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Effect of nitrogen and phosphorus on flowering and yield of gaillardia (*Gaillardia pulchella* Foug.) CV. Local yellow under Jhalawar condition

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Abstract

The studies were carried out to study the effect of nitrogen and Phosphorus on flowering and yield 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 N₃ (N 300 kg ha⁻¹) Earliest first flower opening (60.93 days), Earliest 50% flowering (91.26 days), maximum flower diameter (6.67 cm), maximum number of flower per plant (111.67), maximum weight of flower per plant (0.437 kg), number of flower per plot maximum (2615.83), maximum weight of flower per plot (11.53 kg), maximum flower yield (121.25 q/ha). The individual application of phosphorus treatment P₃ (P 300 kg ha⁻¹) recorded minimum (63.25 days) to first flower opening, earliest (95.25 days) 50% flowering, maximum flower diameter (6.56 cm), flowers per plant (108.83), weight of flower per plant (0.446 kg), number of flower per plot (2574.83), flower weight per plot (10.78 kg) and flower yield (115.08 q/ha).

Keywords: Gaillardia, nitrogen, phosphorus, flowering and yield 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, The flowers are borne on long thin wire like stems in solitary, well above the sprawling branches underneath, with usually showy heads (4-6 cm diameter). 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)^[13] and *Gaillardia aristata* is diploid (Cooper and Mahony, 1936)^[3] 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)^[12].

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)^[4].

Materials and Methods

The field experiment entitled "Effect of Nitrogen and Phosphorous on flowering and yield 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 Earliest first flower opening, Earliest 50% flowering, maximum flower diameter, maximum number of flower per plant, maximum weight of flower per plant, number of flower per plot maximum, maximum weight of flower per plot, maximum flower yield 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 earliest first flower opening (60.93 days), earliest 50% flowering (91.26 days), maximum flower diameter (6.67 cm) maximum number of flower per plant (111.67), maximum weight of flower per plant (0.437 kg), number of flower per plot maximum (2615.83), maximum weight of flower per plot (11.53 kg), maximum flower yield (121.25 q/ha).

The early induction of flowers with increased application of nitrogen might be due to more synthesis of protein and protoplasm from carbohydrates leading to late accumulation of stored carbohydrates in vegetative parts Lodhi *et al.* (1993) [9]. Singatkar *et al.* (1995) [23], Patil *et al.* (2004) [20] and Karetha *et al.* (2011) [6] in gaillardia, Monish *et al.* (2008) [12] in China aster. The application of nitrogen at optimum level attributed to accelerate plant growth and reproductive organs, Sonal *et al.* (2010) [24] in China aster, Joshi and Barad (2002) [5], Swaroop *et al.* (2007) [25] in marigold. Moreover, higher nitrogen content might have accelerated protein synthesis, thus promoting early floral primordial development (Khimani, 1995 in gaillardia) [7]. Application of nitrogen the growth of sink tissues and organs (in present case, the flowers) can be limited by short supply of photosynthates from source leaves (Marschner, 1995) [11], which increases stored food material in the tissues, which in turn causes increase in flower stalk length. The results are in close agreement with the result of Tosar (1989) [26], Nagalakshmi and Ravisankar (2002) [17] and Patel *et al.* (2015) [19] in gaillardia. 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) [6], which might have improved the longevity of flower in field condition (Nanjan *et al.* 1980 in tuberose) [18]. Nitrogen is the essential component of protoplasm and chlorophyll materials and its adequate quantity is essential to maximum photosynthetic activities for synthesis of carbohydrate in plant, (Nagaich *et al.* 2004 in marigold) [16].

The individual application of phosphorus treatment P_3 (P 300 kg ha⁻¹) recorded minimum (63.25 days) to first flower opening, earliest (95.25 days) 50% flowering, maximum flower diameter (6.56 cm), flowers per plant (108.83), weight of flower per plant (0.446 kg), number of flower per plot (2574.83), flower weight per plot (10.78 kg) and flower yield (115.08 q/ha). It is well documented that phosphorus is an essential element in reproductive and vegetative growth of plants and thus, the vegetative growth and flowering stimulation increased by applying on gaillardia in present study, Kumar *et al.* (2002) [8] in China aster. Phosphorus increases in flower size because, phosphorus fertilization might have accelerated photosynthesis during vegetative phase and translocation of photosynthates to various metabolic sinks during reproductive phase, (Singatkar *et al.* 1995 in gaillardia) [23]. Similar founding are, Patil *et al.* (2004) [20] and Karetha *et al.* (2011) [6] in gaillardia, Monish *et al.* (2008) [12] in China aster and Sharma *et al.* (2010) [22], Maharnor *et al.* (2011) [10] in marigold. Increased availability of phosphorus in soil might have higher flower weight and phosphorus content in vegetative, Rathod *et al.* (2003) [21] in gaillardia and phosphorus is also known to have multifarious cellular functions in plants, including signaling and transmembrane metabolic flux and therefore, the secondary metabolism, (Sonal *et al.* 2010 in China aster) [24], which increase the weight of flower in the field their conversion into plant lipids and phosphorus fertilization also enhanced translocation and partitioning of assimilates to floral parts, resulting in improved yield attributes, which obviously resulted in higher flower yield (Karetha *et al.* 2011 in gaillardia) [6].

Conclusion

The individual application of nitrogen N_3 (300 kg ha⁻¹) and phosphorus P_3 (300 kg ha⁻¹) had earliest first flower opening (60.93 and 63.25 days), earliest 50% flowering (91.26 and 95.25 days), maximum flower diameter (6.67 and 6.56 cm), maximum number of flower per plant (111.67 and 108.23), maximum weight of flower per plant (0.437 and 0.446 kg), number of flower per plot maximum (2615.83 and 2574.83), maximum weight of flower per plot (11.53 and 10.78 kg), maximum flower yield (121.25 and 115.08 q/ha).

Table 1.

Treatment	Days to first flower opening	Days to 50% flowering	Flower diameter (cm)	Number of flower per plant	Weight of flower per plant (kg)	Number of flower per plot	Weight of flower per plot (kg)	Estimated flower yield (q/ha)
N_0	70.92	104.54	5.38	97.67	0.358	2384.75	7.58	76.42
N_1	69.13	102.42	6.19	100.33	0.394	2450.92	8.79	92.00
N_2	67.83	100.67	6.38	104.92	0.398	2467.00	9.35	101.83
N_3	60.93	91.26	6.67	111.67	0.437	2615.83	11.53	121.25
SEm ±	1.50	2.18	0.07	1.79	0.01	51.19	0.74	13.12
C.D. (P=0.05)	4.33	6.31	0.22	5.17	0.03	147.83	2.14	16.08
P_0	71.03	105.14	5.66	98.67	0.324	2380.67	8.08	70.17
P_1	68.65	101.78	6.05	100.50	0.386	2416.00	8.27	98.33
P_2	65.88	96.98	6.34	106.58	0.431	2550.00	10.13	107.42
P_3	63.25	95.25	6.56	108.83	0.446	2574.83	10.78	115.08
SEm ±	1.50	2.18	0.07	1.79	0.01	51.19	0.74	13.12
C.D. (P=0.05)	4.33	6.31	0.22	5.17	0.03	147.83	2.14	16.08

References

1. Atwood S. Cellulose. 1937; 46:389.
2. Carig RM. Proceedings Florida State Horticulture Science. 1977; 90:180-210.
3. Cooper DC, Mahony KL. American Journal of Botany. 1936; 22:843.
4. Das DK. Introductory soil science. Kalyani Publication, 1996, 295-296.
5. Joshi NS, Barad AV. Effect of N, P and Pinching on growth, yield and quality of African marigold (*Tagetes erecta* L.) cv. Crackerjack. Gujarat Journal Applied of Horticulture. 2002; 1(1):57-65.
6. 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.
7. Khimani RA. A note on self-life studies in gaillardia. Gujarat Agriculture University Research Journal. 1995; 20(2):190-191.
8. Kumar J, Chauhan SS, Singh PV. Response of nitrogen and phosphorus on China aster. Asian Journal of Horticulture. 2002; 9(4):324-328.
9. Lodhi AKS, Tiwari GN. Nutritional requirement of chrysanthemum under field condition. International Journal of Agriculture Science. 1993; 6(4):355-361.
10. Maharnor SI, Chopde N, Thakre S, Raut PD. Effect of nitrogen and pinching on growth and yield of African marigold. Asian Journal of Horticulture. 2011; 1(6):43-45.
11. Marschner H. Mineral Nutritional of Higher Plants. Second edition. Academic press Ltd., London, 1995, 889.
12. Monish M, Umarm VK, Tyagi AK, Meena PM. Effect of nitrogen and phosphorus levels on growth flowering and yield of China aster. Agricultural Sciences Digest. 2008; 2(28):97-100.
13. Morinaaga Y, Fukushima E, Kano T, Yamasaki Y. Reported *Gaillardia pulchella* diploid. Botanical Magazine Tokyo. 1929; 43:589.
14. Muhammad S, Noorul A. Effect of varies combination of nitrogen, phosphorus and potash an enhancing the flowering time in chrysanthemum (*Chrysanthemum morifolium*). International Journal and Biosean Science. 2014; 4(10):99-108.
15. Muktanjali J, Paithankar DH, Warde AD, Mohariya A, 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. Nagaich KN, Trivedi SK, Lekhi R. Effect of nitrogen and phosphorus on growth, flowering, yield and quality of marigold. Scientific Horticulture. 2004; 8(2):203-209.
17. Nagalakshmi R, Ravisankar C. Effect of spacing and N & P levels on gaillardia. Karnataka Journal of Horticulture. 2002; 25(27):40-41.
18. Nanjan K, Nambisan KMP, Veeraragavathatham D, Krishnan BM. The effect of nitrogen, phosphorus and potash on the yield of tuberose (*Polianthes tuberosa* L.). Karnataka Journal of Agriculture Science. 1980; 4(2):221-227.
19. 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.
20. 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.
21. Rathod NG, Narwadkar PR, Sajindranath AK, Prabu T. Effect of integrated nutrient management on growth and yield of Gaillardia. Journal of Maharashtra Agricultural Universities. 2003; 27(3):318-319.
22. 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.
23. 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.
24. Sonal N, Sehwat SK, Gupta AK, Kumar S, Lather S. Studies on effect of nitrogen and phosphorus on growth of China aster cv. White. Haryana Journal of Horticulture Sciences. 2010; 4(39):298-299.
25. Swaroop K, Raju DVS, Singh KP. Effect of nitrogen and phosphorus on growth, flowering and seed yield of African marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gaiinda. Orissa Journal of Horticulture. 2007; 2(35):15-20.
26. 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.