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Effect of nutrient doses on growth, seed yield and tuber yield of glory lily (*Gloriosasuperba* L.)

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Abstract: In an experiment conducted to find the effect of nutrient doses on growth and yield of glory lily during 2012-13 at Antravalli, Kumta (Uttara Kannada, Karnataka),with six treatments replicated four times,15t Farm Yard Manure (FYM) + 150:75:120 kg NPK / ha registered significantly highest vine length (181.80 cm), number of branches (9.40), stem girth (6.97 mm), fresh seed yield (32.03 q/ha) and dry seed yield (6.57 q/ha). Fresh and dry seed yields in this treatment were statistically on par with 15t FYM + 125:70:100 kg NPK / ha. Significantly highest number of pods (17.0) / plant and pod length (7.11 cm) were recorded in 15t FYM + 100:50:75 kg NPK / ha and 15t FYM + 125:70:100 kg NPK / ha, respectively. The highest tuber yield per ha (26.61q) was recorded in 15t FYM + 100:50:75 kg NPK / ha.

KEY WORDS: Agnishikha, Gloriosa lily, Glory lily, Nutrient doses

Introduction

Glory lily (*Gloriosasuperba* L., Family: Liliaceae) is an important medicinal crop. It is commonly known as Agnishikha, Agnimukhi, Garbhaghatini and Kalihari in Sanskrit; Bachnag, Languli and Karihari in Hindi; Supper lily, Tiger claw, Flame lily in English; Agnishekhe, Shivarakthaballi, Akkathangiballi and Karadikanninagadde in Kannada and Kallavi and Kariannag in Marathi (Anon., 1956). It is the national flower of Zimbabwe and is the state flower of Tamil Nadu, India. In India, it is usually found in Himalayan foot-hills, central India, Tamil Nadu, Andhra Pradesh, Karnataka and West Bengal. It is mainly cultivated for its seeds for extraction of colchicine and colchicoside forming the principal source of drugs used for treating gout, rheumatism and for inducing polyploidy in plants.Tamil Nadu holds a monopoly in production of glory lily with an annual production of about 600 tonnes of seeds in an area of about 2400ha. The seeds are customarily exported to Europe, USA, Australia and African companies based in Nigeria, Cameroon and Zimbabwe for extraction of phytochemicals, coclchicine and its derivatives and to use in pharmaceutical industry.The phytochemicals present in glory lily have analgesic, anti-inflammatory, antithrombotic, enzyme inhibitory, anti-venom and chemotherapeutic potential.

There is very little variability available for seed yield and colchicine content in glory lily (Farooqui, *et al*., 1999). Hence the only way to improve the yield is through manipulation of plant population and nutrient management under cultivation. However, in glory lily, there is no standardized scientific fertilizer recommendation available, as the work on this crop is very meager. The farmers adopt nutrient management based on their personal experiences and this lacuna eventually results in low productivity. It is found to be an exhaustive crop and known to register maximum uptake of nutrients during active vegetative growth and flower initiation stage, *i.e.* period from 2nd to 3rd month of planting. The fertilizer dosage and frequency of application contribute more for higher seed yield. Standardization of this technology may help to improve the seed yield and alkaloid content and to increase net returns per unit area. In this regard, an experiment was conducted to study the effect of nutrient doses on growth, seed yield and tuber yield of glory lily. Objective was to standardize the optimum dose of nutrients for getting maximum yield in glory lily.

Materials and Methods

The study was carried out in the farmer's field at Antravalli, Kumta taluka of Uttar Kannada district (Karnataka) from June, 2012 to January, 2013. The village Antravalli is situated in coastal zone of Karnataka state at 14.46^{o} North latitude and 74.4^{o} East longitude at an altitude of 5 m above mean sea level.There were six treatments with different nutrient doses (Table 1). Nitrogen, Phosphorous and Potash were supplied through Urea, Single Super Phosphate and Muriate of Potash, respectively.The experiment was laid out in randomized block design with four replications. Good quality and healthy tubers (weighing about 50g each) were selected for plating. Observations on growth and yield parameters were recorded in five randomly selected uniform plants. The spacing followed was 90 x 30 cm.The data on various observations collected during the study were subjected to statistical analysis using the Fischer's method of analysis of variance. The level of significance was p=0.05.

Results and Discussion

The escalating costs of agricultural inputs like fertilizers and labour, decreasing land resources and limitation in water availability have forced to switch into scientific approaches to maximize the production per unit area and per unit resource used. Glory lily, a commercial medicinal crop, is found to be exhaustive in nature. The balanced fertilization will pave a way to maximize the seed yield in glory lily.A very fewer attempts have been made towards optimization of nutrient requirements of glory lily. Consequently, there is very little scientific information available on recommendation of fertilizers.In the present study, attempts have been made to optimize the fertilizer doses required for glory lily in coastal area of Uttar Kannada.

There was a significant effect of nutrient doses on growth parameters (Table-1). The vine length was significantly influenced by nutrient doses. The vine length was highest (181.80 cm) in T_6 and was on par with T_5 and T_4The lowest value (139.60 cm) was in T_1 with 15t FYM per ha. There was a gradual increase in vine length with increase in NPK doses. It is evident that when there is more availability of nutrients, crop puts up better vegetative growth. These results are in compliance with those of Mastiholi (2008) in coleus.Balashanmugam and Subramanian (1991) also reported maximum plant height in turmeric with the application of higher doses of potassium.

The nutrient doses recorded significant differences in number of branches. The treatment T_6recorded the highest number of branches (9.40) which was statistically on par with T_5. The lowest number of branches (5.75) was in T_1. Application of higher doses of nutrients helped in better vegetative growth of the crop. There was a gradual increase in number of branches per plant with increase in nutrient dose. Mastiholi (2008),Veeraraghavathatham *et al.* (1985) and Geetha and Nair (1990)in coleus and Venkatesh(1994) in turmeric reported the similar results. The maximum stem girth (6.97 mm) was recorded in T_6 which was on par with T_5 and the lowest (5.83 mm) was in T_1. The flower initiation was found to be earlier (60.75 days) in T_5 and was statistically on par with T_4 and T_6. The treatment T_2 (15t FYM + 50: 25: 40 kg NPK per ha) took maximum number of days (69.25 days) for flower initiation. The early initiation of flowering in higher doses of nutrients might be the result of early and balanced vegetative growth due to higher availability of nutrients.

The yield contributing parameters like number of flowers, number of pods and pod length were significantly influenced by nutrient doses whereas no significant result was noticed for per cent pod set, pod diameter, number of seeds per pod and test weight of seeds (Table-1). The number of flowers per plant increased with increase in nutrient doses. It is found to be highest (25.65) in T_6 which was on par with T_5 and T_4. Least number of flowers per plant was (21.30) in T_1. The treatment T_4 recorded the highest value (17.00) for number of pods per plant and was on par with T_5 and T_6. The number of pods in $T_1$was lowest (14.30). There was increase in number of pods per plant with increase in nutrient dose up to 15t FYM + 100: 50: 75 kg NPK per ha (T_4). Though the further increase in nutrient dose decreased the number of pods per plant, but the values (16.9 and 16.45) were on par.Deivasigamani and Thanunathan (2011) and Mohanaramya *et al.* (2010) also reported the increase in yield traits with improved nutrition in glory lily. The possible reason for increased number of flowers may be more availability of major nutrients which were translocated towards growing point resulting in more flower bud formation and fruit set as reported by Sundareswaran *et al*. (2012) in ambrette. The pod length and diameter recorded positive effect of nutrient doses on them. Statistically there was no significant difference among the nutrient doses for pod diameter while nutrient doses significantly influenced the pod length. The treatment T_5 registered the higher pod length (7.11 cm) which was on par with T_6. The pod length was lowest (5.99 cm) in T_1. The nutrient doses did not influence the number of seeds per pod and test weight of seeds significantly. In contrast to the results of the present study, Deivasigamani and Thanunathan (2011) reported the significant increase in number of seeds per pod and test weight of seeds in glory lily when nutrition was increased.

The yield parameters *viz*., fresh and dry seed yield and tuber yield were recorded and analyzed to study the effect of nutrient doses on yield of glory lily (Table-1). The nutrient doses differ significantly for fresh and dry seed yield. The treatment T_6 (15t FYM + 150: 75: 120 kg NPK per ha) recorded the highest values

Table-1: Effect of nutrient doses on growth and yield parameters of glory lily (*Gloriosasuperba* L.)

Treat-	Vine	No. of	Stem	Days to	No. of	No. of	Fruit	L. of	Dia of	No. of	Seed	Yield per ha (q)		
ment	length (cm)	bran- ches	girth (mm)	flower initiat^n	flowers /plant	pods/ plant	set (%)	pod (cm)	pod (mm)	seeds/ pod	Test wt. (g)	Fresh seed	Dry seed	Tuber
T_1	139.60^c	5.75^c	5.83^c	67.75^{bc}	21.30^b	14.30^d	67.18	5.99^d	2.24	58.90	2.35	20.99^e	3.56^e	15.39^d
T_2	154.20^b	6.30^c	6.09^{bc}	69.25^c	21.60^b	14.40^{cd}	66.85	6.43^c	2.21	59.40	2.38	23.50^d	4.26^d	17.59^{cd}
T_3	161.00^b	7.35^b	6.28^{bc}	66.50^{bc}	22.75^b	15.55^{bc}	68.36	6.64^{bc}	2.14	60.65	2.53	26.02^c	4.88^c	14.88^d
T_4	174.10^a	8.20^b	6.35^b	63.75^{ab}	24.90^a	17.00^a	68.50	6.64^{bc}	2.20	60.60	2.40	28.58^b	5.73^b	26.61^a
T_5	178.95^a	9.25^a	6.54^{ab}	60.75^a	25.15^a	16.45^{ab}	65.76	7.11^a	2.10	60.50	2.43	31.48^a	6.32^a	22.28^b
T_6	181.80^a	9.40^a	6.97^a	63.25^{ab}	25.65^a	16.90^a	65.93	6.86^{ab}	2.10	61.60	2.57	32.03^a	6.57^a	20.30^{bc}
Mean	164.94	7.71	6.34	65.21	23.56	15.77	67.10	6.61	2.17	60.28	2.44	27.10	5.22	19.51
S.Em±	4.01	0.33	0.16	1.71	0.63	0.40	1.61	0.14	0.05	0.77	0.07	0.75	0.16	1.33
CD (5%)	12.08	1.01	0.48	5.15	1.89	1.19	NS	0.41	NS	NS	NS	2.26	0.49	4.01
CV (%)	4.85	8.66	4.97	5.23	9.23	5.02	4.79	4.08	4.49	2.56	5.88	5.53	6.16	13.65

T1: 15t FYM per ha; T2: 15t FYM + 50: 25: 40 kg NPK per ha; T3: 15t FYM + 75: 40: 60 kg NPK per ha; T4: 15t FYM + 100: 50: 75 kg NPK per ha; T5: 15t FYM + 125: 70: 100 kg NPK per ha; T6: 15t FYM + 150: 75: 120 kg NPK per ha for fresh and dry seed yields per ha (32.03 q and 6.57q, respectively) which was statistically on par with T_5 (15t FYM + 125: 70: 100 kg NPK per ha). The lowest dry seed yield was observed in T_1. These results are in agreement with the findings of Deivasigamani andThanunathan(2011), Sathish (2000), Mohanaramya *et al.* (2010) and Vasanthi *et al.*, (2012) in glory lily and Sundareswaran *et al*. (2012) in ambrette. The increasing trend in fresh and dry seed yield may be because of increased photosynthetic rate as a result of better vegetative growth in increased dose of nutrients. The significant increase in seed yield may be because of availability of NPK during the development and maturation of seed, wherein most of the nutrients get accumulated in the seed thereby size and weight of seeds were improved.

The differences in tuber yield due to nutrient doses were statistically significant. The treatment T_4 (15t FYM + 100: 50: 75 kg NPK per ha) recorded the highest tuber yield per ha (26.61q) whereas lowest was recorded in T_3 (14.88 q per ha). The tuber yield followed the increasing trend with increase in nutrient dose up to a certain level (T_4: 15t FYM + 100: 50: 75 kg NPK per ha). Further increase in nutrient doses decreased the tuber yield. This may be due to more of vegetative growth and seed yield in increased nutrient doses which resulted in decrease in tuber yield. Deivasigamani and Thanunathan (2011) reported that application of 100 per cent of recommended dose of nitrogen recorded higher seed and tuber yield whereas Mohanaramya *et al.* (2010)reported that 125 per cent of recommended dose of fertilizers through fertigation gave highest yields in glory lily. The results of present study are in conformity with Somnath (2008), Harinkhede *et al.* (2005) and Ingle *et al*. (2004) in safed musli.

In conclusion, the present experiment showed that under coastal Karnataka conditions the application of 15t of FYM with 125:70:100kg of NPK gave better growth and seed yield per ha whereas the tuber yield is significantly higher when the crop was applied with 100:50:75kg NPK along with 15t FYM per ha.

References

Anonymous: The Wealth of India- Raw Materials. Council of Scientific and Industrial Research, New Delhi, **4**: 139-140 (1956).

Balashanmugam, P.V. and Subramanian, K.S.: Effect of split application of potassium on turmeric. *South Indian Hort.*, **39**: 139-142 (1991).

Deivasigamani, S. and Thanunathan, K.: Integrated nutrient management practices for glory lily (*Gloriosasuperba* L.). *Open access journal of medicinal and aromatic plants*, **2**: 6-9 (2011).

Farooqui, A.A., Rudregouda, H. and Laxminarayan Hegde: Correlation and Path-analysis in Glory lily (Gloriosasuperba L.). *J. Med. Arom. Plant Sci.*, **21**: 316-319 (1999).

Geetha, K.and Nair, M.K.P.: Effect of N and K in coleus. *J. Trop. Agric.*, **31**: 198-203 (1990).

Harinkhede, D.K., Tripathi, R.K. and Khare, A.K.: Effect of organic and inorganic sources of nutrients on growth and root yield of safedmusli (*Chlorophytumborivillianum* L.). *Vaniki Sandesh,* **29**: 24-26 (2005).

Ingle, V.G., Wankhade, S.G., Jadhao, B.J.and Men, M.U.: Effect of manure and fertiuzer levels on yield of safedmusli. *Agric. Sci. Digest,* **24**: 311-312 (2004).

Mastiholi, A.B.: Effect of spacing, time of harvest and NPK levels on growth, yield and quality of medicinal coleus (*Coleus forskohlii* Briq.) under irrigated condition. Ph. D. Thesis, University of Agricultural Sciences, Dharwad (2008).

Mohanaramya, M., Rajamani, K., Soorianathasundaram, K. and Rangaswami, M.V.: Effect of drip fertigation on seed yield, tuber and quality characters of glory lily (*Gloriosasuperba*L.). In Proceedings of National Seminar on Medicinal plants, South Indian Hort.: **97** (2010).

Sathish, K.: Spacing and nitrogen studies in *Gloriosasuperba*Linn. M. Sc. Dissertation, Tamil Nadu Agricultural University, Coimbatore (2000).

Somnath: Response of Safedmusli (*Chlorophytumborivilianum*) to NPK, FYM and mulching in North-East transitional zone of Karnataka. Ph. D. Thesis, University of Agricultural Sciences, Dharwad (2008).

Sundareswaran, S., Sivakumar, D., Sathish, S., Jawaharalal, M. and Vijayakumar, A.: Standardisation of fertilizer and spacing for quality seed production in Ambrette (*Abelmoschusmoschatus* Medic). In Proceedings of National Seminar on Medicinal plants, South Indian Hort. **76:** 149 (2012).

Vasanthi, D., Chillamuthu, S., Santhi, R.and Kalaiselvi, B.: Effect of balanced fertilization on seed yield and colchicines content of Glory lily (*Gloriosasuperba*L.). In Proceedings of National Seminar on Medicinal plants, *South Indian Hort.,* **76**: 144 (2012).

Veeraraghavathatham, D., Venkatachalam, R.and Sundararajan, S.: Performance of two varieties of *Coleus forskohlii* under different spacing levels. In Proceedings of National Seminar on Medicinal plants, South Indian Hort., **33**: 389-392 (1985).

Venkatesh, J.: Studies on the evaluation of promising cultivars and nutritional requirements of turmeric (*Curcuma domestica*Val.). Ph. D. Thesis, University of Agricultural Sciences, Bangalore (1994).