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Standardization of NPK for spider lily (*Hymenocallis speciosa* L.) under hill zone of Karnataka

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Abstract
The present investigation entitled, "Standardization of NPK for spider lily (*Hymenocallis speciosa* L.) under hill zone of Karnataka," was conducted at the College of Horticulture, Department of Floriculture and Landscape Architecture, Mudigere, Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga, during the year 2020-21. The experiment was laid out in a Randomized Block Design, with nine treatments and three replications. The results revealed that significant differences were observed among different treatments of NPK doses. The treatment comprising of 75:20:50 kg NPK/ha recorded the maximum plant height (96.40 cm), number of leaves (69.26), plant spread (N-S) (100.23 cm), plant spread (E-W) (100.91 cm), leaf length (99.63 cm), leaf breadth (6.97 cm), leaf area (458.67 cm^2), flowering duration (32.20 days), number of bulbs per plant (5.87), diameter of bulb (13.98 cm), weight of bulb (997.46 g), bulb yield (94.63 kg), minimum days taken for spike emergence (25.00) and days taken for bud initiation to harvesting of a flower spike (9.41).

Keywords: Standardization, NPK, spider, hill, *Hymenocallis speciosa* L.

Introduction
Spider lily (*Hymenocallis speciosa* L.) also known as beach spider lily or warmer beaches, it is a bulbous perennial herb belonging to family Amaryllidaceae with the chromosome number 2n=22, originated from Latin America. *Hymenocallis* is derived from two Greek words; 'hymen' meaning 'membrane' and 'kallos' meaning 'beauty', referring to the 'membranous beauty' of its delicate flowers. It includes 30 to 40 species (John, 2002) [2]. It ranges in height from 60 to 70 cm. The bulb is 7 to 10 cm in diameter. It has boasting showy umbels of 4 to 6 large, vanilla scented, pure and white flowers from mid-summer to late fall. The flowers open up to look like giant white spiders. Spider lily, is a medicinal plant and ornamental, conventionally used for wound healing. The flowers are also used in making of gajra, mandap, garland and various stage decorations. It is used as an emetic and has shown anti-viral, anti-neoplastic and cytotoxic properties. The bulbs are commonly employed as an ornamental plant and used in cosmetic preparation (Karthikeyan *et al*., 2016) [3]. At the time of harvesting, unopened flower buds are harvested from the stalk during morning or evening hours at two to three days intervals. Bundles of 50 buds are prepared by tying with fibres or rubber band and kept in wet jute bags for transportation. This plant is also grown for ornamental purpose in mass near pond or along paths (Maske *et al*., 2015) [4].

Materials and Methods
The present investigation was carried out in an open field condition at the Department of Floriculture and Landscape Architecture in the College of Horticulture, Mudigere, Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga during the year 2020-21. The experiment was laid out in Randomised Block Design (RBD) comprising of nine treatments and three replication each. The treatments of the experiment are: T_1 - Control, T_2 - 50:15:25 kg NPK/ha, T_3 - 50:20:25 kg NPK/ha, T_4 - 75:15:25 kg NPK/ha, T_5 - 75:20:25 kg NPK/ha, T_6 - 50:15:50 kg NPK/ha, T_7 - 50:20:50 kg NPK/ha, T_8 - 75:15:50 kg NPK/ha and T_9 - 75:20:50 kg NPK/ha. The plot was pruned leaving thirteen leaves in the middle before initiation of experiment. The fertilizers were applied as split dose one at basal and another at flowering time. The observations were recorded at 30 days interval till 180 days after treatment.

Results and Discussion

The experimental results revealed that the treatment 75:20:50 kg NPK/ha recorded maximum plant height (96.40 cm), number of leaves (69.26), plant spread in North- South and East – West (100.23 cm and 100.91 cm) (Table 1). While, the control recorded minimum plant height, number of leaves, plant spread in North-South and East -West. This might be due to that nitrogen is a key nutrient for assimilation of amino acids which are building blocks for protein and nucleic acids in the plants, which enhances the rate of photosynthesis and thereby plant height, number of leaves and plant spread. These results are in similarity with the reports of Satpute *et al.* (2014) [7] and Prasad *et al.* (2017) [6] in liliums, Kejkar and Polara (2015) [9] in spider lily, Meena *et al*. (2018) [5] in tuberose and Dhakal *et al*. (2018) [1] in gladiolus.

The maximum leaf length (99.63 cm), leaf breadth (6.97 cm) and leaf area (458.67 cm^2) was found in the treatment 75:20:50 kg NPK/ha, which was on par with the treatment 75:15:50 kg NPK/ha (Table 1). While, the control recorded minimum leaf length, leaf breadth and leaf area. The beneficial effect of nitrogen in promoting the leaf length, leaf breadth could be due to the fact that nitrogen is a component of protein and protoplasm, both of which increased the chlorophyll content of leaves, cell multiplication, cell expansion and cell differentiation, resulting in an increase in the length, breadth and leaf area of leaves. These results are in conformity with the results of Kejkar and Polara (2015) [9] in spider lily, Meena *et al.* (2018) [5] in tuberose and Dhakal *et al*. (2018) [1] in gladiolus.

Table 1: Effect of NPK on vegetative growth of spider lily

Tr. No.	Treatment	Plant height (cm)	No. of leaves	Plant spread (cm)		Leaf length (cm)	Leaf breadth (cm)	Leaf area (cm^2)
				N-S	E-W			
T_1	Control	87.90	58.51	90.87	91.83	90.81	6.12	359.28
T_2	50:15:25 kg NPK/ha	92.40	64.91	96.54	98.65	97.56	6.79	408.66
T_3	50:20:25 kg NPK/ha	94.80	62.41	94.38	97.30	95.01	6.75	432.54
T_4	75:15:25 kg NPK/ha	92.80	65.28	95.64	97.71	96.52	6.67	421.74
T_5	75:20:25 kg NPK/ha	90.39	63.55	95.52	99.75	93.15	6.80	423.10
T_6	50:15:50 kg NPK/ha	89.40	64.10	93.04	96.82	96.24	6.19	381.57
T_7	50:20:50 kg NPK/ha	93.78	66.54	97.12	99.67	97.58	6.79	437.05
T_8	75:15:50 kg NPK/ha	93.80	67.73	98.63	100.91	99.46	6.93	455.09
T_9	75:20:50 kg NP K/ha	96.40	69.26	100.23	102.05	99.63	6.97	458.67
S. Em±		0.04	0.43	0.49	0.40	0.19	0.05	4.88
C.D @ 5%		0.12	1.30	1.46	1.17	0.58	0.15	14.62

The maximum flowering duration (32.20 days), minimum days taken for spike emergence (25.00) and bud initiation to harvesting of a flower spike (9.41) was observed in the treatment 75:20:50 kg NPK/ha (Table 2). While the least was observed in control. This may be due

Table 2: Effect of NPK on flowering parameters in spider lily

Tr. No.	Treatment	Flowering duration (days)	Days taken for spike emergence	Days taken for bud initiation to harvesting of flower spike
T_1	Control	23.25	43.60	14.40
T_2	50:15:25 kg NPK/ha	29.27	35.60	10.67
T_3	50:20:25 kg NPK/ha	29.70	36.73	10.40
T_4	75:15:25 kg NPK/ha	26.55	35.53	12.47
T_5	75:20:25 kg NPK/ha	27.31	38.53	11.27
T_6	50:15:50 kg NPK/ha	24.14	42.40	11.00
T_7	50:20:50 kg NPK/ha	27.57	38.47	9.60
T_8	75:15:50 kg NPK/ha	28.45	33.47	9.93
T_9	75:20:50 kg NP K/ha	32.20	25.00	9.41
S. Em±		0.64	0.35	0.31
C.D @ 5%		1.87	1.02	0.90

to increase in transfer of carbohydrates from vegetative to reproductive areas led to increase the duration of flowering. These results are in line with Kour and Sharma (2012) [8] and Meena *et al*. (2018) [5] in tuberose.

The maximum number of bulbs per plant (5.87), diameter of bulb (13.98 cm), weight of bulb (997.46 g) and bulb yield per plot (94.63 kg) was recorded highest in the treatment 75:20:50 kg NPK/ha (Table 3). Whereas, the control recorded minimum number of bulbs per plant, diameter of bulb, weight of bulb and bulb yield per plot. It is possible due to that the higher nitrogen levels promote plant growth and development as well as aid in the transfer of photosynthates from source (leaves) to sink (bulbs), resulting in higher bulb production in spider lily. These results are in line with Kejkar and Polara (2015) [9] in spider lily and Meena *et al*. (2018) [5] in tuberose.

Table 3: Effect of NPK on bulb parameters in spider lily

Tr. No.	Treatment	Number of bulbs per plant	Diameter of bulb (cm)	Weight of the bulb (g)	Bulb yield (kg/plot)
T_1	Control	4.30	8.97	751.24	58.05
T_2	50:15:25 kg NPK/ha	5.10	11.57	862.66	78.94
T_3	50:20:25 kg NPK/ha	4.99	10.08	982.46	68.52
T_4	75:15:25 kg NPK/ha	5.09	9.89	981.46	83.62

T_5	75:20:25 kg NPK/ha	4.97	10.69	850.59	76.34
T_6	50:15:50 kg NPK/ha	4.23	9.63	851.50	82.46
T_7	50:20:50 kg NPK/ha	5.27	12.32	982.46	87.97
T_8	75:15:50 kg NPK/ha	5.31	13.79	996.50	92.81
T_9	75:20:50 kg NP K/ha	5.87	13.98	997.46	94.63
S. Em±		0.04	0.09	0.90	0.64
C.D @ 5%		0.11	0.26	2.61	1.86

From the experiment, it can be concluded that the T_9 (75:20:50 kg NPK/ha) had the best vegetative growth, flower quality and bulb qualities. Hence, this can be recommended for commercial production of spider lily for quality and yield of flowers and bulbs, respectively.

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