Research Article

Application of foliar spray of gibberellic acid and nitrogen on the Marigold quantitatively and qualitatively (*Tagetes erecta* and *Tagetes patula* L.)

Sajjad Ali^{1*}, Sami Ullah², Muhammad Hashim Khan³, Fazli Rahim¹, Muhammad Ishaq Khan¹ and Muhammad Ali⁴

1. Department of Botany, Bacha Khan University, Charsadda KPK-Pakistan

2. Centre of Plant Biodiversity, University of Peshawar, KP-Pakistan

3. Department of Botany, Islamia College Peshawar, KP-Pakistan

4. Department of Biotechnology, Bacha Khan University, Charsadda KPK-Pakistan

*Corresponding author's email: sajjad_ali00@yahoo.com

Citation

Sajjad Ali, Sami Ullah, Muhammad Hashim Khan, Fazli Rahim, Muhammad Ishaq Khan and Muhammad Ali. Application of foliar spray of gibberellic acid and nitrogen on the Marigold quantitatively and qualitatively (*Tagetes erecta* and *Tagetes patula* L.). Pure and Applied Biology. Vol. 5, Issue 4, pp1225-1229.

<http://dx.doi.org/10.19045/bspab.2016.50147>

Received: 24/08/2016

Revised: 10/10/2016

Accepted: 16/10/2016

Online First: 09/11/2016

Abstract

A critical investigation was carried out to define the optimal amount of nitrogen and gibberellic acid to produce quality of flowers in Marigold flower during 2011-2012. The research was passed carried out randomly in seven Blocks and doses comprised six degrees of nitrogen (weekly and fourteen days periodically), doses of GA₃ (0, 50 and 100 ppm) and two cultivars (*Tagetes erecta* and *Tagetes patula*). The 65.94 cm of plant height was noted with nitrogen 1000 ppm per week and GA₃ 100 ppm utilized double. GA₃ at 50 ppm form buds of 1.83 cm in size. 6.96 cm flower diameters were eminent having nitrogen dose of 500 while GA₃ of 50 ppm. Nitrogen of 1000 ppm/week determined a sum of 7.25 flowers per plant. 58.25 cm were the stem length noted treated by 1000 ppm/week of Nitrogen and GA₃.

Keywords: Gibberellic acid; Nitrogen; *Tagetes*

Introduction

It is usually known as marigold, used as ornamental plant. It is native to Mexico known as Mexican marigold and also called Azetic marigold. Marigold is also native to Central America. In Pakistan it is used as economically purpose. Marigold is also cultivated as an edging species on many herbaceous borders. It also used in those areas where the water is less because

watering of marigold field done easily. In a single field its mixed variety like red, yellow where commonly cultivated. The aims of present study are how we can improve flowering and its yield, by nitrogen and gibberellic acid.

Material and methods

The practical work was conceded out at NIFA (Nuclear Institute for Food and Agriculture) using two cultivars namely

Tagetes erecta and *Tagetes patula*. Before starting the work 10 kg FYM (Frame Yard Manure), 20 gm Nitrogen, 25 gm of P_2O_5 and 15 gm K_2O/m^2 combined in rows were used. The applications of Nitrogen were used in two intervals that are 7.5 gm during plantation and remaining were applied after 45 days. While spray of Nitrogen were implemented at the start of 1st month. Mainly spray were applied during the morning time 0.05% of T-pol, were used as surface active agent. Doses of Nitrogen were 200, 500 and 1000 ppm was used at 7 days and 14 days at regular periods. Doses of GA_3 were 50 and 100 ppm was used with 2 intervals. The initial spray was applied just after planting while 2nd spray was applied when it attend a height of 15-20 cm. For compression the control was run simultaneously. Plants were planted with 60 x 60 cm row to row and plant to plant. 4m² areas were devoted for the experiment. Spaces between the beds were 4 ft. Data was analyzed statistically by using factorial R.B.D.

Result and discussion

In over all the species of marigold i.e *Tagetes patula* (59-63 cm) was established meaningfully heighted than *Tagetes erecta* (44-56 cm) (Table 1) which is due to the variance in their genomic composition. Substantial rise in plant species over control was saw just when marigold were sprayed either with Nitrogen 500 ppm at 7 days or with 1000 ppm of its application at 7 or 14 days. [1] The height marigold (61, 32 cm) were noticed when the dose of Nitrogen (1000 ppm) were sprayed at 7 days intervals. Distinct species also presented alike performance to the application of Nitrogen as their combined activity. Rise in marigold height after submission to Nitrogen does may probably be endorsed to feature of Nitrogen in cell formation also in synthesis of protein which eventually improves the somatic growth [2]. These reports are in line

with Arora and Saini (1975) that nitrogen spray raises the height of plant. The level of GA_3 rise the height of marigold over the control. The maximum height of plant (60.07 cm) was noted with the application of GA_3 100 ppm. Muknopaddhyay (1990), Artherton and Haris (1980) also reported increase height of marigold due to application of Nitrogen does that what the present finding show. Stem of cultivar *Tagetes patula* (54.01 cm) was extensive as compared to *Tagetes erecta* (47.32 cm). As concerns the nitrogen effect on the length of stem, it was rise by all application with supreme length of stem of 53.76 cm when the marigolds were sprayed with nitrogen. Sprayed with maximum height of stem 53.85 cm when marigolds were treated with 1000 ppm at 7 days intervals). Rise in the length of stem were observed due to rise in the length when were more when the marigold were treated with nitrogen does. Further increase in the concentration of GA_3 formed in the manufacture of height stem as associated to the low amount. The communication of GA_3 and Nitrogen showed that increase length of stem (57.24 cm) was documented when GA_3 100 ppm was sprayed and also nitrogen (1000 ppm) at 7 days interveals. Rise in the length of stem got with GA_3 (100 ppm) is maintained by the report of [3, 4]. Flower bud of “*Tagetes patula*” (1.78 cm) was greater than “*Tagetes erecta*” (1.65cm) (Table 2). The rise in size of bud (1.78 cm) was verified with nitrogen 200 ppm per 7 days. So certain tendencies in the size of bud were not noticed under dissimilar level of nitrogen. Other factors may be apart from nitrogen, which take part in the germination of bud. While in contrast to the entire level of GA_3 increased the size of bud meaningfully. Height buds (1.82 cm) were reported with GA_3 50 ppm and more increase in GA_3 reduced the size of bud. A part of GA_3 in increasing the size of bud may be recognized to translocate the

metabolite at the area of bud growth. *Tagetes patula* cultivar formed many flowers at per plant than “*Tagetes erecta*”. Huge number of flower on each plant (7.24) was noted when sprayed of nitrogen (1000 ppm) at 7 days intervals. The nitrogen absorption showed increases the flower number on each plant. Though 7 days of application of nitrogen does exposed dominant result report are same with [5, 6]. GA₃ also improved the flower number on each plant, which is in conformity the finding of [6, 7]. GA₃ effect were also reported by winter annuals (Singh 1996) cultivar “*Tagetes patula*” presented additional % of calyx (20.80) then *Tagetes erecta* (17.79) (Table 3). The height number of calyx splitting (22.07) was reported in control, while the low (14.00) was reported

with doses of Nitrogen 1000 ppm per 7 days. A decline in split calyx proportion at comparatively huge Nitrogen level was also reported previously by winsor *et al.* (1970). Arota and Saini (1975) also documented a decrease in splitting calayx with large Nitrogen does. Significantly the sizes of flower were varied. *Tagetes patula* created flower of high diameter than *Tagetes erecta* (Table 4a): high diameter of flower (6.76 cm) was reported with Nitrogen 500 ppm per 7 days and 50 ppm GA₃. The application of area (3 g/l) was found to rise the size of flower in *Chrysanthemum* and 7 days, 14 days were greater to fortnightly application for size of flower (Singh 1980). The height size of flower with the application of GA₃ (50 ppm) were also stated by Muknoyadhyay (1990).

Table 1. Effect of nitrogen and GA3 sprays on plant height (cm)

Nitrogen(ppm)/ Intervals	<i>Tagetes erecta</i>	<i>Tagetes patula</i>	Mean	GA3 (ppm)		
				100	50	0
Control	63.15	72.58	67.86	69.65	68.35	65.59
200/week	63.57	72.80	68.19	69.79	68.26	66.61
200/fortnight	62.75	72.55	67.65	68.86	67.82	66.28
500/week	66.68	74.86	70.77	72.28	70.68	69.35
500/fortnight	63.65	72.68	68.16	69.72	67.87	66.88
1000/week	67.86	76.80	72.33	75.94	71.73	69.33
1000/fortnight	64.95	74.06	69.51	71.30	69.70	67.51
Mean	64.66	73.76	69.21	71.08	69.20	67.35

Table 2. Effect of nitrogen and GA3 sprays on bud size (cm)

Nitrogen(ppm)/ Intervals	<i>Tagetes erecta</i>	<i>Tagetes patula</i>	Mean	GA3 (ppm)		
				100	50	0
Control	0.05	0.08	0.06	0.04	1.83	0.05
200/week	0.07	0.08	0.09	0.50	1.20	0.60
200/fortnight	0.05	0.05	0.05	0.89	1.01	1.20
500/week	0.08	0.06	0.07	0.65	0.13	1.00
500/fortnight	0.05	0.08	0.06	0.78	0.05	0.59
1000/week	0.06	0.00	0.03	0.51	1.00	0.56
1000/fortnight	0.05	0.06	0.01	0.67	1.01	0.89
Mean	0.66	0.06	0.053	0.57	0.89	0.69

Table 3. Effect of nitrogen and GA3 sprays on numbers of flower

Nitrogen(ppm)/ Intervals	<i>Tagetes erecta</i>	<i>Tagetes patula</i>	Mean	GA3 (ppm)		
				100	50	0
Control	3.40	6.78	5.09	2.10	4.50	3.28
200/week	4.10	5.69	4.895	2.45	4.61	3.11
200/fortnight	4.28	5.31	4.795	2.11	4.05	3.02
500/week	5.60	5.21	5.405	3.16	5.03	4.01
500/fortnight	4.90	5.61	5.255	3.17	4.51	4.51
1000/week	5.89	5.02	6.805	3.81	4.36	3.62
1000/fortnight	6.78	7.72	7.25	3.67	5.01	4.24
Mean	4.992	5.905	5.642	2.924	4.581	3.684

Table 4. Effect of nitrogen and GA3 sprays on diameter of flower

Nitrogen(ppm)/ Intervals	<i>Tagetes erecta</i>	<i>Tagetes patula</i>	Mean	GA3 (ppm)		
				100	50	0
Control	1.23	1.56	1.395	1.15	2.31	1.30
200/week	1.21	2.34	1.775	1.31	2.00	1.04
200/fortnight	1.11	2.12	1.615	1.23	2.50	3.13
500/week	3.50	3.46	3.48	1.34	1.87	1.23
500/fortnight	2.01	2.34	2.175	1.56	1.90	1.43
1000/week	2.02	2.13	2.075	2.10	2.10	1.23
1000/fortnight	1.89	2.00	1.945	2.00	3.12	1.84
Mean	1.86	2.278	2.066	1.527	6.96	1.6

Authors' contributions

Conceived and designed the experiments: S Ali & S Ullah, Performed the experiments: MH Khan & F Rahim, Analyzed the data: MI Khan & M Ali, Contributed reagents/ materials/ analysis tools: M Ali & S Ullah, Wrote the paper: S Ali & S Ullah.

References

1. Arora JS & Saini SS (1975). Response of carnation (*Dianthus caryophyllus* L.) to various levels of N, P and K fertilization. *Journal of Research, Punjab Agricultural University, Ludhiana* 13(4): 362-66.
2. Atherton JG & Harris GP (1980). Effect of photoperiod on shoot elongation and endogenous gibberellins in the glasshouse carnation. *Scientia Horticulture* 12: 83-88.
3. EL-Shafie (1980). Preliminary studies on the effect of gibberellic acid on the growth and flowering of carnation plant (*D. caryophyllus* L.). *Monufeya Journal of Agricultural Research* 3: 369-385.
4. Jana BK & Kabir J (1987). Response of growth regulators on growth and flowering of carnation cv. Improved Marguerite. *Progressive Horticulture* 19 (1-2): 125-127.
5. Jhon AQ & Arora JS (1978). Differential uptake of N, P and K by carnation plants, under varying levels of nitrogen, their time of application and plant density. *Indian Journal of Horticulture* 35 (1): 58-61.
6. Mengel K & Kirkby EA (1987). Principles of plant nutrition, 4th ed: Panima Publishing Corporation. New Delhi pp.677.
7. Mukhopadhyay A (1990). Responses of carnation to spray application of NAA and Gibberellic acid. *Haryana Journal*

- of *Horticultural Science* 19 (3-4) : 280-283.
8. Mynett K (1979a). Effect of exogenous growth regulators on flower stalk and bud development in glasshouse carnations. Prace. *Instytutu Sadownictwa i Kwiaciarstwa Wiekowe Wicach*, B 4: 70-84.
 9. Patel KS & Arora JS (1986). Effect of pinching, source and doses of N on the growth and flower production of carnation cv. Marguerite White. *Indian Journal of Horticulture* 43 (1-2): 92-97.
 10. Singh B (1986). Foliar application of fertilizer mixtures for chrysanthemum. *South Indian Horticulture* 34 (5): 367-369.
 11. Singh BP (1966). Influence of Gibberellic acid on vegetative growth and flowering of winter annuals. *Science and Culture* 32 (11): 551-552.
 12. Winsor GW, Long MIE & Hart BMA (1970). The nutrition of glasshouse carnation. *J of Hort Sci* 45: 401-413.
 13. Girisha R, Shirol AM, Kulkarni BS, Reddy BS & Anupa T (2012). Studies on effect of different plant growth regulators on growth, flowering and quality of daisy (*Aster amellus* L.) cv. Dwarf Pink. *Int J of Agric, Envir & Biotech* 5(2).