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Standard nitrogen application for chrysanthemum cultivar Snowball

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ABSTRACT : The experiment was conducted to standardize the nitrogen application for the standard potted *Chrysanthemum morifolium* cultivar Snowball, during the year 2015-16 in Ludhiana.The nitrogen (as urea) was applied twice in mid-September and mid-October, in six different treatments *i.e*. control, 100 mg/pot, 200 mg/pot, 300 mg/pot, 400 mg/pot and 500 mg/pot. The different levels of nitrogen doses had significant ($p<0.05$) effect on the vegetative growth and flowering, however, the application of 500 mg/poturea gave maximum plant height (73.03 cm), number of leaves (31.02), root suckers per plant (12.10), flower size (17.67 cm) and delayed flower bud appearance, colour break stage and full bloom (70.55, 85.17 and 115.28 days, respectively), however, deteriorated flower quality with respect to reduced flowering duration (6.15 days). Therefore, it was concluded that 300 mg urea/pot applied twice was optimum dose of nitrogen application for quality flower pot production.

KEY WORDS : Chrysanthemum, Nitrogen, Urea, Vegetative growth, Flowering

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Chrysanthemum (*Chrysanthemum morifolium* Ramat), also known as Queen of East or Autumn Queen, is a popular cut flower of commercial importance belonging to family Asteraceae and native of Europe and Asia (Koley and Sarkar, 2013). Manurial schedule of N, P and K plays a major role in successful production of chrysanthemum. Nitrogen applied as fertilizer is the main sources used to meet the N requirements of plant growth (Konnerup and Brix, 2010). Nutrient status of the plants can be indicator to the response of plant to the fertilization and internal content of the nutrient determine the fertilizer requirements (Polara *et al*., 2014). Chrysanthemum is a heavy feeder of nitrogen and phosphorus with high requirement for N during first seven weeks of their growth period. William *et al*. (2013) reported that chrysanthemum accumulates applied N in the form of NO^{3-} during its active growth period which is later remobilized from vegetative tissues and directed to the developing bud during the bud emergence stage. Excessive nutrient concentrations caused an imbalance in other essential nutrients and reduced flower yield (Chawla *et al.*,2007). The plant height, number of branches, flower per plant and flower size increased with increase in nitrogen dose in annual chrysanthemum (Baboo and Sharma, 1997). Though, there is lot of literature available pertaining to amount of nutrient requirement in field grown chrysanthemum and however, there is need to work in particular for potted cultivars. Keeping this in view, the standardization of optimum nitrogen application was undertaken for the standard potted *Chrysanthemum morifolium* cultivar Snowball.

RESEARCH METHODS

The present experiment was conducted at Department of Floriculture and Landscaping, Punjab

Agricultural University, Ludhiana during 2015-16. The terminal cuttings were taken from the mother stock plants pinched in end of May to encourage more number of axillary shoots of pot standard *Chrysanthemum morifolium* cultivar Snowball. The terminal cuttings (5-7 cm) were treated with IBA 400mg/L and rotted in burnt rice husk in June-July. The rooted cuttings were then transplanted during August in the earthen pots (8'') containing mixture of soil and FYM (2:1) along with diammonium phosphate DAP incorporated as a basal dose @ 1 kg/100 cubic feet. The application of nitrogen in the form of urea (N46%) was done twice *i.e.* mid-September and mid-October as per the treatments- control, 100 mg/pot, 200 mg/pot, 300 mg/pot, 400 mg/pot and 500 mg/pot. The treatments were replicated thrice and experiment was conducted in the Completely Randomized Design. The effect of different doses of nitrogen on vegetative growth (at 15 days interval)and floral parameters were recorded and statistically analyzed by SAS software using Duncan multiple range test (DMRT) at 5 per cent level of significance (Duncan, 1955).

RESEARCH FINDINGS AND DISCUSSION

The different doses of nitrogen significantly affected ($p<0.05$) the vegetative parameters *i.e.* plant height, number of leaves and root suckers per plant and floral attributes *i.e.* days taken to flower bud appearance, colour break stage and full bloom, duration of flowering and flower diameter.

The vegetative parameters *i.e.* plant height, number of leaves 45, 60 and 75 days after planting (DAP) and root suckers per plant increased significantly ($p<0.05$) with the increase of nitrogen from 100 mg/pot to 500 mg/pot (Table 1). The plant height and number of leaves per plant at 45 DAP, was obtained maximum in 500 mg/pot (24.52 cm and 18.78) followed by 400 mg/pot and 300 mg/pot (24.38 cm and 18.31, 23.74 cm and 17.69, respectively) which were at par among themselves. The maximum plant height and numbers of leaves 60 and 75 DAP, were obtained in 500 mg/pot (53.62 cm and 26.27.,73.03 cm and 31.02, respectively) followed by 400 mg/pot (53.07 cm and 25.44., 71.02 cm and 30.81, respectively) which were significantly better than other doses, but at par among themselves. The minimum plant

Table 1: Effect of nitrogen application on vegetative growth of chrysanthemum cultivar Snowball

Treatments (mg urea/ pot)	Plant height (cm)				No. of leaves/plant				No. of root suckers/ plant
	30 DAP	45 DAP	60 DAP	75 DAP	30 DAP	45 DAP	60 DAP	75 DAP	
0	10.25 a	20.88 b	45.09 c	59.59 d	9.57 a	12.70 c	20.41 c	24.13 c	8.85 c
100	9.79 a	21.06 b	46.53 c	61.31 d	8.29 a	14.82 b	22.07 bc	26.15 bc	9.43 bc
200	10.78 a	23.24 a	49.57 b	64.33 c	9.09 a	15.76 b	23.09 b	28.39 ab	10.94 ab
300	10.06 a	23.74 a	50.57 b	67.52 b	8.13 a	17.69 a	23.24 b	28.78 ab	10.47 abc
400	10.76 a	24.38 a	53.07 a	71.02 a	8.92 a	18.31 a	25.44 a	30.81 a	11.20 a
500	10.06 a	24.52 a	53.62 a	73.03 a	9.99 a	18.78 a	26.27 a	31.02 a	12.10 a
F- test	NS	*	*	*	NS	*	*	*	*

* indicate significance of value at P=0.05 NS= Non-significant

Table 2 : Effect of nitrogen application on flowering time and quality of chrysanthemum cultivar Snowball

Treatments (mg urea/ pot)	Days to flower bud appearance	Days to colour break stage	Days to full bloom	Duration of flowering (days)	Flower diameter (cm)
0	62.52 d	75.20 c	108.22 c	12.31 a	14.22 d
100	66.34 c	79.23 bc	111.12 bc	11.63 ab	14.96 cd
200	67.03 bc	81.14 ab	113.51 ab	9.71 bc	15.99 bc
300	67.11 bc	82.14 ab	114.48 ab	8.97 c	16.76 ab
400	68.74 b	84.11 ab	115.21 a	8.33 c	16.97 ab
500	70.55 a	85.17 a	115.28 a	6.15 d	17.67 a
F - test	*	*	*	*	*

Mean values in each column with the same letter are not significantly different at $P < 0.05$ according to DMRT
NS = Non- significant * indicate significance of value at $P < 0.05$

height and numbers of leaves 60 and 75 DAP, were observed in the control (45.09 cm and 20.41.,59.59 cm and 24.13, respectively). The number of root suckers per plant was significantly better in 500 mg/pot (12.10) followed by 400 mg/pot (11.20), at par among themselves. The minimum number of root suckers per plant was observed in the control (8.85) followed by 100 mg/pot, 300 mg/pot and 200 mg/pot (9.43, 10.47 and 10.94, respectively), differed significantly among themselves.

In the present investigations, the increased plant height, number of leaves and root suckers per plant were due to the effect of nitrogen which enhanced the cell division and an overall leaf production (Sigedar *et al*., 1991; Arora and Khanna, 1986 and Joshi *et al.*,2013), increased the transportation of metabolites and rate of photosynthesis (Lodhi and Tiwari, 1993; Belgaonkar *et al.,* 1996) and produced growth promoting hormones like auxin and gibberellins, which enabled the better vegetative growth in plants (Chaitra and Patil, 2007). Nitrogen was helpful in plant growth and low C:N ratio also encouraged vegetative growth being the constituent of protein and nucleic acid (Haque and Jakhro, 2001) and thus, promoted rapid growth (Javid *et al*., 2005). These results are in accordance with Joshi *et al*., 2013; Dorajeerao *et al*., 2012 in chrysanthemum.

The flower bud appearance, colour break stage and full bloom were significantly ($p<0.05$) delayed, whereas, duration of flowering decreased and flower diameter increased with increase of nitrogen application from 100 mg/pot to 500 mg/pot (Table 2). The earliest flower bud appearance, colour break stage and full bloom were obtained in the control (62.52,75.20 and 108.22 days, respectively) and significant delay to flower bud appearance, colour break stage and full bloom were observed in 500 mg/pot (70.55,85.17 and 115.28 days, respectively).

This delay in flower bud appearance, colour break stage and full bloom is better, as flowering of chrysanthemum is confined only to limited period from October to December thus, the monitoring of nitrogen dose application provides growers with an efficient crop schedule according to demand of flowers in the market. The delayed flowering with higher dose of nitrogen in chrysanthemum has been reported earlier by Ingle *et al.* (1993) and Sharma *et al.* (2006).

The flower duration was significantly better in control (12.31 days), followed by 100 mg/pot and 200 mg/pot (11.63 and 9.71 days). The shortest flower duration was observed in 500 mg/pot (6.15 days) followed by 400 mg/pot and 300 mg/pot (8.33 and 8.97 days), at par among themselves. The significantly better flower size were obtained in 500 mg/pot (17.67 cm) as compared to other doses, followed by 400 mg/pot and 300 mg/pot (16.97 and 16.76 cm), at par among themselves. The smallest size of flower were observed in the control (14.22 cm) followed by 100 mg/pot and 200 mg/pot (14.96 and 15.99 cm), differed significantly from each other.

Joshi *et al*. (2013) also reported decreased vase life in chrysanthemum with increased nitrogen application to 300kg ha^{-1}. These results are in conformity with the findings of De and Barman (1997) and John and Paul (1999) in chrysanthemum. The increased flower size was due to increased vegetative growth and number of leaves for providing accelerated photosynthates to develop increased flower size (Kumar *et al.,* 2002).

Thus, the higher dose of nitrogen application of 500 mg urea/pot produced maximum vegetative growth with increased flower size and delayed flowering, but deteriorated the flower quality by reduced duration of flowering. Therefore, it was concluded that 300 mg urea/pot applied twice was standardized nitrogen dose for quality flower pot production with better plant growth in *Chrysanthemum morifolium* cultivar Snowball.

REFERENCES

Arora, J. S. and Khanna, K. (1986). Effect of nitrogen and pinching on growth and flower production of marigold (*Tageteserecta* L.). *Indian J. Hort.*, **43**: 291-294.

Baboo, R. and Sharma, K.S.K. (1997). Effect of nitrogen and potash fertilization on growth and flowering of annual chrysanthemum (*Chrysanthemum coronarium*). *J. Ornam. Hort.,* **5** (12) : 44-45.

Belgaonkar, D. V., Bist, M. A. and Wakde, M. B. (1996). Effect of levels of nitrogen and phosphorus with different spacing on growth and yield of annual chrysanthemum. *J. Soils & Crops,* **6** : 154-158.

Chaitra, R. and Patil, V. S. (2007). Integrated nutrient management studies in china aster (*Callistephus chinensis* Nees) cv. KAMINI. *Karnataka J. Agric. Sci.*, **20** (3): 689-690.

Chawla, S. L., Mohammed, S., Mahawer, L. N. and Jain, M. C. (2007). Effect of nitrogen and phosphorus on vegetative growth and flower yield of chrysanthemum (*Chrysanthemum morifolium*) cv. NILIMA. *Annl. Agric. Res.*, **28** (1): 25-28.

De, L.C. and Barman, D. (1997). Growth and flowering of chrysanthemum (*C. morifolium* Ramat) effected by nitrogen and genotypes. *Indian J. Hill Fmg.*, **10**: 51-55.

Dorajeerao, A.V. D., Mokashi, A. N., Patil, V. S., Venugopal, C. K., Lingaraju, S. and Koti, R. V. (2012). Effect of graded levels of nitrogen and phosphorus on growth and yield of garland chrysanthemum (*Chrysanthemum coronarium* L.).*Karnataka J. Agric. Sci.*, **25** (2) : 224-228.

Duncan, D.B. (1955). Multiple range and multiple F tests. *Biometrics*, **11**:1–42.

Haque, I. and Jakhro, A. A. (2001). *Soil and fertilizer potassium*. "*Soil Science*" National Book Foundation, Islamabad, Pakistan: 261–263 pp.

Ingle, V. G., Thakre, A.V., Ghode, P. B. and Diware, D. V. (1993). Studies on growth and flower yield of some chrysanthemum (*C. morifolium* Ramat) varieties under varying level of nitrogen. *PKV Res. J.*, **17**: 67-69.

Javid, Q. A., Abbasi, N. A., Saleem, N., Hafiz, I. A. and Mughal, A. L. (2005). Effect of NPK fertilizer on performance of zinnia (*Zinnia elegans*) Wirlyging Shade. *Internat. J. Agric. & Biol.*, **7** (3) : 471-473.

John, A.Q. and Paul, T. (1999). Response of *Chrysanthemum morifolium* Ramat to different levels of nitrogen and phosphorus. *Appl. Bio. Res.*, **1**: 35-38.

Joshi, N.S., Barad, A.V. and Pathak, D.M. (2013). Response of chrysanthemum varieties to different levels of nitrogen, phosphorus and potash. *J. Chem. Biol. & Phys. Sci*., **3** (2): 1584 -1593.

Koley, S. and Sarkar, M. M. (2013). Measurement of PAR and its impact on chrysanthemum (*Chrysanthemum morifolium* Ramat).*The Bioscan*, **8** (1) : 169-172.

Konnerup, D. and Brix, H. (2010). Nitrogen nutrition of *Canna indica*. Effects of ammonium versus nitrate on growth, biomass allocation, photosynthesis, nitrate reductase activity and N uptake rates. *Aquat. Bot.*, **92**: 142-148.

Kumar, J., Chauhan, S. S. and Singh, P. V. (2002). Response of N and P fertilization on China aster. National Symp IndiFlori in the New Millennium Bangalore : 38pp.

Lodhi, A. K. S. and Tiwari, G. N. (1993). Nutritional requirement of chrysanthemum under field condition.*Fert.News*, **38**(3): 39-45.

Polara, N.D., Gajipara, N. N. and Barad, A.V. (2014). Effect of nitrogen and phosphorous on nutrient content and uptake in different varieties of African marigold (*Tageteserecta* L.). *Bioscan*, **9** (1) : 115-119.

Sharma, B. P., Sharma, Y. D. and Dilta, B.S. (2006). Studies of NPK nutrition on growth and flowering of chrysanthemum (*Dendranthema grandiflorum*Tzeleve). *Internat J. Pl. Sci*., **1**(1): 32-35.

Sigedar, P.D., Anserwadekhar, K.W. and Rodge, B.M. (1991). Effect of different levels of nitrogen, phosphorus and potassium on growth and yield of *Calendula officinalis* Linn. *South Indian Hort*., **39** : 308-311.

William, N. M., Blom, T. J., Tsujita, M. J. and Shelp, B. J. (2013). Review: Improving nitrogen use efficiency of potted chrysanthemum: Strategies and benefits.*Can. J. Pl. Sci*., **93** : 1-8.