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Effect of nitrogen and phosphorus on flowering yield of Zinnia. (*Zinnia elegans* Jacq.)

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Abstract
The investigation as carried out to investigate the Effect of Nitrogen and Phosphorus on flowering yield of Zinnia.
(*Zinnia elegans* Jacq.) In summer season of 2016. The experiment was conducted at Main Experimental Station, Department of Horticulture, and Narendra Deva University of Agriculture & Technology, Kumarganj, and Faizabad. The experiment was laid out in Randomized Block Design in a factorial arrangement having two factors with nitrogen and phosphorus levels. The combination of four levels nitrogen (0, 50, 100, and 150kg/ha) and three levels of phosphorus (0, 100, and 200 kg/ha) comprising of 12 treatment combinations. The effects of treatment were studied on, number of flower per plant, duration of flowering, length of stalk, weight of flower, weight of flower per plant and flower yield/ha duration of flowering, length stalk, number of flower per plant, yield of flowers per plant with nitrogen 100 kg/ha and phosphorus 200 kg/ha. The interaction effects were also found significant. Thus, the nitrogen (100 kg/ha) with combination of phosphorus 200 kg/ha can be recommended to the growers for higher production of Zinnia flower under eastern Uttar Pradesh

Keywords: nitrogen, phosphorus, duration of flowering, weight flower/plant, yield of flowers etc.

Introduction
Zinnia (*Zinnia elegans* Jacq*)* is popular garden flower of summer season. It has large, *colourful* bloom and ability to withstand hot summer. Zinnia belongs to family "Asteraceae" (Compositae) and is a true American native that originated from Mexico and Central America. Flowers are available from May to October. Good quality and regular supply of flowers depends upon time of seed sowing, growth, development and ultimate flowering behavior of each cultivar. Zinnia plant grows vigorously in hot weather, if they are irrigated regularly. With these factors, proper combination of chemical fertilizers play a vital role to produce more number of shoots and leaves that have good impact on the flower production and quality as to prolong blooming period. **(**Dhaka *et al*, 1999 and Jana and Pal (1991) [8].

In the landscape, Zinnias are tolerant to all type of soil but wet, poorly aerated soils can cause root rot. Exposure to full sun, proper plant spacing, good air movement, and avoiding overhead irrigation decrease the occurrence of several diseases including powdery mildew, leaf spots, and bacterial blights. Though tall cultivars of Zinnia are planted for cut flowers, grown under greenhouse condition in either flat bed or in containers and or as bedding or flowering pot plants (Kessler, 2008).

A well-drained loamy soil rich in organic matter is best for zinnia cultivation. The ideal soil pH should 5-7. It is believed that in richly manures soil, zinnias are more susceptible to viral diseases. Hence, the soil should be only lightly manures. Zinnia is sun loving plant and always prefers sunny locations for good growth and flowering. Blooms are delicate and easily damaged by heavy rains. Large flowered cultivars are more susceptible to damp conditions. Zinnia is short day plant. This means that they initiate vegetative growth when the days are long-dark period 10 hours or less-and flower development when the days are shorter. Stem length and flower size increase with day length and temperature, the greatest profusion of blooms occurring when day light is less than 14 hours.

Nitrogen is one of the very important major plant nutrients which directly affect the plant growth and flowering behavior. Application of appropriate amount of nitrogen is important as its deficiency causes several abnormalities like over growth and less flowering. Application of

Nitrogen through spraying is much more beneficial and quick performing, because plant absorbed nutrients through stomata. Phosphorus is one of the important elements for plant growth and metabolism. It plays key roles in many plant processes such as energy metabolism, the synthesis of nucleic acid and membranes, photosynthesis, respiration, nitrogen fixation and enzyme regulation. Adequate phosphorus nutrition enhances many aspects of plant development including flowering, fruiting and root development. Phosphorus increase root growth and early maturity of crop.

Materials and Methods

The investigation as carried out to investigate the **"**Effect of Nitrogen and Phosphorus on flowering yield of Zinnia. (*Zinnia elegans* Jacq.)" In summer season of 2016. The experiment was conducted at Main Experimental Station, Department of Horticulture, and Narendra Deva University of Agriculture & Technology, Kumarganj, and Faizabad. The experiment was laid out in Randomized Block Design in a factorial arrangement having two factors with nitrogen and phosphorus levels. The combination of four levels nitrogen (0, 50, 100, and 150kg/ha) and three levels of phosphorus (0, 100, and 200 kg/ha) comprising of 12 treatment combinations. The effects of treatment were studied on, number of flower per plant, duration of flowering, length of stalk, weight of flower, weight of flower per plant and flower yield/ha duration of flowering, length stalk, number of flower per plant, yield of flowers per plant with nitrogen 100 kg/ha and phosphorus 200 kg/ha. The interaction effects were also found significant. The combination of 100 kg N/ha with phosphorus 200 kg/ha were found most effective in enhancing vegetative growth, flowering attributes as well as yield of Zinnia flower. Thus, the nitrogen (100 kg/ha) with combination of phosphorus 200 kg/ha can be recommended to the growers for higher production of Zinnia flower under eastern Uttar Pradesh

Results and Discussion

Flowering attributes

4.5 Days to first bud initiation

It is clear from the data presented in Table 4.5 that the days to the first bud initiation was significantly influenced by different levels of nitrogen and phosphorus. The nitrogen treatment significantly influence the number of days required for opening to first bud in Zinnia. The minimum days required for initiation of first bud was recorded with N_2 (100 kg/ha) followed by 36.12 days in N_3 (150 kg/ha).The maximum number of days (42.11) required for initiation of first bud was recorded with N_0 (Control). The earliest first bud initiation (36.04 days) was recorded with phosphorus P_2 (200 Kg/ha) which was found significantly superior over rest of treatment followed by P_1 (100 kg/ha) 37.47 days. The maximum days taken to first bud initiation (38.66) was recorded in phosphorus P_0 (Control). The interaction between nitrogen and phosphorus was found non-significant. The minimum days taken to first flower bud initiation was recorded in N_2P_2 (30.46) with nitrogen 100 kg/ha and phosphorus 200 kg/ha while the maximum days taken for flower bud initiation was recorded in N_0P_0 control (43.93 days).

Table 4.5: Effect of nitrogen and phosphorus on days to first flower bud initiation in Zinnia

Phosphorus	Nitrogen				
	N_0	**N_1**	**N_2**	**N_3**	**Mean**
P_0	43.93	39.56	34.33	36.80	38.66
P_1	41.80	38.20	33.60	36.26	37.47
P_2	40.60	37.38	30.46	35.30	36. 04
Mean	42.11	38.52	32.80	36.12	
	N	P			N x S
SEm±	0.44	0.38			0.77
C.D.(P=0.05)) (P=0.05)	1.31	1.34			NS

4.6 Days to opening of first flower

The result presented in Table 4.6 showed that the days taken to opening first flower of were significantly influenced by different level of nitrogen and phosphorus. The nitrogen treatment significantly influence the number of days required for opening to first flower in Zinnia. It ranges from 43.86 to 49.12 days. The minimum days (43.86) day required for opening of first flower was noted in N_2 (100 kg/ha) followed by 46.00 days in N_3 (150 kg/ha).The maximum 49.12 days required for opening of first flower was observed in N_0 (Control). The effect of varying doses of phosphorus was found non-significant, however the minimum days to first flowering (45.83) recorded at P_2 (200 Kg/ha) and maximum days to first flowering (46.98 days) was recorded at P_0 (Control). The interaction between nitrogen and phosphorus treatment was also found non-significant. The minimum day taken in first flowering is N_2P_2 (42.33 days). While the maximum days taken to first flowering was recorded N_0P_0 (50.40 days) with 100 kg N/ha + 200 kg P/ha.

Table 4.6: Effect of nitrogen and phosphorus on days to opening of first flower in Zinnia

Phosphorus	Nitrogen				
	N_0	**N_1**	**N_2**	**N_3**	**Mean**
P_0	50.40	46.86	44.73	45.93	46.98
P_1	40.03	46.42	44.53	46.20	44.29
P_2	47.20	47.20	42.33	45.86	45.64
Mean	49.12	46.82	43.86	46.00	
	N	P			N x P
SEm±	0.45	0.39			0.78
C.D.(P=0.05)) (P=0.05)	1.32	1.47			NS

4.7 Duration of flowering (days)

A perusal of data shown in Table 4.7 revealed that duration of flowering increased significantly with increasing nitrogen and phosphorus level in Zinnia. In case of nitrogen, different nitrogen levels influence the duration of flowering significantly. Maximum duration of flowering 52.41 days was recorded with N_2 (100 kg N/ha) which was found significantly superior over rest of the treatments. The minimum duration of flowering 42.61 days was recorded with N_0 (control). In case of phosphorus maximum duration of flowering (48.40 days) was recorded with phosphorus P_2 (200 kg/ha). However, the minimum duration of flowering (46.19 days) was recorded with phosphorus P_0 (control). The interaction between nitrogen and phosphorus treatments was found non-significant for Zinnia. Maximum duration of flowering (53.93 days) was recorded in N_2P_2 (nitrogen 100 kg/ha with phosphorus 200 kg/ha) while, the minimum duration of flowering (42.03 days) was recorded in control (N_0P_0)

Table 4.7: Effect of nitrogen and phosphorus on duration of flowering (days) in Zinnia

Phosphorus	Nitrogen				
	N_0	N_1	N_2	N_3	Mean
P_0	42.03	44.26	51.15	47.33	46.19
P_1	42.66	46.00	52.14	48.96	47.44
P_2	43.13	46.26	53.93	50.26	48.40
Mean	42.61	45.51	52.41	48.85	
	N	P			N x P
SEm±	0.51	0.44			0.89
C.D.(P=0.05)) (P=0.05)	1.50	1.30			NS

4.8 Flower stalk length (cm)

It is clear from data presented in Table 4.8 revealed that varying doses of nitrogen and phosphorus significantly influenced the length of flower stalk in zinnia. The gradual increase in nitrogen levels significantly increased the length of flower stalk in zinnia up to 100 kg N/ha. The maximum stalk length 12.33 cm were recorded with N_2 (100 kg/ha). The minimum flower stalk length 6.29 cm was recorded under N_0 (control). The maximum stalk length 10.17 cm, were recorded with phosphorus P_2 (200 kg/ha) which was found significantly superior over rest of the treatments. The minimum flower stalks length 8.50 cm were recorded with phosphorus P_0 (control). The interaction of Nitrogen and Phosphorus was found non-significant. The maximum flower stalk length (13.70 cm) was found in N_2P_2 (100 kg N/ha+200 kg P/ha). Shortest stalk length was found in control (5.60 cm).

Table 4.8: Effect of nitrogen and phosphorus on stalk length (cm) of Zinnia

Phosphorus	Nitrogen				
	N_0	N_1	N_2	N_3	Mean
P_0	5.60	7.46	11.60	9.33	8.50
P_1	6.20	8.40	11.70	10.13	9.11
P_2	7.06	8.80	13.70	11.13	10.17
Mean	6.29	8.22	12.33	10.20	
	N	P			N x P
SEm±	0.21	0.18			0.37
C.D.(P=0.05)) (P=0.05)	0.64	0.55			NS

4.9 Number of flowers per plant

The perusal data present in Table 4.9 revealed that number of flowers per plant were significantly affected by nitrogen and phosphorus treatments. The interaction between nitrogen and phosphorus treatment significantly affect the number of flowers per plant. The numbers of flowers per plant were significantly influenced by different levels of nitrogen treatment. The maximum number of flowers per plant 11.90 were recorded with N_2 (100 kg/ha), while minimum number of flowers per plant (6.19) were recorded with N_0 (control). The different doses of phosphorus significantly affect the number of flower per plant. The maximum number of flowers per plant was counted (9.89) with P_2 (200 kg/ha) while, minimum numbers of flowers per plant (8.91) were recorded with P_0 (control). The interaction between nitrogen and phosphorus treatment for number of flowers per plant was found non-significant. The maximum number of flowers per plant was counted in N_2P_2 (12.50) with Nitrogen 100 kg/ha + 200 kg Phosphorus/ha however, minimum number of flowers per plant was recorded (5.80) in control.

Table 4.9: Effect of nitrogen and phosphorus on number of flowers per plant in Zinnia

Phosphorus	Nitrogen				
	N_0	N_1	N_2	N_3	Mean
P_0	5.80	8.26	11.33	10.26	8.91
P_1	6.13	8.59	11.86	10.86	9.36
P_2	6.93	8.93	12.50	11.20	9.89
Mean	6.29	8.59	11.90	10.77	
	N	P			N x P
SEm±	0.27	0.24			0.48
C.D.(P=0.05))(P=0.05)	0.81	0.70			NS

4.10 Weight of flower (g)

The data presented in Table 4.10 revealed that different nitrogen and phosphorus increased the weight of flower significantly. The highest flower weight (9.80g) was recorded with application of nitrogen N_2 (100 kg/ha) while, lowest flower weight (6.16g) was recorded under (N_0) control treatment. The highest weight of flower (9.25 g) was recorded with phosphorus P_2 (200 kg/ha) which was found significantly superior over rest of the treatments. However the lowest weight of flower (7.44g) was recorded in P_0 (control). The interaction effect of nitrogen and phosphorus was found non-significant. Highest flower weight (10.60g) was recorded N_2 P_2 with Nitrogen 100 kg N/ha +Phosphorus 200 kg/ha. The lowest flower weight (5.50 g) was recorded in control (N_0P_0).

Table 4.10: Effect of nitrogen and phosphorus on weight of flower (g) in Zinnia

Phosphorus	Nitrogen				
	N_0	N_1	N_2	N_3	Mean
P_0	5.50	6.93	9.00	8.33	7.44
P_1	6.06	7.60	9.80	8.86	8.08
P_2	6.93	10.00	10.60	9.46	9.25
Mean	6.16	8.18	9.80	8.88	
	N	P			N x P
SEm±	0.20	0.17			0.34
C.D.(P=0.05))(P=0.05)	0.59	0.51			NS

4.11 Weight flower per plant (g)

The data presented in Table 4.11 clearly showed that that the weight of flowers per plant was affected significantly with different nitrogen and phosphorus levels. The weight of flowers per plant was significantly influenced by different levels of nitrogen treatment. The maximum weight of flower per plant 116.90g per plant was recorded with N_2 (100 kg N/ha). While, minimum weight flower 39.10 g per plant was recorded N_0 (control). The maximum weight of flower per plant (93.99 g) was recorded with P_2 (200 kg N/ha) treatment. This was found significantly superior over rest of the treatments. While, minimum weight of flower per plant

(69.15 g) was recorded with P_0 (control).The interaction effect of nitrogen and phosphorus treatment for weight of flower per plant was also found significant. The maximum weight of flower per plant (132.50g) was recorded in N_2P_2 (Nitrogen 100 kg/ha+ phosphorus 200 kg/ha) followed by N_2P_1 (116.20g). Lowest weight of flowers per plant was found in control N_0P_0 (31.90g)

Table 4.11: Effect of nitrogen and phosphorus on weight flower per plant (g) in Zinnia

Phosphorus	Nitrogen				
	N_0	N_1	N_2	N_3	Mean
P_0	31.90	57.24	102.00	85.46	69.15
P_1	37.14	65.20	112.60	96.22	78.69
P_2	48.26	89.30	132.50	105.90	93.99
Mean	39.10	70.58	116.90	95.86	
	N	P			N x P
SEm±	0.37	0.32			0.64
C.D.(P=0.05)) (P=0.05)	1.08	0.94			1.88

4.12 Yield of flowers per hectare (q/ha)

The data presented in Table 4.5 revealed that different nitrogen and phosphorus levels increased of yield of flower per ha significantly. The yield of flowers was significantly influenced by different levels of nitrogen treatment. The maximum flower yield 263.02 q/ha was recorded with N_2 (100 kg N/ha) followed by N_3 (150 kg N ha^{-1}). The minimum flower yield (87.97) q/ha was recorded with N_0 (control) Maximum yield of flower (211.47q/ha) was recorded in P_2 (200 kg/ha) however, the minimum yield of flower per ha (155.59 q/ha) was recorded in P_0 (control). The interaction between nitrogen and phosphorus treatment yield of flower q/ha was (298.12q/ha) found significant. The maximum yield of flower (298.12q/ha) was recorded in N_2P_2 (nitrogen 100 kg/ha with phosphorus 200 kg/ha) followed by N_2P_1 (261.45 q/ha). Lowest yield of flowers 71.77 q/ ha was found in control.

Table 4.5: Effect of Nitrogen and Phosphorus on yield of flower (q/ha) of Zinnia

Phosphorus	Nitrogen				
	N_0	N_1	N_2	N_3	Mean
P_0	71.77	128.79	229.50	192.28	155.59
P_1	83.56	145.37	261.45	216.49	176.72
P_2	108.58	200.92	298.12	238.27	211.47
Mean	87.97	158.36	263.02	215.68	
	N	P			N x P
SEm±	0.36	0.31			0.62
C.D.(P=0.05)) (P=0.05)	1.06	0.92			1.84

Reference

1. Arora JS, John AO. Effect of different levels of nitrogen, their time of application and plant density on growth and flowering of carnation. Ind. J Hort. 1978; 35(3):254-259.
2. Anuradha K, Pampapathi K, Sreenivasalu R. Effect of nitrogen and phosphorus on flowering and yield of Marigold (*T. erecta* L.). South Ind. Hort. 1988; 36(6):321-323.
3. Anuradha K, Pampapathi K, Sreenivasalu R. Effect of nitrogen and phosphorus on flowering and yield of Marigold (*T. erecta* L.). South Ind. Hort. 1988; 36(6):321-323.
4. Barman D, Pal P. Effect of nitrogen, potassium and spacing on growth and flowering of chrysanthemum (*Chrysanthemum morifolium* Ramat) cv Chandrama. Hort. J. 1999; 12(1):51-59.
5. Biswas B, Maity RG, Mukhopadhyay. Effect of nitrogen, phosphorus and potash on growth and flower production of carnation. Lal Bagh. 1982; 27(3):30-34.
6. Baloch QB, Chacha QI, Panhwar UI. Effect of nitrogen and phosphorus fertilizers on the growth and flower Production of zinnia (*Zinnaelegans*) J of Agri. Tech. 2010; 6(1):193-200.
7. Chauhan A, Kumar V. Effect of graded levels of nitrogen and VAM on growth and flowering in calendula (*Calendula officinalis*). J Orn. Hort. 2007; 10(1):61-63.
8. Dhaka RS, MS Fageria, S Mohemmed, AS Faroda, NL Joshi, S Kathju. *Et al*. Effect of different levels of N, P and K on floral characters of zinnia.pp. 379–82. SKN College of Agric. Jaipur, India, 1999. 1998/08–2000/07.
9. Gowda JVN, Jacob S, Hudder AG. Effect of NPand K on growth and flowering of tuberose c. vdeuble. Indian Perfumer. 1991; 35(2):100-110.
10. Jayanthi R, Gowda JVN. Effect of nitrogen and phosphorus on growth and flowering of chrysanthemum cv. 'Local White'. Current Res. Univ. Agric. Sci. Bangalore. 1988; 17(8):104-106.
11. Jhon AQ, Paul TM, Tanki MI. Effect of nitrogen and plant spacing on growth and flower production of *Zinnia elegans* Jacq. Advances in Plant Sc. 1991; 4(1):17-14.
12. Khan MA, Ziaf K, Ahmad I. Influence of nitrogen on growth flowering of Zinniaeleganscv. Meteor. Asian J. of Plant Sci. 2004; 3(5):571-573.
13. Khan MA, Ziaf Khan Ahmad I. Influence of nitrogen on growth and flowering of *Zinnia elegans* cv. Meteor. Asian J Plant Science. 2004; 3(5):571-573.
14. Kadu AP, Kadu PR, Sable AS. Effect of nitrogen, phosphorus and potassium on growth, flowering and bulb production in tuberose cv. Single. J Soils and Crops. 2009; 19(2):367-370.
15. Kundu M, Joon MC, Beniwal BS, Mehta PK. Effect of nitrogen and phosphorus application on flowering and yield of African marigold (*Tageteserecta* L.). In National Seminar on Recent Trends in Horticulture Crops – Issues and stratigies for research and development, March,22-24, 2010. CCS HAU., Hisar.
16. Larikl K, Shafkh MA, Kakar AA, Munir AS. Effect of nitrogen and potassium fertilization on morphological traits of Zinnia (*Zinnia elegans* L.). Pak. J Agri. Sci. 1999; 36(1-2).
17. Monish Mohit, Umarao, Kumar V, Tyagi AK. And Meena PM. Effect of nitrogen and phosphorous levels on growth, flowering yield of China aster. Agric. Sci. Digest. 2008; 28(2):97-100.
18. Nath S, Sherawat SK, Gupta AK, Kumar S. Studies on effect of N and P on growth of China aster. In"National Seminar on Recent Trends in Horticulture Crop - issues and strategies for research and development. 2010; 22-24:91.
19. Pathiban S, Khader A. Effect of NP and K on yield in tuberose. South Indian Hort. 1991; 39(6):363-367.
20. Umrao VK, Monish M, Tyagi AK, Meena FM. Effect of nitrogen and phosphorus levels on growth flowering and yield of China aster. Agricultural Digest 2008; 28(2):97-100.
21. Yadav PK, Singh S, Dhindwal AS. Effect of nitrogen and FYM application on floral characters and yield of African marigold (*Tagetes erecta* L.). Haryana J. Hort. Sci. 2000;

29(1-2):69-71.
22. Yadav PK, Singh S. Effect of nitrogen and FYM on growth and yield of African Marigold (*Tagetes erecta* L.). Environment and Ecology. 1997; 15(4):849-851.
23. Yagi MI, Gafar MO, Awad A. Effect of manure, fertilizer and spacing on growth, yield and quality of Zinnia flower. Int. J Current Res. 2015; 7(2):12779-12782.