International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
www.chemijournal.com
IJCS 2020; 8(4): 2538-2540

Received: 01-05-2020
Accepted: 03-06-2020

Kanheya Lal Yadav
Department of Floriculture and Landscaping College of Horticulture & Forestry, Jhalrapatan City Jhalawar, Rajasthan, India

Anil Kumar Sharma
Department of Floriculture and Landscaping College of Horticulture & Forestry, Jhalrapatan City Jhalawar, Rajasthan, India

Ashutosh Mishra
Department of Floriculture and Landscaping College of Horticulture & Forestry, Jhalrapatan City Jhalawar, Rajasthan, India

Kamlesh Yadav
Department of Floriculture and Landscaping College of Horticulture & Forestry, Jhalrapatan City Jhalawar, Rajasthan, India

Corresponding Author:
Kanheya Lal Yadav
Department of Floriculture and Landscaping College of Horticulture & Forestry, Jhalrapatan City Jhalawar, Rajasthan, India

Effect of nitrogen and phosphorus on growth and flowering of Gaillardia (*Gaillardia pulchella* Foug.) cv. local yellow under Jhalawar condition

Kanheya Lal Yadav, Anil Kumar Sharma, Ashutosh Mishra and Kamlesh Yadav

DOI: https://doi.org/10.22271/chemi.2020.v8.i4ad.10016

Abstract
The studies were carried out to study the effect of nitrogen and Phosphorus on growth and flowering of Gaillardia (*Gaillardia pulchella* Foug.) cv. Local Yellow under Jhalawar condition. The experiment consisting 16 treatments combination with two factors i.e. nitrogen with four levels (control, 100 kg ha^{-1}, 200 kg ha^{-1} and 300 kg ha^{-1}) and phosphorus with four levels (control, 100 kg ha^{-1}, 200 kg ha^{-1} and 300 kg ha^{-1}) in Factorial Randomized Block Design with three replications. The individual application of nitrogen treatment N_3 (N 300 kg ha^{-1}) maximum plant leaf length (25.61 cm), maximum leaf width (5.73 cm), maximum flower stalk length (16.56 cm), maximum flower fresh weight (4.64 g), earliest first flower bud initiation (50.37 days), maximum number of ray florets per flower (200.75), maximum dry flower weight (0.766 g), maximum length of ray florets per flower (2.44 cm). The individual application of phosphorus treatment P_3 (P 300 kg ha^{-1}) recorded maximum leaf length was recorded (24.61 cm), highest leaf width (5.32 cm), maximum flower stalk length per (16.88 cm), maximum flower fresh weight (4.44 g), minimum (52.08 days) to first flower bud initiation, maximum ray florets per flower (190.08), maximum (0.742 g) flower dry weight, maximum (2.39 cm) length of ray florets.

Keywords: Gaillardia, nitrogen, phosphorus, growth and flowering attributes

Introduction
Gaillardia (*Gaillardia pulchella* Foug.) popularly known as 'Blanket Flower' or Fire Wheel, belong to the family Asteraceae and is native to Central and Western United States, having the basic chromosome number X=18. The generic name Gaillardia was proposed by Mr. Gaillard de Marentoneau, the French botanist 18th century. *Gaillardia pulchella* is diploid (2n=36) as reported by Morinaaga *et al.* (1929) [14] and *Gaillardia aristata* is diploid (Cooper and Mahony, 1936) [4] and tetraploid, 2n = 78 (Atwood, 1937) [1]. Besides its utility in landscape and as cut flowers, Gaillardia is useful in reducing erosion in coastal dune areas (Carig, 1977) [2]. Nitrogen is the most vital element among the major nutrient essentially required for commercial production of flowers. Nitrogen impart green colour to plant, encourages, vegetative growth it is essential constituent of protein, chlorophyll, coenzyme and play important role in synthesis of auxin and phosphorus increased the disease resistance, enhance new cell formation and necessary for root development. Phosphorus is essential constituent of nucleic acid and phytin. Due to deficiency of single element (Phosphorus), the life cycle of plant can't be completed hence, phosphorus is called as "key of life" (Das. 1996) [5].

Materials and Methods
The field experiment entitled "Effect of Nitrogen and Phosphorous on growth and flowering of gaillardia (*Gaillardia pulchella* Foug.) cv. Local Yellow under Jhalawar condition" was conducted at the Instructional Farm, Department of Floriculture and Landscaping, College of Horticulture and Forestry, Jhalrapatan, Jhalawar from March 2017 to September 2017.
The experiment consisting 16 treatments combinations with two factors i.e. nitrogen with four levels (control, 100, 200 and 300 kg ha^{-1}) and phosphorus with four levels (control, 100, 200 and 300 kg ha^{-1}) in Factorial Randomized Block Design with three replications each.

The treatment combinations are $T_0 = N_0P_0$(0 kg N/ha + 0 kg P/ha), $T_1 = N_0P_1$ (0 kg N/ha + 100 kg P/ha), $T_2 = N_0P_2$(0 kg N/ha + 200 kg P/ha), $T_3 = N_0P_3$ (0 kg N/ha + 300 kg P/ha), $T_4 = N_1P_0$ (100 kg N/ha + 0 kg P/ha), $T_5 = N_2P_0$ (200 kg N/ha + 0 kg P/ha), $T_6 = N_3P_0$ (300 kg N/ha + 0 kg P/ha), $T_7 = N_1P_1$ (100 kg N/ha+ 100 kg P/ha), $T_8 = N_1P_2$ (100 kg N/ha + 200 kg P/ha), $T_9 = N_1P_3$ (100 kg N/ha+ 300 kg P/ha), $T_{10} = N_2P_1$ (200 kg N/ha + 100 kg P/ha), $T_{11} = N_2P_2$ (200 kg N/ha +200 kg P/ha), $T_{12} = N_2P_3$ (200 kg N/ha + 300 kg P/ha), $T_{13} = N_3P_1$ (300 kg N/ha + 100 kg P/ha), $T_{14} = N_3P_2$ (300 kg N/ha + 200 kg P/ha), $T_{15} = N_3P_3$ (300 kg N/ha + 300 kg P/ha).

Results and Discussion

The result of present study clearly indicate that maximum plant leaf length, maximum leaf width, maximum flower stalk length, maximum flower fresh weight, earliest first flower bud initiation, maximum number of ray florets per flower, maximum dry flower weight, maximum length of ray florets per flower were significantly increased by individual application of different nitrogen and phosphorus as compare to control.

The application of nitrogen N_3 (300 kg ha^{-1}) had maximum plant leaf length (25.61 cm), maximum leaf width (5.73 cm), maximum flower stalk length (16.56 cm), maximum flower fresh weight (4.64 g), earliest first flower bud initiation (50.37 days), maximum number of ray florets per flower (200.75), maximum dry flower weight (0.766 g), maximum length of ray florets per flower (2.44 cm).

Nitrogen increases the vegetative growth, more transportation and utilization of photosynthetic products resulting in increase in plant height together leaf length of leaves (Khimani, 1995 in gaillardia). Nitrogen increased the width of leaf may be due to increased number of internodes and increased photosynthetic efficiency of the plants due to increase in chlorophyll (Singh and Sangama, 2000 in China aster) [22]. The results also found support from earlier works of Muktanjali *et al*. (2004) [15], Massaye and Rangwala (2009) [13] in China aster. Nitrogen being mobile in plant body moves from older leaves to younger leaves and nitrogen increases flower stalk length and number of branches, which increases stored food material in the tissues, which in turn causes increase in flower stalk length, Tosar (1989) [23], Nagalakshmi and Ravisankar (2002) [16] and Patel *et al.* (2015) [17] in gaillardia and its adequate amount is essential to maximize photosynthetic activities for synthesis of carbohydrate in plant and their conversion into plant lipids, which in turn causes increased fresh flower weight (Karetha *et al*. 2011 in gaillardia) [8]. Nitrogen application might have permitted more accumulation of carbohydrates in the flowers, which accelerated early flower bud initiation process (Kays, 1991) [9]. Role of nitrogen in increasing dry matter accumulation may be the possible cause for this result (Sharma, 2002 in gaillardia). Nitrogen being a growth promoting nutrient helps in synthesis of protein and increases the cell division and cell enlargement which also increases length of ray florets of the plant (Kumar *et al.* 2010 in marigold).

The individual application of phosphorus treatment P_3 (P 300 kg ha^{-1}) recorded maximum leaf length was recorded (24.61 cm), highest leaf width (5.32 cm), maximum flower stalk length per (16.88 cm), maximum flower fresh weight (4.44 g), minimum (52.08 days) to first flower bud initiation, maximum ray florets per flower (190.08), maximum (0.742 g) flower dry weight, maximum (2.39 cm) length of ray florets.

Phosphorus mainly responsible storage and liberation of the energy budget and energy metabolism are controlled by the alternate synthesis (by photosynthesis, oxidative and anaerobic phosphorelation) so increases plant leaf length (Joshi *et al*. 2012 in chrysanthemum). Phosphorus is stored as phytin, whereas in vegetative tissues, it is found as inorganic phosphate in the vacuoles so increases leaf width of plant (Chaudhary, 2007 in tuberose) [3]. Phosphorus is also known to have multifarious cellular functions in plants, including signaling and transmembrane metabolic flux and therefore, the secondary metabolism is modulated by these mechanisms, Patil *et al*. (2004) [8] and Karetha *et al*. (2011) [8] in gaillardia. Phosphorus is found to be involved in the initiation of flower primordial formation leading to increase in flower diameter and flower size as well as the attributes of fresh flower weight in gaillardia (Maheta *et al*. 2016 in China aster) [12]. Phosphorus is found to be involved in the initiation of flower primordial formation leading to increase in number of flower and ray florets per flower as well as the attributes of yield (Sharma *et al*. 2010) [19]. Phosphorus increases the flower dry weight because, phosphorus during decomposition of organic matter, various organic acids are produced which solubilize phosphates, Sharma (2002) [20], Patil *et al*. (2004) [8] and Gadagi *et al*. (2004) in gaillardia. Phosphorus play important role in length of ray florets because, phosphorus enhance new cell formation and necessary for root development, Singatkar (1993) in gaillardia.

Table 1: Effect of nitrogen and phosphorous on growth and flowering parameters

Treatment	Leaf length (cm)	Leaf width (cm)	Flower stalk length (cm)	Flower fresh weight (g)	Days to first flower bud initiation	Number of ray florets per flower	Dry flower weight (g)	Length of ray florets (cm)
N_0	20.13	3.73	7.78	3.71	64.58	169.22	0.690	1.93
N_1	23.02	4.40	13.09	3.75	62.73	170.42	0.694	2.04
N_2	23.18	4.80	14.05	4.03	56.66	182.42	0.725	2.09
N_3	25.61	5.73	16.56	4.64	50.37	200.75	0.766	2.44
SEm ±	0.60	0.16	0.61	0.13	1.96	4.70	0.01	0.07
C.D. (P=0.05)	1.74	0.46	1.78	0.37	5.66	13.56	0.02	0.21
P_0	20.62	3.77	7.09	3.79	63.79	171.92	0.690	1.93
P_1	22.47	4.47	11.77	3.73	61.12	173.33	0.709	1.96
P_2	24.23	5.12	15.73	4.17	56.34	188.17	0.724	2.22
P_3	24.61	5.32	16.88	4.44	52.08	190.08	0.742	2.39
SEm ±	0.60	0.16	0.61	0.13	1.96	4.70	0.01	0.07
C.D. (P=0.05)	1.74	0.46	1.78	0.37	5.66	13.56	0.02	0.21

(N_0-0kg/ha, N_1-100kg/ha, N_2-200kg/ha, N_3-300kg/ha, P_0-0kg/ha, P_1-100kg/ha, P_2-200kg/ha, P_3-300kg/ha)

Conclusion

The individual application of nitrogen N_3 (300 kg ha^{-1}) and phosphorus P_3 (300 kg ha^{-1}) had maximum plant leaf length (25.61 and 24.61 cm), maximum leaf width (5.73 and 5.32 cm), maximum flower stalk length (16.56 and 16.88 cm), maximum flower fresh weight (4.64 and 4.64 g), earliest first flower bud initiation (50.37 and 52.08 days), maximum number of ray florets per flower (200.75 and 190.08),

maximum dry flower weight (0.766 and 0.742 g), maximum length of ray florets per flower (2.44 and 2.39 cm).

References

1. Atwood S. Cellule. 1937; 46:389.
2. Carig RM. Proceedings Florida State Horticulture Science. 1977; 90:180-210.
3. Chaudhary SS. Effect of nitrogen, phosphorus and bio fertilizer application on plant growth and bulb production in tuberose. Haryana Journal of Horticulture Sciences, 2007; 1(36):82-85.
4. Cooper DC, Mahony KL. American Journal of Botany, 1936; 22:843.
5. Das DK. Introductory soil science. Kalyani Publication, 1996, 295-296.
6. Gadagi RS, Krishnraj PU, Kulkarni JH, Tongmin SA. The effect of combined Azospirillum inoculation and nitrogen fertilizer on plant growth promotion and yield response of blanket flower *Gaillardia pulchella*. Scientia Horticulture. 2004; 100(1): 323-332.
7. Joshi NS, Dulawat MS, Pathak DM, Patel NV. Effect of different dose of chemical fertilizer on quality and nutrient content of chrysanthemum varieties. Journal of Chemistry Biology and Physics Science. 2012; 3(1):31-40.
8. Karetha KM, Jat G, Singh V, Gajipara NN. Effect of different level of N, P and K on growth, yield attributes of gaillardia (*Gaillardia pulchella*) cv. Local Double. Asian Journal of Horticulture. 2011; 6(2):344-347.
9. Kays SJ. "Post-Harvest Physiology of Perishable Plant Products". Kluwer Academic Publishers, London, 1991, 111-116.
10. Khimani RA. A note on self-life studies in gaillardia. Gujarat Agriculture University Research Journal. 1995; 20(2):190-191.
11. Kumar P, Kumar J, Rajbeer VK. Effect of nitrogen and iron on growth and flowering parameters in African marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gainda. *Annals of Horticulture*, 2010; 1(3):118-119.
12. Maheta P, Polara ND, Rathod J. Effect of nitrogen and phosphorus on growth, flowering and flower yield of China aster (*Callistephus chinensis* L. Nees) cv. Poornima. Asian Journal of Horticulture. 2016; 11(1):132-135.
13. Masaye SS, Rangwala AD. Effect of different levels of N, P and K on flower quality of China aster. Annals of Agri Bio Research, 2009; 14(2):153-158.
14. Morinaaga Y, Fukushima E, Kano T, Yamasaki Y. Reported *Gaillardia pulchella* diploid. Botanical Magazine Tokyo. 1929; 43:589.
15. Muktanjali J, Paithankar DH, Warde AD, Mohariya, Ambre TP. Effect of graded levels of nitrogen and phosphorus on growth and flower production of China aster cv. Local. Advanced in Plant Science. 2004; 17(1):163-165.
16. Nagalakshmi R, Ravisankar C. Effect of spacing and N & P levels on gaillardia. Karnataka Journal of Horticulture, 2002; 25(27):40-41.
17. Patel AS, Leua HN, Parekh NS, Patel HC. Effect of integrated nitrogen management on growth, flowering and flower yield of gaillardia (*Gaillardia pulchella* Foug.) cv. Lorenziana under middle Gujarat condition. Asian Journal Horticulture. 2015; 10(1):126-129.
18. Patil BC, Kulkani BS, Jagdeesh SL, Madalgeri MB. Effect of split application on nitrogen at different stage on growth and flower production in gaillardia on red soil. Karnataka Journal of Horticulture. 2004; 1(1):104-107.
19. Sharma AK, Chaudhary SS, Gupta YC. Effect of nitrogen and phosphorus on flowering and yield of African marigold (*Tagetes erecta* L.). Progressive Agriculture, 2010; 1(10):158-160.
20. Sharma MK. Effect of nitrogen levels and planting dates on growth, yield and quality of gaillardia (*Gaillardia pulchella* Fouger) cv. Yellow Double. Asian Journal of Horticulture, 2002; 1(6):116-119.
21. Singatkar SS, Sawant RB, Ranpise SA, Wavhal KN. Effect of different levels of N, P and K on growth and flower production of Gaillardia. Journal of Maharashtra Agriculture Universities. 1995; 20(3):392-394.
22. Singh KP, Sangama. Effect of graded level of nitrogen and pruning on China aster (*Callistephus chinensis*) cv. Kamini. Indian Journal of Horticulture. 2000; 57(1):87-89.
23. Tosar MV. Effect of spacing with different levels of nitrogen on growth and flower production of gaillardia (*Gaillardia pulchella*). M.Sc. (Agri.) thesis, Gujarat Agricultural University, sardarkrushinagar, 1989, 12-13.