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Effect of bioinoculants with reduced doses of inorganic fertilizers on growth and flowering of tuberose

K.S. PANDHARE, MANISHA DESHMUKH*, DIPTI TULE AND V.J. KAWARKHE
Department of Horticulture, Post Graduate Institute, Dr. Panjabrao Deshmukh Krishi Vidhyapeeth, AKOLA (M.S.) INDIA

ABSTRACT

A field experiment was carried out during *kharif* season of 2003-2004 at the farm of Floriculture Nursery Unit, Central Research Station, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, to study the effect of bioinoculants with reduced doses of inorganic fertilizers for optimum growth and flowering of tuberose. The results obtained in the experiment suggested that use of bioinoculants with reduced doses of inorganic fertilizers significantly influenced the growth and flowering of tuberose. The vegetative growth of tuberose plants was positively influenced by the application of both the bioinoculants together with the reduced doses inorganic fertilizers. It was maximum under 100 per cent NPK (200:300:200 kg ha^{-1}) along with both the bioinoculants.

Key words : Tuberose, Gnorganic, Flowering, Bioinoculants

INTRODUCTION

Tuberose (*Polianthes tuberosa*) is an ornamental bulbous plant. It belongs to family Amarallidaceae. Tuberose is grown through out the year but it blooms profusely during summer and rainy season. For obtaining good quality of flower, nutrition plays an important role and preferably nitrogen and phosphorus has been found more effective in improving vegetative growth of many flowering plant reported by Banker and Mukhopadhyay (1985). Indiscriminate use of chemical fertilizers has caused serious damage to soil. On the other hand, biofertilizers offer an economically attractive and ecologically sound mean of improving quality and quantity of internal sources. Therefore, an experiment was carried out to study the effect of bioinoculants on growth and flowering of tuberose.

MATERIALS AND METHODS

A field experiment was conducted at Floriculture Nursery, Parks and Garden Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, during *kharif* season of 2003-2004. The trial was laid out in Randomized Block Design (RBD) with sixteen treatments replicated thrice. Treatments were undertaken by using *Azatobactor* and Phosphate Solubilizing Bacteria (PSB) with reduced doses of inorganic fertilizers. Preplanting treatment of application of bioinoculants to bulbs was given 15 minutes before planting and kept in shade. Bulbs selected for planting were about 20-25 g in weight. Bulbs were planted in flat bed giving spacing 20 x 20 cm and size of gross plot was 1.4 x 1.4 m^2 accommodating 49 plants. One third dose of nitrogen and the complete dose of phosphorous and potash as per treatments was given at the time of planting. Out of remaining two third dose of nitrogen was given at 30th and 60th day after planting in two equal splits. Five plants were randomly selected from each treatment and observations regarding vegetative growth and flowering were recorded. All package of practices was followed during conduction of trial.

RESULTS AND DISCUSSION

Effect of bioinoculants with reduced doses of inorganic fertilizers on days required for sprouting of bulb:

It is revealed from data presented in Table 1 that the early sprouting (18.66 days) of bulb was observed under treatment T_{13} (*Azotobactor* + PSB +100% NPK) closely followed by T_{14} (*Azotobactor* + PSB + 75% N P+100% K) and T_7 (*Azotobactor* + 100% NPK) *i.e.* 19.00 days. These treatments were found statistically at par with each other. The late sprouting of bulbs (23.30 days) was observed under treatment T_{16} (0%RDF). It is cleared that application of *Azotobactor* + PSB +100% NPK recorded early sprouting of bulbs followed by T_{14} and T_7 and also alone or in combination of *Azotobactor* and PSB enhanced early sprouting of bulbs.

Effect of bioinoculants with reduced doses of inorganic fertilizers on height of plant (cm):

It is revealed from data presented in Table 1 that the maximum plant height was recorded under *Azotobactor* + PSB + 100% NPK (T_{13}) closely followed by *Azotobactor* + PSB + 75% NP+100% K (T_{14}) and *Azotobactor* +100% NPK (T_7) *i.e.* 58.5cm, 57.8cm and 56.5cm, respectively. These treatments ($T_{13,}$ T_{14} and T_7) were at par with each other in respect of plant height.

* Author for correspondence

Effect of bioinoculants alone (T_4 and T_5) or in combination (T_6) was found significant in respect of plant height as compared to T_{16} (0%RDF). During the investigation, the minimum plant height (44.20cm) was recorded under the treatment Control (0% RDF). The application of *Azotobactor* and PSB in combination helped in increasing plant height. Application of *Azotobactor* with inorganic fertilizers resulted in more N accumulation in soil where as PSB may have helped in increasing phosphorus availability by releasing enzyme phosphate in soil, which resulted into more plant height. Similar results were recorded by Chandrikapure (1998) and Gupta (1997).

Effect of bioinoculants with reduced doses of inorganic fertilizers on number of leaves and leaf area per plant (cm):

It is revealed from data presented in Table 1 that significantly maximum leaves per plant (25.94) were recorded in treatment T_{13} (*Azotobactor* + PSB + 100% NPK) closely followed by treatment T_{14} (*Azotobactor* + PSB + 75% NP + 100% K) *i.e.* 25.03 leaves per plant. However, these treatments were found at par with each other Similar trend in respect of leaf area per plant was recorded and maximum leaf area per plant 557.71cm^2 and 542.11cm^2 were recorded in treatment T_{13} and T_{14}, respectively. Increase in number of leaves and leaf area may be due to increase in nutrient availability to the plant with the association of bioinoculants. Kaloti (1998) in aster concluded that number of leaves were maximum under the *Azotobacter* treatments as compared to uninoculated. Similar results obtained by Gupta (1997) in marigold who stated that significantly increased in leaf area in treatments receiving *Azotobacter* over control.

Effect of bioinoculants with reduced doses of inorganic fertilizers on number of days required for emergence of spike:

Data presented in Table 1 indicated that early emergence of spike was observed under the treatment T_{16} *i.e.* 0% RDF (100.22 days). The maximum days required for emergence of spike (110.50 days) was under treatment (T_{13}) *Azotobactor* + PSB +100% NPK followed by T_{14} (109.54 days) and T_7 (109.65. days). Treatment $T_{13,}$ T_{14} and T_7 were found at par with each other.

Table 1 : Effect of bioenoculants with reduced doses of inorganic fertilizers on growth and flowering of tuberose

Treatments details	Days for sprouting of bulbs	Plant height (cm)	Num-ber of leaves	Leaf area / plants (cm^2)	No. of days for spike emergence	Days for opening of first pair of florets on spike	Dura-tion of flowering (days)
T_1 RDF 100%(NPK 200:300:200kg ha^{-1})	20.30	54.76	23.76	534.60	108.05	126.00	18.00
T_2 RDF 75% (NPK 150:225:150kg ha^{-1})	21.66	53.00	22.31	513.35	106.80	124.80	16.50
T_3 RDF 50% (NPK 100:150:100kg ha^{-1})	22.30	50.80	19.30	453.55	105.50	123.50	15.40
T_4 Azotobacter alone	22.00	48.20	18.79	447.66	103.00	123.50	14.80
T_5 PSB alone	22.66	47.90	18.42	438.94	102.50	123.00	14.50
T_6 Azotobacter + PSB	22.30	48.40	19.00	452.80	104.00	124.00	14.90
T_7 *Azotobacter* + 100% N+ 100%PK	19.00	56.50	24.31	538.14	109.65	126.03	18.50
T_8 *Azotobacter* + 75% N + 100% PK	19.30	54.20	23.07	523.69	107.92	124.00	18.10
T_9 *Azotobacter* + 50% N + 100 PK	20.00	52.46	21.35	491.26	107.00	124.20	18.80
T_{10} PSB + 100% P + 100%NK	19.66	56.00	23.92	533.41	109.10	125.20	18.50
T_{11} PSB + 75% P + 100% NK	19.30	55.00	22.80	517.56	108.50	125.30	18.10
T_{12} PSB + 50% P + 100% NK	20.00	54.20	21.24	488.94	108.80	124.20	17.80
T_{13} *Azotobacter* + PSB +100%NP +100%K	18.66	58.50	25.94	557.71	110.50	127.60	19.50
T_{14} *Azotobacter* + PSB + 75%NP + 100%K	19.00	57.80	25.03	542.11	109.54	125.00	20.10
T_{15} *Azotobacter* + PSB + 50% NP + 100% K	20.00	54.50	23.39	526.28	107.8	124.50	17.90
T_{16} RDF 0%	23.30	44.20	16.25	387.23	100.22	122.50	13.01
F Test	Sig	Sig	Sig	Sig	Sig	Sig	Sig
S.E. ±	0.18	0.728	0.509	6.46	0.39	0.38	0.43
C.D. (P=0.05)	0.51	2.05	1.44	18.65	1.11	1.09	1.22

More number of days required for emergence of spike, where bioinoculants alone (T_4 and T_5) or in combination (T_6) were applied as compared to $T_{16.}$ This may be due to the fact that dose of inorganic fertilizers with bioinoculants supply the nutrients to the plants which prolonged the vegetative growth and spike emergence. These results are similar with Bankar and Mukhopadhyay (1985) who reported that increase in number of days for spike emergence with increase dose of fertilizers.

Effect of bioinoculants with reduced doses of inorganic fertilizers on days required for opening of first pair of florets per spike:

The late opening of first pair of florets (127.60 days) was under treatment T_{13} (*Azotobacter* + PSB + 100% NPK) closely followed by T_7 *Azotobactor* +100% NPK (126.03days) and T_1 100% RDF (126.03days) The early opening observed in treatment T_{16} (0% RDF) 122.50 days (Table 1). The delay in opening of first pair of florets was recorded where bioinoculants alone (T_4 and T_5) or in combination (T_6) were applied as compared to T_{16} (0%RDF). The above results may be due to fact that plants which prolonged the vegetative growth and delay flowering. Similar results recorded by Chandrikapure (1998)

Effect of bioinoculants with reduced doses of inorganic fertilizers on duration of flowering:

It is revealed from data presented in Table 1 that maximum duration of flowering (20.10 days) was found in the treatment T_{14} (*Azotobacter* + PSB + 75% NP +100% K) closely followed by T_{13} - *Azotobactor* + PSB + 100% NPK (19.50days). The minimum duration of flowering (13.01 days) was under treatment T_{16} (0 % RDF). The significant effects in above treatments had more duration of flowering due to more number of leaves which helped to produce more carbohydrates in plant. Bankar and Mukhopadhyay (1985) also reported increased duration of flowering in tuberose with increased dose of fertilizers.

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