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Influence of Nitrogen on Growth and Flowering of *Zinnia elegans* Cv. Meteor

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Abstract: Response of *Zinnia elegans* Cv. Meteor to different levels of nitrogen was studied during the year 2002. Vegetative characteristics viz., plant growth rate per week, plant height, number of laterals, length of laterals, number of leaves and leaf area, were positively affected by increasing the dose of nitrogen (from 5 to 20 g pot⁻¹). Emergence of first flower delayed while number of flowers per plant, size of flowers and blooming period generally decreased at higher level of nitrogen. Nitrogen application @ 20 and 10 g pot⁻¹ were most effective in improving the vegetative and floral characteristics, respectively.

Key words: *Zinnia elegans*, nitrogen, growth

INTRODUCTION

Zinnias, well known for their bold colors except blue, are available in straight colors or mixtures. Flowers are multi-colored having pink, rose, cherry lavender, purple, red, orange, golden yellow, white or cream color. Zinnia may be potentially more valuable specialty cut flower than realized because of its diversified characteristic ability to propagate by seed, rapid growth and minimal labour requirements. The best production of plants needs proper nutrition, irrigation alongwith other cultural practices.

Excellent quality Zinnia plants can be produced by applying 20:10:5 NPK granules @ 10 g/1400 cm³ of soil^[1]. Whereas, John *et al.*^[2] observed that Zinnia Cv. Giant Flower Crimson produced maximum plant height (142.33 cm), number of branches per plant (17.53), number of flowers per plant (33.2) and flower diameter (9.16 cm), when supplied with 150 kg nitrogen per hectare. Increasing nitrogen rates delayed flowering but augmented plant growth, number of leaves, spike length and number of florets per spike in Gladiolus Cv. 'Vinks Glory'^[3].

Application of N in two equal splits, i.e., first half at 30 days after planting and remaining half at 60 days after planting, promote sprouting, spike emergence and flowering in gladiolus^[4]. While Dhaka *et al.*^[5] reported that number of days required for emergence of first flower, bud, anthesis, duration and longevity of flowers responded positively to N and P application in Zinnia.

A little research work has been done on this important flowering plant in Pakistan. Therefore, the present project was envisaged to investigate the effect of various levels of nitrogen on growth of

Zinnia elegans Cv. Meteor which will be helpful for Zinnia growers for the production of flowers of proper size and quality.

MATERIALS AND METHODS

The effect of various levels of nitrogen on growth and flowering of Zinnia Cv. Meteor was determined in the Floriculture Research Area, Institute of Horticultural Sciences, University of Agriculture, Faisalabad, during the year 2002.

The seeds of *Zinnia elegans* Cv. Meteor were sown in earthen pots and nursery was transplanted in large sized pots, with one plant per pot, after one month of sowing of seeds. Pots were filled with properly prepared medium containing normal soil, silt and farm yard manure in the ratio of 1:1:1. Nitrogen was applied @ 0, 5, 10, 15 and 20 g pot⁻¹ using urea (46%) as source of nitrogen. These doses were equivalent to 0, 50, 100, 150 and 200 kg h⁻¹ application of nitrogen, respectively.

Fertilizer was applied in two splits: first half at the time of transplanting and the remaining half one month after transplanting. Data were collected on various vegetative and floral characteristics including plant growth rate per week (cm), plant height (cm), number of lateral shoots, length of lateral shoots (cm), number of leaves per plant, leaf area (cm²), emergence of first flower (days), total number of flowers, size of flowers (cm²) and blooming period (days).

Data were statistically analyzed by performing Analysis of Variance technique^[6] and interpreted according to Duncan's Multiple Range test at 5% level of probability.

RESULTS AND DISCUSSION

Nitrogen application significantly affected the vegetative (Table 1) and floral characteristics (Table 2) of *Zinnia elegans* Cv. Meteor. Growth rate was maximum (6.7 cm per week) when Zinnia plants were supplied with 15 g (T₃) or 20 g (T₄) nitrogen per pot, although, results were statistically non-significant for nitrogen application @ 10, 15 and 20 g pot⁻¹. Application of 5 g N per pot resulted less growth rate (5.7 cm per week) as compared to 10, 15 and 20 g N application. Yet, the results were significantly different from the control i.e. minimum growth rate (4.7 cm per week) was recorded in plants grown without application of nitrogen fertilizer. Results revealed that growth rate of Zinnia was increased by increasing the dose of nitrogen, as already reported by John *et al.*^[2] that increasing the dose of nitrogen from 50 to 150 kg ha⁻¹, resulted in more vigorous growth in Zinnia Cv. Giant flowered crimson.

Maximum plant height (51.8 cm) was recorded in plants supplied with 20 g N/pot, while, minimum plant height (40.5 cm) was observed in plants grown without nitrogen (control). Nitrogen application @ 10 and 15 g pot⁻¹ resulted in plants having statistically similar height i.e. 45.8 and 47.7 cm, respectively. Almost similar trend was observed for number of lateral shoots per plant i.e. number of lateral shoots increased with increasing nitrogen application. Minimum number of laterals (4.5 per plant) were found in control, while, maximum number of laterals (7.0 laterals per plant) were observed in plants supplied with 20 g N/pot. Nitrogen application @ 5, 10 or 15 g pot⁻¹ resulted in 5.2, 5.8 and 6.0 lateral shoots per plant, respectively. Length of lateral shoots was positively correlated with the rate of nitrogen application. Plants supplied with 20 g N/pot had lateral shoots of maximum size (26.0 cm). Length of lateral shoots decreased gradually with reduction in

nitrogen application rate i.e. 24.5, 24.2, 22.9 and 22.2 cm, in plants receiving 15, 10, 5 and 0 g N/pot, respectively.

Number of leaves was maximum (65.7) in plants with maximum height i.e. in plants supplied with 20 g N/pot. Plant supplied with 5 g N/pot produced 43.4 leaves, statistically similar to those produced by the plants with no fertilizer application (41.4 leaves). Leaf area increased gradually with increasing the dose of nitrogen i.e. minimum (31.8 cm²) in control and maximum (44.4 cm²) in plants receiving nitrogen @ 20 g pot⁻¹. No significant difference in leaf area was observed in plants supplied with 5, 10 or 15 g N/pot. These findings are confirmed by John *et al.*^[2] who reported that plant height and number of branches per plant were maximum when nitrogen was applied @ 150 kg ha⁻¹.

Data on reproductive behavior of Zinnia plants (Table 2) shows significant impact of nitrogen application on various parameters. Emergence of first flower was delayed gradually with increasing the dose of nitrogen. Flowers emerged earliest i.e. after 22 days of transplanting, in plants receiving 10 g N/pot, although, results were statistically similar to plants supplied with 5 g N/pot. Higher doses i.e. 15 g and 20 g N/pot delayed flowering and flowers emerged even later than the control plants. Results revealed that higher the dose of nitrogen longer was the period required for flowering, as already stated by Shah *et al.*^[3]. Moderate doses of nitrogen increased flowering in Zinnia i.e. more flowers were produced by plants receiving 10 g (13.5 flowers per plant) and 5 g (12.6 flowers per plant) nitrogen per pot, than those supplied with 15 g (11.7 flowers per plant) and 20 g (10.8 flowers per plant) nitrogen per pot. Higher doses of nitrogen had negative impact on flowering of Zinnia. Size of Zinnia flowers was affected significantly by nitrogen application. Flowers of maximum size (8.0 cm²) were observed in plants treated with 10 g N/pot. Statistically similar results were recorded when nitrogen

Table 1: Effect of nitrogen on vegetative characteristics of *Zinnia elegans* Cv. Meteor

Treatments (g N/pot)	Plant growth rate (cm)	Plant height (cm)	No. of laterals	Length of laterals (cm)	No. of leaves	Leaf area (cm ²)
0	4.7c	40.5d	4.5d	22.2d	41.4c	31.8c
5	5.7b	42.8c	5.2c	22.9c	43.4c	34.5b
10	6.3a	45.8b	5.8bc	24.2bc	55.7ab	38.8b
15	6.7a	47.7b	6.0b	24.5b	60.3b	39.9b
20	6.7a	51.8a	7.0a	26.0a	65.7a	44.4a

Means with same letter(s) in a column are statistically non-significant

Table 2: Effect of nitrogen on floral characteristics of *Zinnia elegans* Cv. Meteor

Treatments (g N/pot)	Emergence of first flower (days)	Number of flowers per plant	Size of flowers (cm ²)	Blooming period (days)
0	25.6c	11.0b	6.3b	54.0c
5	23.7de	12.8a	6.9ab	62.3b
10	22.0e	13.5a	8.0a	65.4a
15	28.0b	11.7b	7.6ab	60.4b
20	30.9a	10.8b	6.6b	60.7b

Means with same letter(s) in a column are statistically non-significant

was applied @ 5 g (6.9 cm²) and 15 g (7.6 cm²) nitrogen per pot. Higher dose of nitrogen (20 g pot⁻¹) reduced flower size to 6.6 cm², comparable to control plants (6.3 cm²). These results do not verify the findings of John *et al.*^[2] who reported more number of flowers per plant with increased diameter, in plants supplied with higher dose of nitrogen (150 kg ha⁻¹). Zinnia plants fertilized with moderate dose of nitrogen i.e. 10 g pot⁻¹ bloomed for a longer duration (65.4 days) than all other treatments. Plants supplied with 5, 15 and 20 g N/pot bloomed for 62.3, 60.4 and 60.7 days, respectively which are statistically similar with each other.

Positive relationship occurs between nitrogen application rate and vegetative growth (plant growth rate, plant height, number and size of lateral shoots, number of leaves and leaf area) i.e. growth increased with increasing the dose of nitrogen. But, flowering behaviour was negatively correlated with nitrogen application. Optimum doses of nitrogen (10 to 15 g pot⁻¹) resulted in optimum vegetative growth and best reproductive growth behavior. Therefore, optimum use of N fertilizer would help better towards vigorous growth of *Zinnia elegans*, to keep your plants healthy and attractive and to obtain a large number of good quality blooms.

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