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EFFECT OF NITROGEN, PLANTING DISTANCE AND BULB SIZE ON BULB AND BULBLETS PRODUCTION OF TUBEROSE (*POLIANTHES TUBEROSA* L.) CV. HYDERABAD DOUBLE

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Abstract

A field experiment was carried out to study the effect of nitrogen, planting distance and bulb size on bulb and bulblets production of tuberose (*Polyanthes tuberosa* L.) cv. Hyderabad Double. Results revealed that higher levels of nitrogen enhanced number and yield of bulb and bulblets per hectare. Nitrogen at (300 kg/ha) resulted maximum number of bulbs (14.93 & 15.16 per plant) and (20.54 & 21.57 lacks/ha), weight of bulb (186.15 & 188.95 g/plant) and yield of bulb (258.19 & 265.93 q/ha), likewise maximum number of bulblets (9.95 & 10.10 per plant) and (13.73 & 14.14 lacks/ha), weight of bulblets (99.38 & 100.87 g/plant) and yield of bulblets (137.51 & 141.64 q/ha) were reported in two consecutive years of experiments. Wider spacing (30 × 30 cm) promoted the number and yield of bulb and bulblets per plant but increases number and yield of bulb and bulblets per hectare. Number of bulbs and bulblets (13.45 & 13.65) and (9.96 & 9.09) per plant and weight of bulbs and bulblets (166.42 & 168.92 g) and (84.92 & 86.20 g) per plant were recorded in wider spacing in two consecutive years of experimentation, while number of bulbs and bulblets per hectare (19.94 & 20.93 lacks) and (13.99 & 14.41 lack) and yield of bulb and bulblets (264.44 & 272.38 q/ha) and (133.41 & 137.41 q/ha) were obtained in closer spacing. Bigger bulb size induced more number and higher yield of bulb and bulblets in both the year of experiments. Number of bulb and bullets (13.13 & 13.33) and (8.98 & 9.12) per plant, (18.09 & 19.00 lacks) and (12.36 & 12.73 lacks) per hectare were counted in bulb size used greater than 2.00 cm, while weight and yield of bulbs (165.81 & 168.30 g/plant) and (229.65 & 236.54 q/ha) and bulblets (84.06 & 85.33 g/plant) and (115.91 & 119.39 q/ha) were counted in bulb used greater than 2.00 cm in 2012-13 and 2013-14 of experiments respectively.

Key words: Nitrogen, planting distance, bulb, bulblets, tuberose

Introduction

Flowers are an integral part of human life, due to their diversity in beauty, form, texture, colour and fragrance. Tuberose (*Polianthes tuberosa* Linn.) is commercial ornamental bulbous plant popularly known as Rajnigandha. It is native to Mexico (Trueblood, 1973), from where it spread to different part of world during the 16th century. It belongs to the family Amaryllidaceae. Tuberose is semi hardy, dwarf, perennial (Edwards, 2006), bulbous, day neutral plant, bulbs are made of scales and simple leaf base the stem remains concealed in scales, roots are adventitious and shallow. It is commercially propagated by bulb. Tuberose is grown for garden decoration in pots, beds, borders for cut flower, loose flower and extraction of essential oil. Tuberose is popular among flower loving people because of its sweet and pleasant fragrance and also long keeping quality. Nutrients such as nitrogen play a major role in the growth and development of plants (Scott, 2008). Silberbush *et al.* (2003) and Kim *et al.* (1998) have emphasized to supply nutrients to the soil during the growth of plants to increase their productivity. Besides being the chief constituent of the chlorophyll molecule require for photosynthesis, its deficiency leads to a decrease of photosynthesis (Thomas *et al.* 1975), nitrogen is also required for synthesis of amino acids, amines, protein, nucleic acids, nucleotides, urines, pyrimidines, coenzymes, hexose amine etc. Plant density is another, important yield contributing factor, can be manipulated to maximize production from per unit area. Quantity as well as quality of bulbs depends upon

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various factors, out of which size of bulbs play important role. Size of planting material is important for obtaining good bulb production. Present study was under with objectives to assess the individual effect of nitrogen does, planting distance and bulb size on bulb and bullets production of tuberose.

Materials and Methods

The present study was conducted at Main Experiment Station, Department of Horticulture, N.D.U.A. & T., Faizabad in two successive years 2012-13 and 2013-14. The experiment was conducted in Randomized Block Design (factorial) with 16 treatment combinations, comprising of 4 levels of nitrogen (0, 100, 200 and 300 kg/ha), two levels of planting distance S_1 (30×20 cm) and S_2 (30×30 cm) and two levels of bulb size B_1 (less than 2.00 cm) and B_2 (greater than 2.00 cm). Nitrogen was applied through urea in two split doses (half as basal dressing and half in top dressing 40 days after sowing), The soil of the experimental site was loam having medium available nitrogen; phosphorus and potassium with p^H level 7.86. Bulb and bullets production were studied as influenced through nitrogen levels, planting distance and bulb size. Five plants were tagged for recording the data in each treatment leaving the border plants pertaining to bulb and bullets of tuberose in two consecutive years. The data were analysed by procedure suggested by Gomez and Gomez (1984).

Results and Discussion

The studies pertaining to initiation, growth and development of bulbs and bullets were some other indices for evaluating the efficiency of nitrogen treatments on plant growth in tuberose. The number (14.93 & 15.16) and weight (186.15 & 188.95g) of bulb and bullets (9.95 & 10.10 and 99.38 & 100.87g) per plant responded significantly to nitrogen fertilization in two successive years of experiments, and with each increase in the level of nitrogen applied there was in turn, sizable increase in each of bulb and bullets parameter studies. The highest dose of nitrogen 300 kg N ha^{-1}, which produce the maximum number of leaves per clump also proved most effective in improving the growth of bulb and bullets. The growth and development of foliage, bulb and bullets were directly aligned with the nitrogen fertilization. Kadu *et al.* (2009) and Devi, *et al*. (2010) recorded profound increase in the size of bulb and bulb yield per plant in tuberose with 300 kg N ha^{-1} which are in conformity with the present investigation.

As the amount of nitrogen increased, the yield

Table-1: Effect of nitrogen levels, planting distance and bulb size on bulb and bullets production of tuberose (*Polianthes tuberosa* L.) cv. Hyderabad Double

Treatments	Number of bulbs/ plant		Number of bulbs/ha (lack)		Weight of bulbs/ plant(g)		Yield of bulbs (q/ha)		Number of bulblets/ plant		Number of bulblets/ha (lack)		Weight of bulblets/ plant (g)		Yield of bulblets (q/ha)	
	2012-13	2013-14	2012-13	2013-14	2012-13	2013-14	2012-13	2013-14	2012-13	2013-14	2012-13	2013-14	2012-13	2013-14	2012-13	2013-14
N_0	9.73	9.88	13.33	13.99	136.22	138.26	186.68	192.28	6.57	6.67	9.09	9.36	60.03	60.93	82.44	84.92
N_1	12.35	12.54	16.88	17.73	161.15	163.57	223.12	229.81	8.40	8.53	11.57	11.91	76.83	77.98	106.69	109.89
N_2	13.82	14.02	19.00	19.95	166.66	169.16	230.73	237.65	9.80	9.95	13.50	13.91	93.71	95.11	129.47	133.35
N_3	14.93	15.16	20.54	21.57	186.15	188.95	258.19	265.93	9.95	10.10	13.73	14.14	99.38	100.87	137.51	141.64
S.Em±	0.11	0.12	0.16	0.29	0.45	0.90	0.72	1.30	0.12	0.12	0.17	0.24	0.61	0.64	0.48	0.89
CD at 5%	0.32	0.35	0.45	0.83	1.29	2.59	2.07	3.75	0.34	0.34	0.34	0.70	1.75	1.85	1.40	2.57
S_1	11.97	12.15	19.94	20.93	158.67	161.05	264.44	272.38	8.40	8.53	13.99	14.41	80.05	81.25	133.41	137.41
S_2	13.45	13.65	14.94	15.69	166.42	168.92	184.41	190.46	8.96	9.09	9.95	10.25	84.92	86.20	94.65	97.49
S.Em±	0.08	0.09	0.11	0.20	0.31	0.63	0.51	0.92	0.08	0.08	0.12	0.17	0.43	0.45	0.34	0.63
CD at 5%	0.23	0.25	0.32	0.59	0.91	1.83	1.46	2.65	0.24	0.24	0.34	0.50	1.24	1.31	0.99	1.81
B_1	12.28	12.47	16.79	17.62	159.29	161.67	219.70	226.29	8.38	8.50	11.58	11.93	80.91	82.12	112.14	115.51
B_2	13.13	13.33	18.09	19.00	165.81	168.30	229.65	236.54	8.98	9.12	12.36	12.73	84.06	85.33	115.91	119.39
S.Em±	0.08	0.09	0.11	0.20	0.31	0.63	0.51	0.92	0.08	0.08	0.12	0.17	0.43	0.45	0.34	0.63
CD at 5%	0.23	0.25	0.32	0.59	0.91	1.83	1.46	2.65	0.24	0.24	0.34	0.50	1.24	1.31	0.99	1.81

N_0= 0 kg/ha, N_1=100 kg/ha, N_2= 200 kg/ha, N_3= 300 kg/ha, S_1= 30 cm x 20 cm, S_2= 30 cm x 30 cm, B_1= 1.00-2.00 cm, B_2= 2.00-3.00 cm

of bulb (258.19 & 265.93 q/ha) and bullets (137.51 & 141.64 q) per hectare were stepped up significantly over control. All levels of nitrogen applied, *viz.*, 100, 200, and 300 kg N ha^{-1} proved its superiority over 0 kg nitrogen per hectare (control) showing their by that nitrogen application is beneficial for enhancing the yield of bulb and bullets of tuberose. Similar result has been reported by Devi *et al*. (2010), noted yield of tuberose bulbs increased with the increasing of nitrogen levels and the finding of Rathore and Singh (2013) in gladiolus is also in accordance to the findings. It is very well elucidated that the weight of bulb and bullets per clump was increase due to significant improvement in the formation and development of bulb and bullets by additional supply of nitrogen to the tuberose clump up to the 300 kg N ha^{-1}.

The formation and development of bulb and bullets depend upon two major factors, the promotion of cell proliferation and storage of starch in the resulting cells. The cell division and cell enlargement are accelerated by ample supply of nitrogen. Because one of the main function of nitrogen in the initiation of meristematic tissue. The accumulation of starch or carbohydrates depends upon the surplus production of photosynthesis. The total amount of photosynthesis, depend upon the rate and area of the seat of photosynthesis, which are governed by many facts but the number of leaves play a major role. Thus, it is clear that the formation and development of bulbs and bullets were encouraged significantly due to more manufacture of photosynthesis on account of increased number of leaves per clump under the influence of additional nitrogen application and thus the improvement of yield contributory factors ultimately resulted in increased yield. These results confirm the findings of Singh *et al*. (2004).

The production of bulb and bullets were significantly influenced by spacing. Wider spacing expressed maximum number (13.45 & 13.65) and weight (166.42 & 168.92 g) of bulb and bullets (8.96 & 9.09) and (84.92 & 86.20 g) per clump in both the year of experiments with wider spacing as compare to closer spacing. Whenever the number of bulbs and bulblets per hectare (19.94 & 20.93 lacks) and (13.99 & 14.41 lack) and yield of bulb and bulblets (264.44 & 272.38 q/ha) and (133.41 & 137.41 q/ha) were obtained in closer spacing. Findings may be due to availability of more nutrients and air to the plants helps in increasing number and weight of bulb and bulblets per plant in wider spacing. However due to accommodation of more number of plants in per hectare area so that higher number and yield of bulb and bulblets were produced. Similar observation was reported by Shalini *et al*. (2004) and Ramachandrudu, and Thangam (2007) in gladiolus, Malam *et al*. (2010) in tuberose.

Planting of larger mother bulbs up to 2.00 cm diameter showed a gradual increased in daughter bulb production (229.65 & 236.54 q/ha). Use of bigger size of planting materials having enough storage of nutrients inside helps to plant for proper growth and developments, which promoted to increased more number of bulb and bulblets in tuberose. Raja and Palanisamy (1999) obtain more number of bulbs by planting larger bulbs of tuberose. Similar finding confirming improved bulb with larger bulb as planting has been reported by Arya *et al*. (2006), Memon *et al*. (2009), Nijasure and Ranpise (2010), Wagh *et al*. (2012) and Raja and Palanisamy (2000) in tuberose.

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