Studies on influence of different graded levels of nitrogen and phosphorus on growth and flower attributes of Tuberose (*Polianthes tuberosa L.)*

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ABSTRACT

To study the influence of different graded levels of nitrogen and phosphorus on the growth and flower attributes of Tuberose (*Polianthes tuberosa L.)* cv. Single. The experiment was carried out at the Floriculture unit, Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalainagar. The effects of four levels of nitrogen *viz*., 0, 50, 100 and 150 kg ha^{-1} and four levels of phosphorus *viz.*, 0, 40, 60 and 80 kg ha^{-1} with all possible combinations were investigated in the Factorial Randomized Block Design with 16 treatments, each replicated thrice. The growth parameters like plant height, number of leaves, leaf area, number of side shoots per clump and flowering parameters like number of days taken for flower spike emergence, length of spikes (cm), length of the rachis (cm), number of florets per spike were found to be favorably influenced by the application of higher levels of nitrogen and phosphorus. They were found to be maximum with application of nitrogen @ 150 kg ha^{-1} and phosphorus @ 80 kg ha^{-1}. Considering the growth and flower attributes, application of 150 kg nitrogen and 80 kg phosphorus ha^{-1} combination was found to be the best for tuberose.

INTRODUCTION

Tuberose (*Polianthes tuberosa L.),* cv. Single is a bulbous perennial summer flowering ornamental crop plant belongs to the family Amaryllidaceae. It is native to Mexico in which it is commonly known as Rajnigandha. It is one of the commercial flower crop with sweet lingering fragrance with great demand in the market. It is widely grown for aesthetic, medicinal and commercial purpose mainly in India, France, Italy and other tropical countries. In India, this crop is commercial cultivated in different states mainly

in Tamilnadu, Karnataka, Maharashtra and West Bengal. In South India, cultivation of tuberose cv. Single is gaining popularity. However little attention has been paid regarding its nutritional requirement for growth, flowering and improving the yield and quality of flowers. In India, four tuberose cultivars are grown, Single, Double, Semi-Double and Variegated in which the cv. Single occupies the foremost position (Amitabha Mukhopadhyay and Banker, 1986). The waxy white flowering spikes of single flowered cultivars of tuberose with sweet lingering fragrance are in great demand. Although tuberose cultivation has been found to be a profitable enterprise, experimental evidences on its nutritional requirements are very meager. The present study was designed to find out the optimum dose of nitrogen and phosphorus required by the crop along with a constant application of potash.

Amongst the three major nutrient elements, nitrogen plays comparatively more important role than phosphorus and potassium in influencing all the vegetative growth, flowering and yield (Patel *et al*., 1994). Hence, to find out nutritional requirement of tuberose under the Cauvery delta regions of coastal ecosystem, the present study has been conducted with an objective to study the effect of nitrogen and phosphorus on the vegetative growth and flower attributes of Tuberose. So far the nutritional requirement has not been standardized to suit according to the coastal ecosystem of Cauvery delta region. Hence, to find out nutritional requirement of tuberose the present study has been conducted to find out the optimum requirement of nitrogen and phosphorus for the growth and flower attributes of tuberose.

MATERIALS AND METHODS

The experiment was carried out at the floriculture research unit, Department of Horticulture, Faculty of Agriculture, Annamalai University. The effects of four levels of nitrogen *viz.*, 0, 50, 100 and 150 kg ha^{-1} and four levels of phosphorus *viz.*, 0, 40, 60 and 80 kg ha^{-1} with all possible combinations were investigated in the factorial randomized block design with 16 treatments, each replicated thrice. Fertilizers were applied as per treatment through single super phosphate (SSP) and urea at the time of sowing as basal dose. Before planting, the bulb of 2.5 cm in diameter was taken and it was planted to the prepared field as per the treatment schedule with a spacing of 30 cm x 30 cm with a control was taken for study. The observations are recorded on the

selected five plants from each treatment in each replication and the mean data is statistically analyzed. The data were subjected to statistical analysis as suggested by Panse and Sukhatme, 1978.

Table.1. Influence of graded levels of nitrogen and phosphorus on growth and flower attributes in Tuberose (*Polianthes tuberosa* L.)

Treatment	Plant height (cm)	Number of leaves	Leaf Area (cm^2)	Number of side shoots	Number of days taken for flower spike emergence	Length of spikes (cm)	Length of the rachis (cm)	Number of florets per spike
Nitrogen kg ha^{-1}								
0	36.72	29.90	23.18	1.57	171.03	41.96	12.38	16.52
50	43.86	37.57	27.79	2.46	154.72	54.78	17.74	24.52
100	48.08	41.66	30.81	3.04	144.64	61.86	20.45	29.04
150	50.08	43.55	32.09	3.29	139.68	65.47	21.71	31.47
SED	0.41	0.38	0.34	0.06	0.71	0.71	0.34	0.51
CD (p=0.05)	0.82	0.78	0.68	0.12	1.40	1.41	0.69	1.02
Phosphorus kg ha^{-1}								
0	39.68	32.77	25.04	1.92	164.54	47.21	14.86	19.76
40	44.71	38.32	28.39	2.58	152.67	55.81	18.02	25.31
60	46.38	41.66	29.61	2.81	148.53	59.06	19.15	27.31
80	47.98	43.55	30.83	3.05	144.34	62.00	20.24	29.18
SED	0.28	0.26	0.15	0.03	0.52	0.54	0.18	0.26
CD (p=0.05)	0.57	0.53	0.32	0.07	1.00	1.07	0.37	0.52
Interaction of N X P								
N_0P_0	34.30	27.60	21.38	1.24	176.85	37.40	10.72	13.86
N_0P_{40}	35.92	29.15	22.59	1.47	172.99	40.12	11.88	15.65
N_0P_{60}	37.52	30.67	23.78	1.68	169.11	43.81	12.93	17.41
N_0P_{80}	39.14	32.21	24.99	1.91	165.20	46.53	14.00	19.18
$N_{50}P_0$	39.86	32.98	25.06	1.94	164.33	47.72	15.19	19.94
$N_{50}P_{40}$	43.78	37.57	27.51	2.41	155.40	54.30	17.52	24.28
$N_{50}P_{60}$	45.39	39.12	28.70	2.63	151.55	57.21	18.60	26.06
$N_{50}P_{80}$	46.41	40.63	29.91	2.87	147.67	59.90	19.65	27.82
$N_{100}P_0$	41.48	34.49	26.27	2.15	160.46	50.50	16.25	21.72
$N_{100}P_{40}$	48.50	42.20	31.10	3.10	143.71	62.63	20.72	29.59
$N_{100}P_{60}$	50.10	44.03	32.31	3.32	139.70	65.35	21.83	31.35
$N_{100}P_{80}$	52.26	45.92	33.58	3.59	134.72	68/98	23.02	33.51
$N_{150}P_0$	43.09	36.04	27.48	2.38	156.53	53.22	17.31	23.53
$N_{150}P_{40}$	50.62	44.36	32.37	3.36	138.62	66.20	21.96	31.73
$N_{150}P_{60}$	52.50	46.13	33.65	3.61	133.76	69.87	23.26	34.43
$N_{150}P_{80}$	54.12	47.68	34.86	3.84	129.85	72.60	24.32	36.21
SED	0.71	0.66	0.50	0.11	1.21	1.25	0.53	0.76
CD (p=0.05)	1.40	1.32	1.01	0.20	2.40	2.48	1.05	1.53

RESULTS AND DISCUSSION

Growth is one of the essential parameter determines the yield attributes of any crop. It is the phenotypic expression with respect to nutrient status, provided all other conditions are favorable. In general the growth parameters were significantly varied due to *Per se* and interaction effects of growth promoting treatments. The maximum growth obtained with application of .maximum graded levels of nitrogen and phosphorus. It was minimum in control. The results of the present investigation on the growth parameters *viz.*,Plant height (cm), number of leaves, leaf area (cm^2), number of side shoots and floral attributes like number of days taken for flower spike emergence (days), length of spikes (cm), length of the rachis (cm) and number of florets per spike.

EFFECT OF NITROGEN

Nitrogen plays an important role in various metabolic process of plant. It is an essential constituent of protein chlorophyll which is usually present in many compounds helps in plant metabolism, such as nucleotides, phosphatides, alkaloids, enzymes, hormones, vitamins, *etc.* It imparts dark-green colour to plants, produces rapid early growth, and improves capacity to fix atmospheric nitrogen symbiotically (Singh and Uma. 1996). Increasing levels of N is increased the plant height (50.08 cm), number of leaves (43.55) number of side shoots (3.29), leaf area (32.09 cm^2) (Table-1). Nitrogen nutrition is also required for improvement of growth parameters through efficient metabolic activity and increased rate of photo synthesis. The similar result was reported by Kumar and Misra. (2011) in gladiolus and Devi and Singh (2010) in tuberose. Similarly, the flowering characters like number of days taken for flower spike emergence (139.68 days), length of spikes (65.47 cm), length of the rachis (21.71 cm), number of florets per spike (31.47) was also highest in the treatment which received the application of nitrogen @ 150 kg ha^{-1}. The improvement in flower parameters with nitrogen @ 150 kg ha^{-1} application could be ascribed to its pivotal role in regulation of the metabolic and enzymatic processes of respiration and transpiration which reflected in increased yield. Similar results were also reported by Maharnor *et al.,* (2011) and Yadav *et al*., (2000) in African marigold.

EFFECT OF PHOSPHORUS

Phosphorus is an essential constituent of nucleic acids and stimulates root growth as well as increase nodule activity in plant. Phosphorus is also an essential primary nutrient and is constituent of nucleic acids such as ribonucleic acid (RNA) and deoxyribonucleic acid (DNA), adenosine diphosphate (ADP) and adenosine triphosphate (ATP), nucleoproteins, amino acids, proteins, phosphotides, phytin and several coenzymes *viz.*, thiamine, pyrophosphate and pyrodoxyl phosphite. (Atam Prakash *et al.,* 2002). Phosphorus application had significant influence on growth and flower characters of Tuberose. The performance of Tuberose was maximum with increasing dose of $P_2 O_5$ up to 80 kg ha^{-1} (Table-1). Application of phosphorus at optimum level produced significantly higher growth and flower characters as compared to control and other treatments. The increase in plant height of (47.98 cm), number of leaves (43.55), number of side shoots (3.05) and leaf area (30.83 cm^2) was noticed at 80 kg P_2O_5 ha^{-1}. Increase in vegetative growth is attributed to the role of phosphorus in various metabolic processes such as cell division, cell development and cell enlargement. Similarly, Flowering characters were also increased with the application of 80 kg $P_2 O_5$ ha^{-1} *viz.,* the flowering characters like number of days taken for flower spike emergence (144.34 days), length of spikes (62.00 cm), length of the rachis (20.24 cm) and number of florets per spike (29.18). The maximum value is obtained with increasing dose of $P_2 O_5$ as Up to 80 kg ha^{-1}. (Table-1) Application of 80 kg $P_2 O_5$ ha^{-1} produced significantly increased all the flower parameters. The similar result was reported by Acharya and Dashora (2004) in african marigold and Khan *et al.*, (2012) in gladiolus.

INTERACTION EFFECT

Interaction effect of nitrogen and phosphorus levels on growth and flower characters in tuberose. The combined application of nitrogen and phosphorus @ 150 and 80 significantly increases in growth and flower characters. The growth characters (Table-1) *viz.*, Plant height (54.12 cm), number of leaves (47.68 cm,) number of side shoots (3.84), leaf area (34.86 cm^2) Similarly, the flowering characters like number of days taken for flower spike emergence (129.85 days), length of spikes (72.60 cm), length of the rachis (24.32 cm), number of florets per spike (36.21). Nitrogen availability is depending more or less on phosphorus. Phosphorus enhances the symbiotic nitrogen (N) fixation process in flower crops and ultimately improved the intake of nutrients and

which it favours in improving all the characters and the results are in conformity with those reported by Sharma and shaffat Mohammad (2003) in tuberose and Grawal *et al.* (2004) in Chrysanthemum .

CONCLUSION

On the basis of one year field experimentation, it seems quite logical to conclude that maximum growth and improving the flower attributes of tuberose with combined application of nitrogen @ 150 kg ha^{-1} and phosphorus 80 kg ha^{-1} can be sufficient on medium sandy loamy soil of coastal ecosystem of cuddalore district in Tamil nadu.

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