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Full Length Research Paper

Effect of nitrogen, phosphorus and potash on growth and flower yield of ratoon spider lily (*Hymenocallis littoralis*)

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The investigation was carried out to study the effect of various levels of N, P and K on ratoon spider lily. All the growth parameters were significantly influenced due to different levels of nitrogen. Application of nitrogen at 400 Kg N ha^{-1} with three equal split doses recorded significantly the highest plant height, number of leaves per plant, leaf length and width, number of flower stalk per plant, length of flower stalk, number of flower buds per stalk, number of flower buds per plant, flowering duration of single stalk, number of flower buds per net plot as well as flower yield per hectare. Phosphorus also plays a significant role in improving growth parameters at higher level except, number of leaves per plant. Phosphorus at 200 Kg P_2O_5 was recorded maximum number of flower stalks per plant, number of flower buds per stalk, length of flower stalk, maximum flowering duration, number of flower buds per plant, number of flower buds harvested per net plot and flower yield per hectare. The optimum growth and flowering yield was obtained with application of 400 Kg N ha^{-1} and 200 Kg P_2O_5 ha^{-1}.

Keywords: Nitrogen, phosphorus, potash, flower, ratoon spider lily.

INTRODUCTION

Spider lily (*Hymenocallis littoralis* L.) is native to South America and belongs to the family *Amaryllidaceae*. It is bulbous ornamental plant with 45-60 cm tall and it has long, broad and strap shaped light green leaves, cultivated for its white, fragrant spidery shaped flowers for varied uses. An umbel produced 9-10 flowers on its head, which are in two to three numbers at a time on a single well developed plant. The flower has six long, delicate, narrow segments united at the base by thin membranous cup or corona. The spider lily is perennial bulbous flower crop and gives economic production up to 7-10 years. Maximum yield is obtained in summer as compared by both winter and rainy season.

India has diverse agro-climatic conditions which are congenial for growing of all kinds of flowers throughout the years. The area under the flower crops in India is around 0.17 million hectare with production of 5075.87 million numbers of cut flowers and 1.01 million metric tonnes of loose flowers. Whereas, Gujarat has 12.50 thousand hectare area under flower crops with production of 5063 lakh numbers of cut flowers and 49.50 thousand tonnes of loose flowers during 2010-2011 (Anon., 2011a).

Spider lily is now emerging as an important commercial flower crop in Gujarat and Maharashtra. The total area under lily cultivation in Gujarat is about 3209 hectare with production of 127779 bundles during 2010-11 (Anon, 2011b). The flowers of spider lily are largely used in garland and *Gajra* making, *mandap* and various flower decorations. A very little research work has been done for standardization of agro-techniques like planting, manuring, irrigation, spacing, nutrition, harvesting and post-harvest handling etc. Some standardize techniques are available for common cultivation of main crop of

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spider lily. The present investigation was carried out to find beneficial quantity and combination of NPK for optimum growth and flowering in second year cultivation or ratoon crop of spider lily.

MATERIALS AND METHODS

The experiment was laid out in FRBD with three replications and twenty four treatment combinations which were carried out at Horticulture Instructional Farm, College of Agriculture, Junagadh Agriculture University, Junagadh during the year 2011-12. The total area of experiment was 40.8 m x 19 m= 775.2 $m^2$with gross and net plot sizes were 3.15 m × 3.0 = 9.45 $m^2$and 2.25 m × 1.80 = 4.05 m^2, respectively. The treatments consisted of four levels of nitrogen; with tree equal doses (as basal, two months and three months after cutting) three levels of phosphorus and two levels of potash applied as basal. FYM 10 ha^{-1} was applied uniformly before first irrigation. The recommended cultural practices were carried out during this investigation.

RESULT AND DISCUSSION

Effect of Nitrogen

The growth parameters were significantly influenced due to increased levels of nitrogen. The dose 400 Kg N ha^{-1}(N_3) significantly improved Nitrogen is a constituent of amino acid and nucleic acids, proteins and nucleotides. It is also part of chlorophyll and numerous secondary substances such as alkaloids, is an important constituent of the protoplasm.

Nitrogen is an important constituent of various enzymes which have take part in plant metabolism, thus nitrogen plays an active role in energy metabolism (Bergmann, 1992). Thus, higher dose of nitrogen at 400 Kg ha^{-1}(N_3) improved cell division, cell elongation which resulted in the growth parameters such as plant height (99.91 cm) and at par with 300 Kg ha^{-1} (N_3), while lowest plant height (89.81 cm) registered at 0 Kg N ha^{-1} (N_0), whereas significantly maximum number of leaves per plant (103.98) recorded with 400 Kg ha^{-1} (N_3) and minimum (85.38) with 0 Kg ha^{-1} (N_0) at last picking which was at par with 200 Kg ha^{-1} (N_0) similar trend was observed in leaf length at last picking (95.82 cm) and significantly maximum leaf width (5.69 cm) recorded with highest dose of nitrogen and minimum leaf width (4.61 cm) recorded at 0 Kg N ha^{-1} (N_0) as presented in Table 1. The increased level of cytokinins in plants due to higher N application rate might have caused to increase leaf length and width.

These results are in conformity with the findings of Koladiya and Dhaduk (1995) and Ghule*et al.* (2003) in spider lily, Mishra *et al*. (2002), Polara *et al.* (2004b) and Patel *et al.* (2006) in tuberose, Sharma *et al.* (2007) and Kumar *et al.* (2006) and Patel *et al*. (2010) in gladiolus. These results are also in agreement with the findings of Kumar *et al*. (2006) and Patel *et al.* (2006) in tuberose.

Abundant nitrogen stimulates the synthesis of amino acids and a substantial amount of photosynthetically produced triose-phosphate serves as skeletons for amino acids. In growing tissues such as young leaves and root tips, most of the amino acids are used for protein synthesis and if growth is not restricted by other factors, no major accumulation of carbohydrates occurs (Kosegarten and Mengel, 1995).

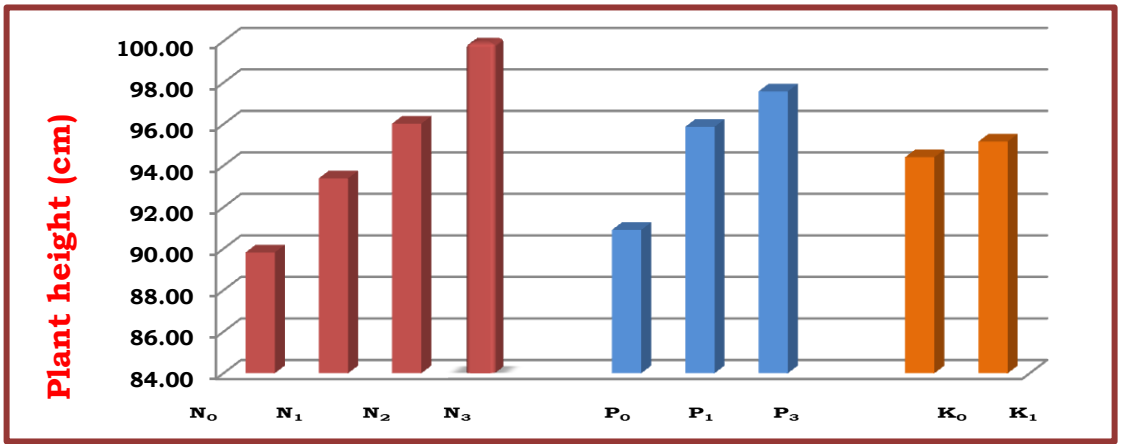
The significantly maximum number of flower stalks per plant (4.23) observed with 400 Kg N ha^{-1} (N_3) which was at par with (N_2) and the lowest numbers of flower stalk (3.64) registered at 0 Kg N ha^{-1} (N_0). The significantly longest flower stalk (82.7 cm) recorded under 400 Kg N ha^{-1} (N_3) and found at par with (N_2) whereas minimum length of flower stalk recorded under 0 Kg N ha^{-1} (N_0). The number of flowers per stalk (16.22), flowering duration of single stalk (12.67 days), number of flowers per plant (61.65), number of flowers harvested per net plot (605.4) flower yield (29897 bundles ha^{-1}) were significantly influenced by various levels of nitrogen and 400 Kg N ha^{-1} (N_3) was found superior than the 300 Kg (N_2) and 200 Kg N ha^{-1} (N_1) presented in Table 2. This might be due to higher dose of nitrogen assimilates that are needed for improving such characters. These findings are in close agreement with findings of Ghule *et al.* (2003). They reported that all flowering parameters were significantly increased with the higher doses of nitrogen in spider lily. Sharma *et al.* (2007) also observed that the flowering parameters were significantly influenced with application of nitrogen in gladiolus.

The longest flower stalk, maximum number of flowers per stalk was significantly recorded with 400 Kg N ha^{-1} over the other treatments. These findings are in agreement with Koladiya and Dhaduk (1996) and Ghule *et al.* (2003) in spider lily. Similar results were also obtained by Polara *et al.* (2004) and Devi and Singh (2010) and revealed that the length of spike increased with increasing doses of nitrogen in tuberose and Patel *et al.* (2010) in gladiolus.

The highest number of flowers per plant, number of flowers per net plot and flower yield per hectare were registered with 400 Kg N ha^{-1} (N_3) and found superior over other doses. These results are in conformity with those of Ghule *et al.* (2003) in spider lily and Dalvi *et al.* (2008) observed that the maximum spike yield found with higher doses of nitrogen in gladiolus.

Effect of Phosphorus

The phosphorus at 200 Kg P_2O_5 ha^{-1} (P_2) found significant on growth parameters such as significantly maximum plant height (97.58 cm) recorded with 200 Kg P_2O_5 ha^{-1} (P_2) and which was at par with 100 Kg P_2O_5 ha^{-1} (P_1), The increased dose of phosphorus also increases

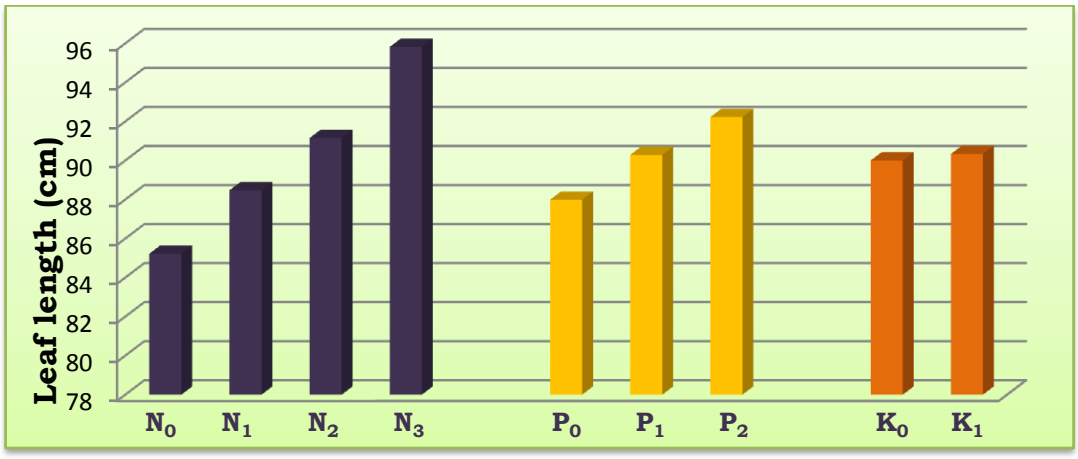


Plant height at flowering as affected by different levels of NPK.

Table1. Effect of different levels of N, P and K on growth parameters of ratoon spider lily.

Treatments	Plant height (cm)	Number of leaves per plant	Leaf length (cm)	Leaf width (cm)
Nitrogen (Kg N ha^{-1})				
N_0- 0	89.81	85.38	85.22	4.61
N_1- 200	93.39	88.66	88.47	5.21
N_2- 300	96.02	96.41	91.15	5.51
N_3- 400	99.91	103.98	95.82	5.69
S. Em. ±	1.79	2.24	1.30	0.106
C. D. at 5 %	5.11	6.39	3.71	0.304
Phosphorus (Kg P_2O_5 ha^{-1})				
P_0- 0	90.91	90.15	87.98	5.10
P_1- 100	95.87	93.64	90.28	5.27
P_2- 200	97.58	96.89	92.22	5.42
S. Em. ±	1.55	1.94	1.12	0.092
C. D. at 5 %	4.42	NS	3.21	0.262
Potash (Kg K_2O ha^{-1})				
K_0- 0	94.41	92.61	90.00	5.39
K_1- 100	95.16	94.50	90.33	5.42
S. Em. ±	1.26	1.58	0.920	0.075
C. D. at 5 %	NS	NS	NS	NS
C. V. %	8.02	10.17	6.12	8.62
Interactions				
N X P	NS	NS	NS	NS
N X K	NS	NS	NS	NS
P X K	NS	NS	NS	NS
N X P X K	NS	NS	NS	NS

leaf length which was (92.22 cm) at 200 Kg P_2O_5 ha^{-1} (P_2) and at par with (P_1) while minimum leaf length was registered with 0 Kg P_2O_5 ha^{-1} (P_0). Similar trend was recorded in case of the significantly highest leaf width (5.42 cm) recorded with higher dose of phosphorus and minimum (5.10 cm) with lower level at flowering stage and found superior over other levels of phosphorus (P_1 and P_0). Because phosphorus is essential for plant growth as it affect cell division, root growth and lengthening. It is an important constituent of ADP, ATP, nucleoproteins, purines, pyrimidine and co-enzymes etc. (Bergmann, 1992). It is also one of structural component



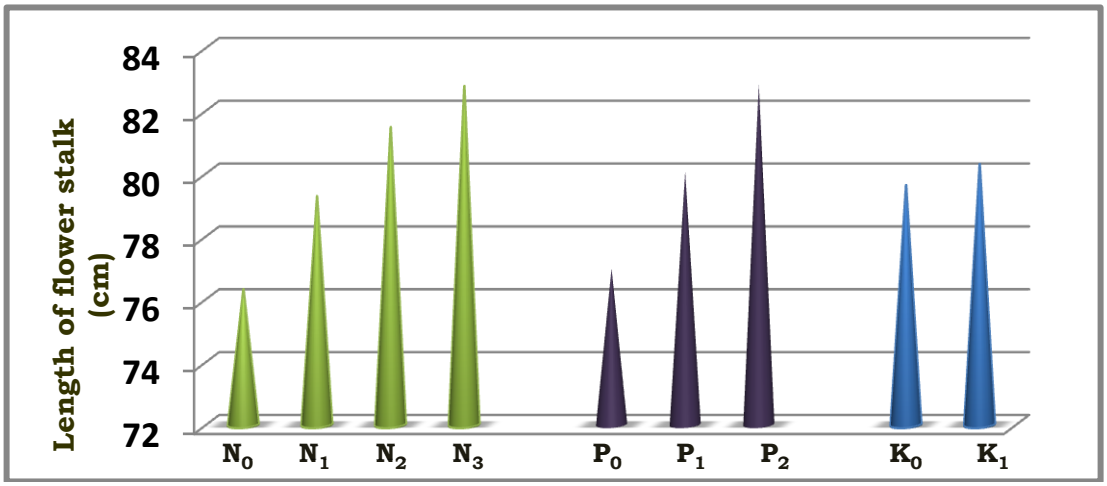
Leaf length as affected by different levels of NPK

Table2. Effect of different levels of N, P and K on flowering parameters of ratoon spider lily.

Treatments	Number of flower stalks per plant	Length of flower stalk (cm)	Number of flower buds per stalk	Flowering duration of single stalk (Days)	Number of flower buds per plant	Number of flower buds per net plot	Flower yield (bundles ha^{-1})
Nitrogen (Kg N ha^{-1})							
N_0- 0	3.64	76.3	12.29	9.77	35.51	384.4	18983
N_1- 200	3.79	79.2	13.84	10.93	43.89	458.2	22627
N_2- 300	4.17	81.4	15.32	11.81	55.45	530.2	26183
N_3- 400	4.23	82.7	16.22	12.67	61.65	605.4	29897
S. Em. ±	0.123	1.20	0.325	0.194	1.77	14.8	631.83
C. D. at 5 %	0.35	3.44	0.925	0.554	5.04	42.2	1800.36
Phosphorus (Kg P_2O_5 ha^{-1})							
P_0- 0	3.81	76.9	13.96	10.58	44.91	467.3	22989
P_1- 100	3.89	80.1	14.26	11.26	47.83	492.5	24327
P_2- 200	4.18	82.8	15.03	12.05	54.63	523.8	25950
S. Em. ±	0.107	1.05	0.281	0.168	1.53	12.8	547.22
C. D. at 5 %	0.30	2.98	0.81	0.479	4.36	36.5	1559.16
Potash (Kg K_2O ha^{-1})							
K_0- 0	3.57	79.6	11.35	11.35	47.61	486.3	23958
K_1- 100	3.69	80.3	11.25	11.25	49.54	502.8	24887
S. Em. ±	0.087	0.855	0.229	0.137	1.25	10.4	446.80
C. D. at 5 %	NS	NS	NS	NS	NS	NS	NS
C. V. %	13.10	6.42	9.56	7.31	10.03	13.63	10.97
Interactions							
N X P	NS	NS	NS	NS	NS	NS	NS
N X K	NS	NS	NS	NS	NS	NS	NS
P X K	NS	NS	NS	NS	NS	NS	NS
N X P X K	NS	NS	NS	NS	NS	NS	NS

of cell membrane, chloroplast and mitochondria which resulted significantly in the largest plant height, at flowering stage, leaf length and leaf width.

The tallest plant was significantly produced at 200 Kg P_2O_5 ha^{-1}(P_2) which is in accordance with Ghule *et al.* (2003) in spider lily. This finding is in agreement with Mukhopadhyay (1981). Dahiya *et al.* (2001) reported that increased plant height with application of various doses of phosphorus in tuberose. The longest leaf was produced by same dose of phosphorus which is in conformity with Patel *et al.* (2010). They reported that the maximum leaf length was found with increasing dose of phosphorus in gladiolus. Phosphorus at 200 Kg P_2O_5 ha^{-1} (P_2) also attended the maximum leaf length and leaf width



Length of flower stalk as influenced by various levels of NPK.

at flowering over the 100 Kg P_2O_5 ha^{-1}(P_1) respected finding are in accordance with Sharma (2007) in gladiolus and Polara (2006) in marigold. They also reported longest leaf with increased doses of phosphorus. The different levels of phosphorus were found significant on flowering parameters like number of flower stalks per plant (4.18) with 200 Kg P_2O_5 ha^{-1} (P_2) and at par with (P_1), significantly maximum length of flower stalk (82.8 cm) registered at 200 Kg P_2O_5 ha^{-1} (P_2) which was at par with (P_1). The higher number of flower buds per stalk (15.03) recorded significantly under P_2 and at par with 100 Kg P_2O_5 ha^{-1} (P_1). Similar trend was recorded incase of flowering duration of single stalk (12.05 days), number of flowers per plant (54.63), number of flowers per net plot (523.8), flower yield (25950) registered with 200 Kg P_2O_5 ha^{-1} (P_2) and at par with 100 kg P_2O_5 ha^{-1} (P_1) whereas lowest values recorded with 0 Kg P_2O_5 ha^{-1} (P_1) showed in Table 2.

The highest number of flower stalks per plant and longest flower stalk, maximum flowering duration were recorded with phosphorus @ 200 kg P_2O_5 ha^{-1}(P_2) and found superior over 100 Kg P_2O_5 ha^{-1} (P_1). The improvement in these parameters might be due to phosphorus enhance better vegetative growth responsible for more accumulation of food and dry matter which increases number of stalk per plant and length of flower stalk, number of flower buds per plant thereby flower yield. These findings are supported by Patel and Chundawat (2002) and Ghule *et al*. (2003) in spider lily. Bankar and Mukhopadhyay (1990) reported phosphorus application significantly increased the number of spikes, floret per spike and flowering duration in tuberose.

Effect of Potash

The all vegetative parameters viz. days to emergence of first flower stalk, plant height, leaf length and leaf width remains non significant due to applied dose of potash, it might be due to increased level of one nutrient reduces availability of another nutrients. This finding is in conformity with Singh *et al*. (2000) in tuberose. Effect of different levels of potash was found to be non-significant on flowering and yield attributes. The lack of response of applied potash in spider lily due to too much doses of nitrogen applied might be reduce availability of another nutrient. These findings are in conformity with Joshi (2002) who reported that potash application remained a non significant effect on flowering attributes of chrysanthemum and Sehrawat *et al.* (2003) in gladiolus.

REFERENCES

Anonymous (2011a). National Horticulture Board, Sector 18, Gurgaon (Haryana). http//www.nhb.gov.in

Anonymous (2011b).The Reports from Director of Horticulture, Ganghinagar, Gujarat.http://agri.gujarat.gov.in

Bankar, G.J. and Mukhopadhyay, A. (1990).Effect of NPK on growth and flowering in tuberose cv. "Double".Indian J. Hort., **47**(1): 120-126.

Bergmann, W. (1992).'Nutritional Disorders of Plants-Development, Visual and Analytical Diagnosis.'Gustav Fischer, Jena and New York, 741 p.

Dahiya, S.S.; Mohansundram, S.; Singh, S. and Dahiya, D.S. (2001).Effect of nitrogen and phosphorus on growth and dry matter yield of tuberose (*Polianthestuberosa* L.).Haryana J. Hort. Sci.,**30**(3&4): 198-200.

Dalvi, N.V.; Rangwala, A.D. and Joshi, G.D. (2008). Effect of spacing and graded levels of fertilizers on yield attributes of gladiolus. J. Maharashtra Agric. Uni.,**33**(2): 167-170.

Devi, K.L. and Singh U.C. (2010).Effect of nitrogen on growth, flowering and yield of tuberose (*Polianthestuberosa* L.) cv. Single.J. of Ornamental Hort.,**13**: 228-232.

Ghule, A.D.; Patil, P.V. and Kantharaju, K.T. (2003).Effect of different levels of nitrogen and phosphorus on growth and flowering of spider lily. J. Maharashtra Agric. Uni.,**28**(2): 128-130.

Koladiya, B.V. and Dhaduk, B.K. (1995).Studies on effect of different spacing and nitrogen levels on growth and flower production of spider lily (*Hymenocallis littoralis* L.).*Thesis Abstract Direc.of Pub. CCS* Haryana Agric. Uni., **22**(3&4): 129-130.

Kosegaten, H. and Mengel, K. (1995).Carbohydrate metabolism and partitioning in crop production.*In*: plant physiology and Biochemistry, (B. B. Sing and Kanrad Mengele eds.). Panima Publishing Corporation, New Delhi, pp. 1-49.

Kumar, R.; Yadav, D.S. and Roy, A.R. (2006).Effect of nitrogen, phosphorus and potassium on growth, flowering and corm production of gladiolus cv. PusaShabnum under Meghalaya conditions.Environment and Ecology, **24**(3A): 939-942.

Mishra, M.; Mohapatra, A. and Mohanty, C.R. (2002).Effect of N, P and spacing on tuberose.Floriculture research trend in India, Proceedings of the national symposium on Indian floriculture in the new millennium, LalBagh, Bangalore, Pp 338-339.

Patel, M.M.; Parmar, P.B. and Parmar, B.R. (2006). Studied the effect of nitrogen, phosphorus and spacing on growth and flowering in tuberose (*Polianthestuberosa*Linn.) cv. Single.J. Ornamental Hort*.,* **9**(4): 286-289.

Patel, N.M.; Desai, J.R.; Saravaiya, S.N.; Patel, N.B.; Patel, K.A. and Patel, R.B. (2010). Influence of chemical fertilizers on growth, quality, corm and cormel production of gladiolus (*Gladiolus grandiflorus* L.) cv. Sancerree under South Gujarat conditions.Asian J. of Hort.,**5**(1): 123-126.

Patel, R.L. and Chundawat, B.S., (2002). Diagnostic survey and nutritional studies in spider lily.National Symposium on Indian Floriculture in the New Millenium, Bangalore.Feb. 25-27pp-99.

Patil, P.R. and Reddy, B.S. (2002). Flowering and flower quality in tuberose as influenced by community planting and fertilizer levels.J. Maharashtra Agric. Uni.,**27**(1): 31-34.

Polara, N.D.; Dhola, S.N.; Khimani, R.A.; Delvadia, D.V. and Makwana, A.N. (2004).Effect of nitrogen, phosphorus and potash on growth and yield of tuberose (*Polianthestuberosa* L.) cv. Double.Int. J. Bio**-**Sci. Repo.,**2**(2): 358-361.

Sehrawat, S.K.; Dahiya, D.S.; Singh, S. and Rana, G.S. (2003).Growth, flowering and corm production in gladiolus as influenced by NPK application.Haryana J. Hort. Sci., **32**(3&4):222-224.

Sharma, G. and Singh, P. (2007).Response of N, P and K on vegetative growth, flowering and corm production in gladiolus under mango orchard.J. Ornamental Hort.,**10**(1): 52-54.

Sharma, R.K.; Dashora, L.K. and Mohmmed, S. (2007). Effect of time of planting and nitrogen on growth and flower yield of tuberose (*Polianthestuberosa*L.)cv. Double.Orissa J. Hort., **35**(2): 108-113.

Singh, A.; Godara, N.R. and Gupta, A.K. (2000).Effect of nitrogen, phosphorus and potash application on N, P andK content in leaves and bulbs of tuberose (*Polianthestuberosa*L.).Haryana J. Hort. Sci.,**29**(1&2): 27-29.