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***Research Note* :**

EFFECT OF SPACING AND NITROGEN ON BULB FORMATION AND GROWTH OF ASIATIC LILY UNDER HILL ZONE

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ABSTRACT : Bulbs of Asiatic lily (*Lilium* spp.) cv. Gironde were planted under open field condition in hill zone of Karnataka (Mudigere) to study the impact of spacing and nitrogen levels on bulb formation and growth. Treatments comprised of three levels of spacing (30x15 cm, 30x30 cm and 40x15 cm) and four levels of nitrogen (0, 100, 150 and 200 kg per ha). The plant spacing of 30x15 cm and 200 kg per ha nitrogen level showed resulting in a significant effect on weight, size and yield of bulb, and weight and number of bulblets per plant, the maximum qualitative and quantitative characteristics of bulbs and bulblets.

Keywords *: Asiatic lity bulb, bulblets, spacing, nitrogen.*

Asiatic lily is one of the most important bulbous flowering plants belonging to the family Liliaceae. Asiatic lilies are excellent for forcing, growing in beds, border, indoor garden and for naturalization in grass under trees and shrubs. The current interest in growing Asiatic lily commercially is gaining movement in India. The information regarding spacing and nutrient management for bulb production under open field conditions is lacking under hill zones of Karnataka, which is of prime concern. The cut flower trade of Asiatic lily is lagging behind in this region, owing to the non availability of quality planting materials at larger scale. Therefore, the present study was undertaken to study the response of spacing and nitrogen levels on various bulb formation and production parameters in Asiatic lily cv. Gironde.

The present investigation was carried out at the Department of Floriculture and Landscape Architecture, College of Horticulture, Mudigere during the period from September 2012 to March 2013. The soil of the experimental site was loamy having the p^H of 5.39. The experiment was laid out in open field with factorial randomized complete block design (FRCBD). There were three replications and twelve treatment combinations in the experiment. Bulbs were planted in each plot with different plant densities with the spacing of 30 × 15 cm (S_1) 30 × 30 cm (S_2) and 45 × 15 cm (S_3) as per treatments.

Full dose of P_2O_5 in form of rock phosphate (28.0% P_2O_5) and K_2O in form of muriate of potash (60.0% K_2O) were applied at the time of planting. Fertilizers were applied separately to individual plots as per the treatments. Four levels of nitrogen, 0 Kg (N_0), 100 kg (N_1), 150 kg (N_2) and 200 kg (N_3) per hectare were applied in form of urea (46.4% N). Nitrogen treatments in form of urea were applied in 4 split doses.

Average weight of bulbs

Plant geometry and nitrogen levels influenced weight of bulbs significantly (Table 1). Maximum weight of individual bulb (28.99 g) was recorded at S_1 (30x15 cm) spacing which was on par at S_3 (40x15 cm) spacing (27.46 g) and least bulb weight (24.03 g) was recorded at S_2 (30x30 cm) spacing . Karthikeyan and Jawaharlal (2) had also recommended dense planting (36 plants/m^2) of carnation for getting better quality of flowers. Among the different nitrogen levels, maximum bulb weight (22.79 g) was observed at N_4 (200 kg/ha) level which was on par at N_3 (150 kg/ha) level (21.18 g) and minimum bulb weight (16.59 g) was observed at N_1 (0 kg/ha). The interaction effect of both nitrogen and spacing levels showed non-significant differences with respect to weight of bulbs.

Size of bulbs

Average size of bulbs was significantly influenced by spacing and nitrogen levels. The largest size of bulbs (9.65 cm) was recorded at S_1 (30x15 cm) spacing followed by S_3 (40x15 cm) spacing (8.43 cm) and the smallest size (7.81 cm) was registered under S_2 (30x30 cm) spacing. Among different nitrogen levels, maximum size of bulbs (7.82 cm) was recorded at N_4 (200 kg/ha) level followed by 150 kgN/ha (6.61 cm), while minimum size of bulbs (5.40 cm) was recorded at N_1 (0 kg/ha) level. The interaction effect of both nitrogen and spacing levels showed non-significant differences with respect to average size of bulbs.

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Table 1: Effect of spacing and nitrogen levels on bulb and bulblet parameters in Asiatic lily.

Treatment	Weight of bulb (g)	Bulb size (cm)	Yield of bulbs per m^2	Number of bulblets per plant	Weight of bulblet (g)
Spacing (cm)					
S_1= 30X15	28.99	9.65	21.22	1.04	1.05
S_2= 30X30	24.03	7.81	10.44	0.91	0.93
S_3= 40X15	27.46	8.43	14.74	0.99	1.02
C.D. (P=0.05)	1.87	0.69	1.21	0.07	0.05
Nitrogen levels (kg/ha)					
N_1=0	16.59	5.40	11.25	0.63	0.67
N_2=100	19.92	6.07	12.00	0.71	0.73
N_3=150	21.18	6.61	11.33	0.75	0.76
N_4=200	22.79	7.82	11.83	0.85	0.84
C.D. (P=0.05)	2.15	0.80	NS	0.08	0.06
Interaction (S x N)					
S_1N_1	24.00	8.03	20.55	0.86	0.89
S_1N_2	29.30	9.00	22.22	0.97	1.02
S_1N_3	30.10	10.09	20.56	1.04	1.05
S_1N_4	32.54	11.49	21.55	1.32	1.23
S_2N_1	19.80	6.51	9.78	0.83	0.88
S_2N_2	23.33	7.26	10.44	0.92	0.91
S_2N_3	25.37	7.68	10.44	0.93	0.96
S_2N_4	27.63	9.78	11.11	0.96	0.96
S_3N_1	22.57	7.03	14.66	0.85	0.89
S_3N_2	27.03	8.03	15.33	0.95	0.99
S_3N_3	29.23	8.67	14.33	1.04	1.01
S_3N_4	31.00	10.00	14.66	1.13	1.17
C.D. (P=0.05)	NS	NS	NS	0.14	0.10

Yield of bulbs/m^2

The yield of bulbs/m^2 was significantly influenced by spacing. Maximum yield of bulbs/m^2 (21.22) was recorded at S_1 (30x15 cm) spacing compared to S_2 (30x30 cm) and S_3 (40x15 cm) spacing. Yield of bulb per meter square was not significantly influenced by nitrogen levels alone and interaction of nitrogen levels and spacing.

Number of bulblets per plant

Bulblets production per plant was significantly influenced by spacing, nitrogen levels and their interaction. Maximum number of bulblets per plant (1.04) was recorded in S_1 (30x15 cm) spacing which was on par at S_3 (40x15 cm) spacing (0.99) and least number of bulblets was recorded at S_2 spacing (0.91). Among different nitrogen levels, maximum number of bulblets (0.85) were recorded at N_4 (200 kg/ha) level followed by 150 kgN/ha (0.75) and 100 kgN/ha (0.71), while minimum number of bulblets (0.63) were recorded at N_1 (0 kg/ha) level.

With respect to interaction, maximum number of bulblets per plant (1.32) were recorded at S_1N_4 (30x15 cm + 200 kg N/ha) combination followed by S_3N_4 (40x15 cm + 200 kg N/ha) (1.13), S_1N_3 (30x15 cm + 150 kg N/ha) (1.04) and S_3N_3 (40x15 cm + 150 kg N/ha) (1.04) and least number of bulblets (0.83) were recorded at S_2N_1 (30x30 cm + 0 kg N/ha) treatment combination.

Average weight of bulblets

Average weight of bulblets was also significantly influenced by spacing, nitrogen levels and their interaction. Maximum weight of bulblets (1.05 g) was recorded at S_1 (30x15 cm) spacing which was at par with S_3 (40x15 cm) spacing (1.02 g) and least weight (0.93 g) was observed under S_2 (30x30 cm) spacing.

Among different nitrogen levels, maximum weight of bulblets (0.84 g) was recorded at N_4 (200 kg N/ha) level which was at par with N_3 (150 kg N/ha) (0.76 g) and N_2 (100 kg N/ha) (0.73 g) level, while minimum weight of bulblets (0.67 g) was recorded at N_1 level (0 kg N/ha). With respect to interaction, maximum weight of bulblets per plant (1.23 g) was recorded at S_1N_4 (30x15 cm + 200 kg N/ha) treatment combination which was on par with S_3N_4 (40 x 15 cm + 200 kg N/ha) (1.17 g) and least weight of bulblets was recorded at S_2N_1 (30x30 cm +0 kg/ha) treatment combination (0.88 g).

Bulb size, bulb weight and bulblet weight

The weight of bulbs, bulblets and size of bulbs were increased significantly with a decrease in plant spacing. This might be due to fact that the use of resources efficiently could helped in synthesis of more photosynthates which are further diverted to bulb growth. These findings are in parallel to the reports of Bhat *et al.* (1).

Nitrogen levels had a significant effect on bulb size, bulb and bulblet weight of Asiatic lily. Data showed that by increasing doses of nitrogen, bulb size and weight of bulb and bulblet increased also. When optimum nitrogen was supplied to a plant, greater translocation of photosynthetic material occurred from the leaves to sink sites (bulbs) resulting in better formation and growth of bulb and bulblets. These findings are similar to the findings of Khalaj and Edrisi (3) in Tuberose. The optimum spacing of 20 × 20 cm was also found superior for, enhancing growth and quality flowering in gladiolus (Ram *et al.,* 5).

Bulb yield per meter square

The number of bulbs/m^2 increased with closer spacing (30x15 cm) might be due to that closer spacing occupying more number of plants per unit area, which in turn increased number of bulbs/m^2. Klasman *et al.* (4) reported similar views in gladiolus.

Number of bulblets per plant

In the present study, maximum production of bulblets per plant (1.04) was recorded with closer spacing (30x15 cm). This might be due to fact that plants face less competition from each other for light, water and nutrients and as a consequences show better physiological activity, which inturn is reflected in improvement of bulblets yield. Klasman *et al* (**4**) reported similar observations in gladiolus.

Among the different nitrogen levels, maximum number of bulblets per plant was increased with increased nitrogen levels. This might be due to the fact that plants grow more vigorously and produce more metabolites which might result in more bulblets per plant. Similar results were expressed by Singh and Mahadevamma (**6**) in tuberose.

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