INTERNATIONAL JOURNAL OF AGRICULTURE & BIOLOGY
1560–8530/2005/07–3–474–476
http://www.ijab.org

Performance of Zinnia (*Zinnia elegans*) "Dahlia Flowered" Crimson Shade by Application of NPK Fertilizer

QAZI ADEEL JAVID, NADEEM AKHTAR ABBASI, ISHFAQ AHMED HAFIZ AND ASIA LATIF MUGHAL†
Departments of Horticulture and †Food Technology, University of Arid Agriculture, Rawalpindi, Pakistan

ABSTRACT

Crimson Shade of zinnia (*Zinnia elegans*) was grown in different levels of NPK fertilizer. The maximum plant height, number of lateral shoots, number of leaves, leaf area, number of flower per plant and 100 seed weight was observed in (30 + 20 + 20 NPK gm / m^2).

Key Words: Zinnia; Dahlia Flowered; Crimson; NPK fertilizer

INTRODUCTION

Zinnia (*Zinnia elegans)* is popular in garden flower because of its large, colorful bloom and ability to withstand hot summer. Zinnia belongs to family "Compositeae" and is a true American native that originated from Mexico and Central America. Zinnia is an annual plant and has erect stem from 10 to 100 cm in height, with ovate leaves. It has flowers up to 10 cm in diameter across in solitary heads. The disk florets are yellow orange or purplish brown; the ray florets have every flower color, except blue and various shapes i.e. single or multiple whorls. Zinnia is a summer season flower in Pakistan. 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 will grow 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 more number of leaves that have good impact on the flower production and quality prolonging blooming period. Nitrogen, Phosphorus and Potassium are most important for plant growth and to get good quality of flowers. Nitrogen, Phosphorus and Potassium also play role in production of higher seed yield of good quality. Scientific findings of various authors (Oberthova, 1980; Jana & Pal, 1991; Dhaka *et al*., 1999) also showed the beneficial effect of various combination of fertilizer on numerous growth parameters of Zinnia. Present research project was envisaged to find out the optimum combination of nitrogen, phosphrous and potassium for better production of Zinnia flower under soil and climatic conditions of Pakistan.

MATERIAL AND METHODS

A field experiment to study the effect of Nitrogen, Phosphorus and Potassium application in different proportions on the growth and flowering of Zinnia cv. "Giant Dahlia Flowered Blue Point Series" was conducted at the Research Farm of the Department of Horticulture, University of Arid Agriculture, Rawalpindi.

A field plot measuring 13.1 m x 25 m (325 m^2) was ploughed thoroughly and Farm Yard Manure (FYM) @ 20 tonnes ha^{-1} was applied in soil at the time of field preparation. This plot was further divided into 4 blocks having uniform conditions within each block. Each block was further divided into 10 parts having 2.1 x 2.1 m^2 size where fertilizer combination in a treatment was applied. Seeds of Crimson Shades of Zinnia Giant Dahlia Flowered Blue Point Series were sown to raise nursery in 10 inches earthen pots on 18.3.2003. After sowing in pots, light irrigation with sprinkler was done. Seedlings were transplanted after 3-4 week at 2-3 true leaf stage on well prepared soil in field with row to row 60 cm and plant to plant 45 cm distance. Twenty seedlings were transplanted in each block. The fertilizer treatments were as follow:

Treatment	$N + P_2O_5 + K_2O$ (g/m^2)
T_1	No Fertilizer Application
T_2	10 + 30 + 30
T_3	20 + 30 + 30
T_4	30 + 20 + 20
T_5	30 + 20 + 30

Whole phosphorus and potassium in the form of Single Super Phosphate and Potassium Sulphate, respectively and Nitrogen in the form of Urea, were applied at the time of field preparation. All other cultural practices were carried out according to the recommendations.

Data on plant height, number of lateral shoots, number of leaves, leaf area, number of flower per plant and 100 seed weight were recorded fortnightly according to Randomized Complete Design Block (RCBD) from field and subjected to analysis of variance technique and means were compared using least significant difference test (Steel & Torrie, 1980).

RESULTS AND DISCUSSION

Data presented in Table I indicated plant height, number of lateral shoots, number of leaves, leaf area, number of flower per plant and 100 seed weight increased

significantly with optimum dose of fertilizer as in T_4 (30:20:20 g N P K /m^2).

Maximum plant height (61.50 cm) was recorded with (30:20:20 g NPK /m^2) (Table I); whereas, the minimum plant height (39.65 cm) was observed with (00:00:00 g NPK /m^2). Increase in plant height is the most obvious manifestation of growth, which is directly affected by genetic make up, and cultural practices especially fertilization (Meyre *et al*., 1973). Among fertilizers, nitrogen is the most important as far as growth is concerned. Nitrogen has extreme importance regarding plant growth because it is a constituent of protein and nucleic acid, which is helpful in plant growth (Haque, 2001). Phosphorus, like Nitrogen, is also important, as it is the structural part of many compounds, notably nucleic acid and phospholipids. In addition to this, phosphorus plays an important role in energy metabolism (Memon, 2001). Potassium appears to have no structural role in plant but it serves a number of catalytic roles. Many enzymes do not act efficiently in absence or abundance of potassium (Taiz & Zeiger, 1991). The results of present study are similar to the results of Jhon *et al*. (1991).

Maximum (12) numbers of shoots per plant were counted with (30:20:30 g NPK /m^2) and minimum (5) numbers of shoots per plant were counted in control. The high balanced levels of fertilizers had positive effects on plant height and also high dose of fertilizers has direct relation with lateral buds and number of branches (Khan *et al*., 1999). It was also noticed by Henry (1992) that by the application nitrogen, phosphorus and potassium vegetative growth of plant increased. The results of this study are in accordance with Jana and Pal (1991).

Maximum (81) number of leaves were recorded with (30:20:20 g NPK /m^2); while, minimum (52) numbers of leaves were observed where no fertilizer application. These results show that increased level of nitrogen along with sufficient amount of phosphorus and potassium has maximum effect on vegetative growth in treated plant, as nitrogen promotes rapid development of dark green leaves, stems and branches. Although potassium is involved in synthesis of peptide bond, protein metabolism and carbohydrate metabolism and also participates in rapid cell division and differentiation (Belorkar *et al*., 1992). Hence, the balanced application of these nutrients might have resulted in higher number of leaves. The results obtained from this experiment are in agreement with the findings of Hend (2002).

Data related to leaf area are given in Table I showed that maximum leaf area (60.47 cm^2) was measured with (30:20:20 g N P K /m^2) that is significantly different from all other treatments. The minimum leaf area (23.40 cm^2) was measured with control. The results show that the balanced dose of fertilizer has significant effect on leaf area. As nitrogen has a tendency to increase leaf cell number and cell size with overall increase in leaf size (Meyer *et al*., 1973). Also, the phosphorus and potash contents in soil increased by fertilizer application that might have resulted in maximum increase in nutrient uptake and due to this, more photosynthesis might have resulted in more chlorophyll formation with an increased leaf area as (Belorker *et al*., 1992). These results are in agreement with Anamika and Lavania (1990). Data revealed that T_4 (30:20:20 g NPK/m^2) resulted in the maximum (9) number of flowers per plant. These results reflect presence of such a source, where nutritional supply from roots to the flowering primordia remained in the favor of flower production and also the number of flowers may directly be correlated with number of shoots per plant, as the number of shoots per plant were highest with T_4 (30:20:20 g NPK/m^2). Balanced dose of nitrogen, phosphorus and potassium seemed to have increased the vegetative growth, favorable for the synthesis of peptide bond, protein and carbohydrate metabolism that are essential for flower development (Boodly & Meyer, 1965). Control or imbalanced application of fertilizer has poor flowering. The results are in line with the findings of Preeti *et al*. (1999).

Maximum seed weight (0.74 g) was also observed with T_4 (30:20:20 g NPK/m^2) that is statistically different from all other treatments. T_4 showed better results because there might be optimum dose of nitrogen, phosphorus and potassium required for seed production. As the potassium is involved in seed production, T_5 (30:20:30 g NPK / m^2) should have given better results but it was not so. This might be due to the availability of potassium in soil at optimum level for seed production before fertilizer application. So, when more fertilizer was applied that might be beyond the optimum level and cause deleterious effects on seed production. The results of this experiment are in agreement with Dar *et al*., (2002).

Table I. Effect of NPK fertilizer on different growth characteristics of Zinnia "Crimson Shade"

Treatments	*N+P+K*	*Plant height (cm)*	*No. of lateral shoots/plant*	*No. of leaves/plant*	*Leaf area (cm2)*	*No. of flowers per plant*	*100 seed weight (g)*
T_1	00+00+00	39.65 $_c$	5 $_c$	52 $_c$	23.40 $_e$	2.00 $_d$	0.41 $_d$
T_2	10+30+30	44.25 $_b$	6 $_{bc}$	61 $_b$	35.00 $_d$	4.00 $_c$	0.50 $_{cd}$
T_3	20+30+30	44.80 $_b$	8 $_b$	60 $_b$	44.95 $_c$	5.00 $_c$	0.54 $_{bc}$
T_4	30+20+20	61.50 $_a$	12 $_a$	81 $_a$	60.47 $_a$	9.00 $_a$	0.74 $_a$
T_5	30+20+30	44.50 $_b$	8 $_b$	64 $_b$	52.82 $_b$	7.00 $_b$	0.62 $_b$
LSD Value		3.337	1.789	8.416	2.507	1.217	0.1089

(Means not sharing similar letters differ significantly at $P \leq 0.05$)

REFERENCES

Anamika, E. and M.L. Lavania, 1990. Effect of Nitrogen, phosohrous, and potassium on growth, yield and quality of *Rosa arvensis*. *Harayana J. Hort. Sci.*, 19: 291–8

Belorkar, P.V., B.N. Patel, V.J. Golliwar and A.J. Kothare, 1992. Effect of nitrogen and spacing on growth, flowering and yield of African marigold. *J. Soils and Crops*, 2: 62–4

Boodly, J.W. and J.R. Meyer, 1965. The nutrient content of Bonnaffom deltue chrysanthemum from juvenile to mature growth. *American Soc. Hort. Sci.*, 87: 472–8

Dar, Q.A.H., T.K. Chattopadhyay, R.L. Misra and M. Sanyat, 2002. Studies on growth characters of Zinnia. *Indian Soc. Orn. Hort. New Delhi, India.* pp. 203–5. [CAB Absts. 2002/08–2003/04]

Dhaka, R.S., M.S. Fageria, S. Mohemmed, A.S. Faroda, N.L. Joshi, S. Kathju and K. Amal, 1999. *Effect of different levels of N, P and K on floral characters of zinnia*. pp. 379–82. SKN College of Agric. Jaipur, India. [CAB Absts., 1998/08–2000/07]

Haque, I. and A.A. Jakhro, 2001. Soil and fertilizer potassium. *In: Soil Science* pp. 261–63. National Book Foundation, Islamabad, Pakistan.

Hend, E.W., 2002. Response of *Zinnia elegans* to phosphorus and potassium fertilizers. *J. Agric. Sci., Cairo, Egypt.* [CAB Abstracts 2002/08–2003/04]

Henry, D., 1982. Effect of potassium on plant growth. *J. Orn. Hort. Sci.*, 6: 320–1

Jana, B.K. and A. Pal, 1991. Response of nitrogen and phosphorus on growth flowering and yield of Cosmos. *Indian Agriculturist*, 35: 113–8

Jhon, A.Q., T.M. Paul and M.I. Tanki, 1991. Effect of nitrogen and plant spacing on growth and flower production of *Zinnia elegans* Jacq. *Advances in Plant Sci.*, 4: 1–7

Khan, M.A., A.B. Malik, M.N. Khan and T. Saeed, 1999. Nitrogen fertilizer in *Zinnia elegans* in pot culture. *Pakistan J. Sci. Res.*, 3: 81–4

Memon, K.S., 2001. Soil and fertilizer potassium. *In: Soil Science*, pp. 292–93. National Book Foundation, Islamabad, Pakistan

Meyer, B.S., D. Banderson, R.H. Bohning and D.G. Fratianne, 1973. *Introduction to Plant Physiology.* pp. 193–322. D. Van Nostrand Companey, New York

Oberthova, K., 1981. Nutrient content of Zinnia plants grown for seed. *Acta Fytotechina.*, 37: 71–80

Preeti, H., R.L. Misra and P. Hatibarua, 1999. Effect of Nitrogen sources on vegetative and floral characters of gladiolus cv. Danvatri. *J. Orn. Hort.*, 2: 111–4

Steel, R.G.D. and J.H. Torries, 1980. *Principles and Procedures of Statistics*. pp. 232–51. McGraw Hill Book co. Inc., New York

Taize, L. and E. Zeiger, 1991. Mineral nutrition. *In: Plant Physiology.* p. 114. Benjamin Cumming, Publishing Co., Inc. 390 Bridge Parkway, Redwood City, California, USA

(Received 28 December 2004; Accepted 24 March 2005)