetes erecta*.

Fresh weight of a single flower and fresh weight of flower per plant

Time of application was found significant; the highest fresh weight of a single flower (7.62 g) was noted on spray of PGRs at 25 DAT than fresh weight of a single flower (7.43 g) obtained on spray of PGRs at 50 DAT. Further analysis of data also showed that maximum fresh weight of a single flower (9.24 g) was registered by application of 250 ppm GA_3 (G_4) and lowest fresh weight of a single flower (6.26 g) was noted by control (G_0). Interaction effect between time of application and the PGRs failed to produce a significant impact on fresh weight of flower (Table 2). Time of application was registered insignificant, with a greater fresh weight of flower per plant (592.37 g) was noted when sprayed at 25 DAT while lowest fresh weight of flower per plant (545.70 g) when PGRs were sprayed at 50 DAT. As regard to the influence of PGRs, determined fresh weight of flower per plant (851.61 g) was noted with foliar application of 250 ppm GA_3(G_4). While, least fresh weight of flower per plant (339.87 g) was noted with control (G_0). Interaction effect between time of application and PGRs was insignificant (Table 2). The increment in fresh weight of a single flower with GA_3 as it improves the cell division and enlargement, enhancement of protein synthesis as well as a high dry matter accumulation Dalal *et al.* (2009). Increase in weight of single flower due to GA_3 application was also stated by Swaroop *et al.* (2007) in marigold. Comparable findings were also noted by Mishra (2017) in *Tagetes erecta*. The number of flowers per primary branch, the number of flowers per plant, and the fresh weight of a single flower are all factors that support the previous discussion of flowering parameters. Comparable conclusions were noted by Badge *et al*. (2015; Kalaimani *et al.* (2017) in *Tagetes erecta*.

Dry weight of a single flower and dry weight of flower per plant

A cursory glance of data revealed that time of application was not significant, highest dry weight of a single flower (1.18 g) was noted on a spray of plant growth regulators at 25 DAT compared to dry weight of a single flower (1.06 g) found on a spray of PGRs at 50 DAT. Among the different PGRs, maximum dry weight of a single flower (1.56 g) was noted on spray of 250 ppm GA_3 (G_4) while, least dry weight of a single flower (0.75 g) was registered on control (G_0). Interaction effect between time of application and the PGRs failed to exert any significant effect (Table 2). Among the time of application, highest dry weight of flower per plant (93.12 g) was noted with application at 25 DAT and lowest dry weight of flower per plant (79.42 g) at 50 DAT. Highest dry weight of flower per plant (143.78 g) noted on application of 250 ppm GA_3 (G_4) whereas, least dry weight of flower per plant (40.76 g) was recorded with control (G_0). Interaction effect between PGRs and time of application failed to exert any significant effect (Table 2). The maximum dry weight of a single flower of marigold with GA_3 application is associated with increased cell division and enlargement which promotes the synthesis of protein as well as high dry matter accumulation (Dalal *et al.,* 2009). Hence, the growth promoting compounds might have a positive effect on weight of flowers. The Comparable conclusions were observed by (Palei *et al.*, 2016; Narute *et al*., 2020) in *Tagetes erecta*. Increase in dry weight of flower per plant lends support from previous discussion on the flowering parameters viz., number of flowers per plant and weight of single flower. Comparable finding was stated by Palei *et al.* (2016) in *Tagetes erecta*.

Estimated flower yield per hectare

The effect of time of application was registered to be significant. The greatest estimated flower yield per hectare (511.96 q) was noted by application at 25 DAT and minimum estimated flower yield per hectare (471.34 q) was recorded at 50 DAT. In case of PGRs, maximum estimated flower yield per hectare (735.60 q) was registered with spray of 250 ppm GA_3 (G_4) while, least estimated flower yield per hectare (294.58 q) was noted with control (G_0). The interaction effect between time of application and PGRs was non-significantly registered. This increase in flower yield per hectare is supported by prior data on the yield parameters, such as number of flowers per branch, number of flowers per plant, weight of single flower and weight of flower per plant. Comparable findings were stated by Arti *et al*. (2019) in *Tagetes erecta* L. cv. Lemon Yellow.

CONCLUSION

Out of the time of application, it can be inferred from the current research work that PGRs spraying at 25 DAT had a stronger impact on the vegetative and yield characteristics of of *Tagetes erecta* cv. Pusa Narangi Gainda. Among the PGRs, foliar spray with GA_3 @ 250 ppm was found to be the best treatment in most of the parameters of economic importance except number of leaves and number of primary branches, where B-9 @ 100 ppm exhibited better result. Since the above conclusions are made based on the result of a one-year investigation, a further study on a similar line would be required in order to give a more reliable recommendation.

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REFERENCES :

Anuradha, R.W., Sateesh R.P., Naveen Kumar, P. T. and Kulakarni, B.S. 2017. Effect of Growth regulators on vegetative, flowering and flower yield parameters in African Marigold cv. Culcatta Orange. *International Journal of Pure and Applied Bioscience*, **5**(5): 636-640.

Arti, A., Singh, P. and Verma, L.R. 2019. Regulation of growth and flowering by PGRs in African Marigold (*Tagetes erecta* L.) cv. Lemon Yellow. *International Journal of Current Microbiology and Applied Science*, **8**(8):1704-1708.

Badge, S., Panchbhai, D.M. and Patil, S. 2015. Regulation of flowering by pinching and foliar application of gibberellic acid in African marigold (*Tagetes erecta* L.*). Indian Horticulture Journal*, **5**(1/2):41-46.

Becerraa, M.O., Luis, M.C., Ming, H.L., Juan, M. D. and Gustavo C.H. 2020. Lutein as a functional food ingredient: Stability and bioavailability. *Journal of Functional Foods*, **66**(1):103771.

Dalal, S.R., Somavanshi,A.V. and Karale, G.D. 2009. Effect of gibberellic acid on growth, flowering, yield, and quality of gerbera under polyhouse conditions. *International Journal of Agricultural Sciences*, **5**(2):355-356.

Gomez, K.A. and Gomez, A. A. 1985. Statistical procedure for agricultural research. In: 2nd Edition (pp. 20-25). *Awiley International Publication,* Singapore.

Kalaimani, M, Sathappan, C. T., R., Kandasamy and Singaravel, R. 2017. Investigation of different levels PGRs and pinching treatments on flowering and yield parameters of African marigold (*Tagetes erecta* L.). *Chemical Science Review and Letters*, **6**(22):741-745.

Kanwar, J. and Khandelwal, S.K. 2013. Effect of PGRs on growth and yield of African marigold (*Tagetes erecta* L.). *Madras Agricultural Journal,* **100**(1/3):45-47.

Kumar, K.P., Padmalatha, T., Pratap, M. and Reddy, S.N. 2015. Effect of plant bio-regulators on growth, flowering, and seed yield in China aster (*Callistephus chinensis* L. Nees) cv. Kamini. *Indian Journal of Agricultural Research*, **49**(3):348-352.

Kumar, M., Singh, A. K. and Kumar, A. 2014. Effect of PGRs on flowering and yield attributes of African marigold (*Tagetes erecta* L.) cv Pusa Narangi Gainda. *Plant Archives,* **14**(1): 363-365.

Kumar, P., Singh, A., Laishram, N., Pandey, R.K., Dogra, S., Jeelani, M.I. and Sinha, B.K. 2020. Effects of PGRs on quality flower and seed production of marigold (*Tagetes erecta* L.). *Bangladesh Journal of Botany*, **49**(3):567-577.

Mahalle, B.V., Kidke, S.S., Khobraagade, H.M. and Belorkar, P.V. 2001. Effect of foliar spray of B-9 on growth parameter and chlorophyll content of chrysanthemum. *Journal of Soils and Crops*, **11**:120-124.

Mishra, P. 2017. Effect of plant growth regulators on growth and flowering characters of African marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gainda. *International Journal of Agricultural Science and Research,* **7**(1): 173-178.

Murali, T.P. and Gowda, J.V. 1988. Effect of growth regulators on biochemical composition of leaves and flower yield in Jasminum. *Indian Journal of Horticulture*, **45**(3/4):344-351.

Palei, S., Das, A. K. and Dash, D. K. 2016. Effect of PGRs on growth, flowering and yield attributes of African marigold (*Tagetes erecta* L.) *International Education and Research Journal*, **6**(2): 44-45.

Sajid, M., Amin. N., Ahmad, H.A.B.I.B and Khan, K. 2016. Effect of gibberellic acid on enhancing flowering time in *Chrysanthemum morifolium. Pak. J. Bot.* **48**(2):477-483.

Sathappan, C.T. 2018. Effect of PGRs and pinching on growth and flower yield of African marigold (*Tagetes erecta* L.). *Journal of Horticultural Sciences*, **13**(1):42-47.

Sheng J., X. L. and Zhang D. 2022. Gibberellins, brassinolide, and ethylene signaling were involved in flower differentiation and development in *Nelumbo nucifera*. *Horticultural Plant Journal*, **8**(2): 243-250.

Swaroop, K., Singh, K.P. and Raju, D.V.S. 2007. Vegetative growth, flowering and seed characters of African marigold (*Tagetes erecta* Linn.) as influenced by different growth substances during mild off seasons. *Journal of Ornamental Horticulture*, **10**(4): 268-270.