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EFFECT OF NITROGEN SOURCES AND PHOSPHORUS ON BULBS AND BULBLETS PRODUCTION OF TUBEROSE CV. DOUBLE

A.P.S. Gangwar*, J.P. Singh and I.P. Yadav

Department of Horticulture,C.S.Azad University of Agri. & Technology, Kanpur-208 002
**E mail:gangawarajai5@gmail.com; ab05aug@gmail.com*

ABSTRACT : An experiment was laid during two consecutive years in Horticulture garden of CSAUA&T, Kanpur.There were three nitrogenous sources *viz.* urea ammonium sulphate and calcium ammonium nitrate,four levels of nitrogen *viz* 0,50,100 and 150 kg/ha, and four levels of phosphrus *viz* 0,100,200 and 300 kg/ha thus consisting total number of forty treatments replicated thrice in Factorial Randomized Block Design. Calcium ammonium nitrate treatments revealed greater harvest of bulbs/clump both by number (9.43, 8.97) and weight (229.90, 235.0g) and bulblets/clump (10.56,10.80 and 115.78,123.14g) in first and second year, respectively. Nitrogen @100kg/ha produced highest bulblets per clump (10.50 and 11.09) during both the years of investigation. This trend was same regarding the weight which revealed 106.60 and 115.91 g respectively. The weight of bulbs and bulblets greatly influenced by application of phosphorus at the rate of 200 kg/hectare It also induced maximum number and weight of bulblets (10.44,10.81 and 104.74,113.47 g) during both the years The highest dose of phosphorus 300 kg/ha reduced the number and weight of bulblets (10.19,10.29 and 93.75,105.60 g) during both the years of investigation.

Keywords: *Tuberose, nitrogen,phosphorus, source of nitrogen,bulb, bulblets.*

Tuberose (*Polianthes tuberosa* L.), a native of Maxico, belongs to the family Amaryllidacease. It is cultivated on large scale in France, Italy, South Africa, North Carolina, U.S.A. and in India in many tropical and sub-tropical areas such as Maharashtra, West Bengal, Tamil Nadu and Karnataka. It is, however, well adopted to North Indian climatic conditions yet its growth well in Uttar Pradesh. The tuberose occupies very selective and special position among the ornamental bulbous plants for flower loving people because of its prettiness elegance and pleasantly sweet fragrance.It has great economic potential for cut flower trade and essential oil industries.

MATERIALS AND METHODS

The present investigation entitled “Effect of nitrogen sources and phosphorus on bulbs and bulblets production of tuberose (*Polianthes tuberosa* L.)” was conducted under the eco-edaphic conditions prevailing at Horticulture Garden of Chandra Shekhar Azad University of Agriculture and Technology, Kanpur (U.P.),India during the two consecutive years, 1998-99 and 1999-2000. Uniform and healthy bulbs of tuberose cv. Double having 2.5-3.0 cm diameter were procured from N.B.R.I.Lucknow.In order to assess to exat nature and composition of soil,samples up to 20 cm depth were collected and anaylised in the Department of Agriculture Chemistry and Soil Science for physico-chemical components. The required dose of nitrogen 50kg (N_1),100kg (N_2) and 150kg (N_3) per hectare; and phosphorus 100kg (P_1),200kg (P_2) and 300kg (P_3) per hectare as per treatments were applied. Control plots were not given any fertilizer treatment. The sources of nitrogen were Urea (S_1), Ammonium Sulphate (S_2) and Calcium Ammonium Nitrate (S_3). Phosphorus as per treatment and potash as per recommendation were applied in form of single superphosphate and muriate of potash, respectively. Full dose of phosphorus and half dose of nitrogen were applied as basal dressing ,and remaining half dose of N was applied as split doses at 60 and 90 days after planting. All the recommended cultural and plant protection measures were applied. The experiments were laid out by following Factorial Randomized Block Design in both consecutive years of experimentation with three replications. Thus, 120 plots (1.0x 1.0m size) were used for 40 treatment combinations. Biometric observations for stock production i.e., number and weight of bulbs and bulb lets were taken for both the experimental years. Data were analyzed through computer as suggested by Panse and Sukhatme (7).

RESULTS AND DISCUSSION

The number of bulbs per clump was counted at harvest under both the trials. It is obvious that nitrogen applied @ 100 kg/ha and 150 kg/ha increased the number of bulbs per clump (8.99, 8.62, and 8.92,9.06) in tuberose significantly during first and second year, respectively (Table 1). The plants under control

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revealed poorest harvest (6.89 and 7.26 bulbs) during both corresponding years. These findings are in agreement with the reports of Bhattacharjee (1), Chaudhary (4), Kumar and Singh (5) and Rathore and Singh (8) in gladiolus and tuberose. Phosphorus application @ 300 kg/ha gave the highest number of bulbs (9.70 and 9.18) followed by its 200kg treatment (8.73 and 8.80). All the levels of P significantly brought lower production of bulbs when compared with its control (7.17 and 7.40 bulbs/clump) barring P_1 (100 kg/ha) during second year of trial. These findings are in line with the reports of Bhattacharjee (1) and Mostafa *et al.(*6) in gladiolus and tuberose. Among, sources of nitrogen fertilization, calcium ammonium nitrate caused significantly higher number of bulbs per clump (9.43 and 8.97) followed by ammonium sulphate (8.59 and 8.74) during both the years, respectively. However, both of these fertilizers being superior than urea remained significantly at par when compared with themselves. Results are inconsonance with Chaudhary (4) and Mostafa *et al.*(6) in tuberose.

production of bulbs weight (219.10,225.50 and 229.90,235.00 g) during both corresponding years of investigation. Increasing levels of nitrogen significantly improved the weight of tuberose bulbs per clump.The maximum weight of bulbs were revealed by application of 150 kg N/ha, *i.e.* 227.40 and 233.70 g and the control produced by the significantly poorest bulb weight (180.70 and 188.90 g) during both the years of investigations. Results are similar with the reports of Chaudhary (4), Mostafa *et al.* (6), Rathore and Singh (8), Bhattacharjee (1) and Singh (10) in tuberose and gladiolus. Increasing doses of P increased the weight of tuberose bulbs during both the years and highest dose i.e. 300 kg/ha revealed the maximum bulb weight (231.50 and 236.40 g) followed 200 kg/ha treatment (220.70 and 227.50 g).The plants under its control (P_0) expressed significantly poorest yield of bulbs (187.90 and 193.90 g) during both the years of trials.These findings are in agreement with the reports of Mostafa *et al. (79), Bhattarcharjee et al.* (2) in tuberose and Bhattacharjee (1) and Shalska (9) in gladiolus.

Table 1: Effect of nitrogen and phosphorus with influence of nitrogen sources on bulbs and bulbelts production in tuberose cv. Double.

Treatments	Number of bulbs per clump		Weight of bulb per clump(g)		Number of bulbelts per clump		Weight of bulbelts per clump(g)	
	1998-99	1999-2000	1998-99	1990-2000	1998-99	1999-2000	1998-99	1999-2000
Urea (S_1)	7.74	7.83	200.80	206.40	9.72	10.12	82.75	92.81
Amonium Sulphate(S_2)	8.59	8.74	219.10	225.50	10.48	10.55	99.73	109.19
Calcium Ammonium Nitrate (S_3)	9.43	8.97	229.90	235.00	10.56	10.80	115.78	123.14
0 kg N/ha (N_0)	6.98	7.26	180.70	188.90	8.28	9.60	73.52	82.37
50 kg N/ha (N_1)	7.85	7.85	206.00	210.70	9.92	9.93	93.70	103.12
100 kg N/ha (N_2)	8.99	8.62	216.40	222.40	10.50	11.09	106.60	115.91
150 kg N/ha (N_3)	8.92	9.06	227.40	233.70	10.33	10.45	97.90	106.11
0 kg P/ha (P_0)	7.17	7.40	187.90	193.90	9.55	9.92	90.63	98.84
100 kg P/ha (P_1)	8.09	8.17	212.10	218.00	10.32	10.60	98.21	105.22
200 kg P/ha (P_2)	8.73	8.80	220.70	227.50	10.44	10.81	104.74	113.47
300 kg P/ha (P_3)	9.70	9.18	231.50	236.40	10.19	10.29	93.75	105.60
CD (P=0.05)								
S	0.98	0.54	9.47	12.46	0.65	N.S.	3.41	3.46
N	0.98	0.55	9.45	12.40	N.S.	N.S.	3.43	3.46
P	1.14	0.63	10.54	14.39	NS	NS	3.93	3.99

The weight of bulbs per clump of each treatment were recorded. Urea treatment, however gave significantly poorest harvest (200.80 and 206.40 g) whereas, other fertilizers i.e. ammonium sulphate and calcium ammonium nitrate caused significantly greater

It is obvious from the mean values (Table 1) that out of three sources of nitrogen nutrition,calcium ammonium nitrate proved most effective as compared to rest of sources producing 115.78 and 123.14 g bulblets per clump during both the years of study,

Table 2: Interactive effect of phosphorus and source of nitrogen (P X S) on bulbs and bulblets production in tuberose cv.Double.

Treatment	Number of bulbs per clump		Weight of bulbs per clump (g)		Number of bulbelts per clump		Weight of bulblets per clump (g)	
	1998-99	1999-2000	1998-99	1999-2000	1998-99	1999-2000	1998-99	1999-2000
P_0S_1	6.68	7.17	175.90	182.90	9.07	9.62	74.05	86.66
P_0S_2	7.72	7.79	197.70	204.70	10.07	10.36	94.04	101.56
P_0S_3	8.09	8.20	216.10	219.30	10.58	10.69	116.23	119.83
P_1S_1	7.76	7.66	203.10	209.20	9.97	10.21	82.24	90.33
P_1S_2	8.32	8.61	217.10	221.90	10.59	10,85	99.16	106.43
P_1S_3	8.71	8.61	226.90	232.80	10.69	10.92	120.50	127.03
P_2S_1	8.15	8.14	207.60	214.50	10.18	10.50	89.10	99.03
P_2S_2	9.01	9.12	223.70	231.90	10.75	10.82	110.03	119.40
P_2S_3	9.27	9.34	234.60	239.50	10.46	11.16	122.04	128.92
P_3S_1	8.37	8.36	216.80	218.90	9.66	10.16	85.60	95.23
P_3S_2	9.30	9.44	238.00	243.50	10.52	10.20	95.70	109.36
P_3S_2	11.64	9.72	242.10	248.40	10.51	10.46	104.36	116.80
CD (P=0.05)	NS	NS	NS	NS	NS	NS	6.82	6.92

respectively. However, application of urea gave significantly lesser weight of bulblets under both the trials. These findings are in agreement with reports of Mostafa *et al.* (6) and Chaudhary (4) in tuberose. Among the three levels of nitrogen,100 kg/ha dose maximized the weight of bulblets (106.60 and 115.91 g) significantly when compared with rest of doses followed by 150 kg/ha level (97.90 and 106.11 g).It was noted significantly minimum under control (73.52 and 82.37 g) during both the year of investigation. These findings are in line with reports of Bhattacharjee (1), Shalska (9), Singh (10) and Kumar and Singh (8) in gladiolus and tuberose. Phosphorus levels induced significant variation on the weight of bulblets per clump during both the years. Application of 200 kg P/ha level expressing 104.74,113.47 g weight of bulblets proved significantly superior than its lower and higher both the doses (100 and 300 kg/ha).All the P concentration when compared with its control (93.63,98.84) showed significantly greater weight of bulblets per clump. Results are in line with reports of Bose *et al.* (3) in amaryllis, and Chaudhary (4) and Mostafa *et al.* (6) in tuberose.

Among the first order interactive treatments, P × S was found to exert significant influence on the weight of bulblets whereas, P × N and S × N though increased values numerically but failed to touch the level of significance under both the years of experimentation. Similarly, the second order interaction also did not cause significant difference in this regard (Table 2). Among the interaction of phosphorus levels and sources of nitrogen, P_2O_5@200kg/ha and nitrogen from CAN (P_2S_3) resulted in significantly the highest weight of bulblets/clump (122.04 g and 128.92g) during both the years respectively, followed by (P_1S_3) (120.50g; 127.03g) and P_0S_3 (116.23g; 119.83g).

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