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Effect of Polyhouse Cultivation on Yield of Tuberose Genotypes

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A B S T R A C T

The investigation was conducted to study the effect of polyhouse cultivation on yield of tuberose with respect to floral and bulb characters at All India Coordinated Research Project on Floriculture, National Agriculture Research Project, Pune during the year 2014-15. Ten genotypes of single type tuberose (5 hybrids and 5cultivars) were laid out in factorial randomized block design with three replications under open field and protected condition. The maximum values for spike length (153.75 cm), rachis length (43.50 cm), number of florets (57.79), spike per sq. m. (109.31) and bulb per sq. m. (125.18) were recorded in Genotype L1P4under protected condition among all genotypes as compared with open field conditions. However, the vase life of spike grown in open field was significantly higher and it was noticed more in cv. Arka Nirantsra (8.11 days).

Introduction

Tuberose (*Polianthes tuberose* L.) is an important flower from the aesthetic and commercial point of view. It is a member of family Amaryllidacea and was originated in Mexico. Its importance among the commercially grown flowers is due to its potential for cut flower trade, long vase life and essential oil industry. It is cultivated in most of the tropical and subtropical countries of the world. The cultivation of tuberose on commercial basis is being taken up around big cities in India. With the improvement of living standard of the people, the demand for flowers is increasing day by day.

In present scenario of increasing demand for cut flowers, protected cultivation in polyhouse is the best alternative for using land and other resources efficiently. The past research showed that there was early and continuous flowering of tuberose under low plastic tunnel (Singh and Singh, 2012). However

information on cultivation of tuberose under protected condition is very scanty. In view of this, the present research was undertaken to study the effect of protected cultivation on yield of tuberose.

Materials and Methods

The experiment was conducted at the All India Co-ordinated Research project on floriculture, Pune during the year 2014-15. Ten different genotypes of single type tuberose were replicated thrice in open field as well as in polyhouse condition with factorial randomized block design.

Planting was carried out on flat beds (1.8 x 1.5 m) in open field and on raised beds (1.4 x 0.90 x 0.30 m) in polyhouse at 30 x30 cm and 30 x 40 cm, respectively. Standard cultural practices were followed throughout experimentation. The data were recorded on three selected plants from each treatment and replication for growth, floral and bulb characters.

Results and Discussion

The mean performance of the varieties for floral and bulb characters (Table1) reflected variation among different growing condition and genotypes. The maximum spike length was observed in protected condition (103.84 cm) than open field condition (80.32 cm). The significantly maximum length of spike (153.75 cm) was recorded in genotype L1P4 followed by cv. Variegated (138.14 cm) and cv. Local Single (128.86 cm) grown under protected condition. Whereas, shortest spike length was noticed in genotype PhuleRajani X Suvasini (52.13 cm) which was at par with genotype L9P7 (56.49 cm) grown under open field condition. However, the average spike length was noticed significantly maximum in genotype L1P4 (132.92 cm) and minimum in PhuleRajani x Suvasini (59.27 cm). The increase in spike length under protected condition is due to controlled environmental conditions particularly temperature, humidity, light intensity which triggered plant growth as compared with those genotypes grown in open field. This result also favors the findings of Iftikhar *et al.*, (2011) in rose.

The rachis length differs significantly in growing condition, genotypes and its interaction. Significantly maximum rachis length was found in protected condition (30.56 cm) than the open field condition (27.74 cm). Maximum rachis length (43.50 cm) was observed in genotype L1P4 grown under protected condition followed by genotype L1P4 grown under open field condition (39.11 cm) and cv. Arka Nirantara (33.71 cm) grown under protected condition. Whereas, minimum rachis length was observed in cv. Local Single (21.57 cm), which was at par with genotype GK-T-C-4 (22.41 cm) both grown under open field condition and genotype GK-T-C-4 grown under protected condition (23.34 cm). However, the average rachis length was recorded significantly more in genotype L1P4 (41.30 cm) and significantly shortest rachis length was noticed in genotype GK-T-C-4 (22.88 cm). This increase in the rachis length might be due to increase in the CO_2 level in the protected condition. The similar trend was observed in gladiolus by Kadam *et al.*, (2012).

The spikes per sq. m was found significantly maximum in protected condition (88.17) than in open field condition (67.27). Genotype L1P4 was noted for maximum number of spike per sq. m (109.31) which was at par with genotype GK-T-C-2 (98.78) both grown under protected condition. Whereas, minimum number of spikes per sq. m was recorded in cv. Arka Nirantara (52.01) which was at par with cv. Local Single (54.68), cv. Variegated (55.55) and genotype L9P7(58.17) grown under open field condition. The average number of spike per sq. m. was recorded

significantly maximum in genotype L1P4 (99.59). Whereas, minimum in cv. Local Single (62.60) which was at par with cv. Variegated (66.59) and genotype PhuleRajani X Suvasini (69.22).

The significant difference in number of bulbs per sq. m was observed in genotype grown under different growing conditions. Significantly maximum bulb per sq. m was recorded in protected condition (97.52) than that of open filed condition (79.52).

The genotype L1P4 recorded maximum number of bulbs per sq. m (125.18) which was at par with cv. Shringar (112.90), genotype GK-T-C-2 (112.85) grown under protected condition. Whereas, minimum was recorded in cv. Arka Nirantara (62.61) which was at par with cv. Variegated (63.49), cv. Local Single (64.38), and genotype L9P7 (66.13) grown under open field condition and genotype L9P7 (66.98) and genotype PhuleRajani X Suvasini (79.36) under protected condition. Among the genotypes, genotype L1P4 produced average maximum number of bulb per sq. m. (114.61) which was at par with cv. Shringar (110.25); whereas, minimum in genotype L9P7 (66.56) which was at par with cv. Local Single (72.75) and cv. Variegated (74.07).

It was observed that the phototropic growth was superior in protected condition. These might be due to more supply of food for vegetative growth by increased CO_2 level in polyhouse.

The mean performance of the varieties for floral characters reflected variation among different growing condition and genotypes (Table 2). The number of floret was significantly differed in growing condition, genotypes and its interaction. Maximum number of florets was observed in protected condition (47.58) than the open field condition (46.28).The significantly maximum number of floret was observed in genotype L1P4 grown under protected condition (57.79) followed by cv. Phule Rajani grown under protected condition (52.21). However, minimum number of florets was counted in cv. Variegated grown under open field condition (40.15) which was at par with cv. Local Single grown under open field (40.42), cv. Variegated grown under protected condition (41.92) and genotype PhuleRajani X Suvasini grown under open field condition (42.61). Among the genotypes, the average number of florets was noted significantly highest in L1P4 (53.61). Whereas, significantly minimum number of florets were observed in cv. Variegated (41.03).

The increase in the number of florets might be due to increase in the mean micro area temperature under the protected condition resulting in the increased rate of reproductive development in tuberose as also reported by Singh and Singh (2012) and Rachana *et al.*, (2013).

The absence of tinge on bud was observed in genotypes grown under protected condition while in open field condition it was observed on some genotypes. The darkest pink colour tinge was visually observed on the buds of genotype L9P7. Whereas, light pink colour tinge was present in cultivars such as Shringar, Arka Nirantara and Variegated.

However it was absent in cvs. Local Single, Phule Rajani, genotypes L1P4, GK-T-C-2, GK-T-C-4 and Phule Rajani X Suvasini. The tuberose cultivars showed pinkish tinge flower buds due to presence of flavonoids and greenish tinge due to chlorophyll pigment present in these cultivars. This pigment synthesis is also controlled by gene and which expressed under prevailing environment. Same findings were also observed by Mahawer *et al.*, (2013) in single type tuberose cultivar.

Table.1 Effect of growing condition on growth and yield of tuberose genotypes

Varieties	Spike length (cm)			Rachis length (cm)			No. of spike per sq. m			No. of bulb per sq. m.		
	Open field	Polyhouse	Mean	Open field	Polyhouse	Mean	Open field	Polyhouse	Mean	Open field	Polyhouse	Mean
Local Single	84.71	128.86	106.78	21.57	31.88	26.73	54.68	70.53	62.60	64.38	81.10	72.75
Shringar	71.88	88.97	80.43	25.20	28.50	26.85	86.42	93.43	89.93	107.58	112.90	110.25
PhuleRajani	71.77	95.41	83.59	31.83	33.19	32.51	78.46	93.49	85.98	91.69	102.27	96.98
Variegated	112.07	138.14	125.10	25.62	27.50	26.56	55.55	77.62	66.59	63.49	84.65	74.07
ArkaNirantara	94.27	113.48	103.87	30.02	33.71	31.86	52.01	91.69	71.85	62.61	107.61	85.12
GK-T-C-2	73.79	95.72	84.76	25.45	26.08	25.76	58.20	98.78	78.49	71.42	112.85	92.14
GK-T-C-4	74.07	89.09	81.58	22.41	23.34	22.88	66.13	88.14	77.14	82.00	102.32	92.17
L1P4	112.08	153.75	132.92	39.11	43.50	41.30	89.86	109.31	99.59	104.04	125.18	114.61
L9P7	56.49	68.61	62.55	25.13	25.76	25.45	58.17	93.49	75.83	66.13	66.98	66.56
PhuleRajani X Suvasini	52.13	66.40	59.27	31.05	32.16	31.61	73.20	65.24	69.22	83.75	79.36	81.56
Mean	**80.32**	**103.84**		**27.74**	**30.56**		**67.27**	**88.17**		**79.71**	**97.52**	
	SE ±	CD @ 5%		SE ±	CD @ 5%		SE ±	CD @ 5%		SE ±	CD @ 5%	
Condition	**0.48**	**1.38**		**0.26**	**0.75**		**1.35**	**3.86**		**1.93**	**5.53**	
Interaction	**1.52**	**4.35**		**0.83**	**2.37**		**4.26**	**12.20**		**6.11**	**17.51**	
Varieties	**1.07**	**3.08**		**0.58**	**1.67**		**3.01**	**8.63**		**4.32**	**12.38**	

Table.2 Effect of growing condition on flower and bulb characters of tuberose genotypes

Varieties	No. of floret per spike			Tinge on floret present or absent			Vase life of spike		
	Open field	Polyhouse	Mean	Open field	Polyhouse	Mean	Open field	Polyhouse	Mean
Local Single	40.42	46.00	43.21	Absent	Absent	-	6.49	4.00	5.24
Shringar	50.49	49.88	50.18	Present	Absent	-	8.93	5.56	7.24
PhuleRajani	49.36	52.21	50.78	Absent	Absent	-	9.00	6.44	7.72
Variegated	40.15	41.92	41.03	Present	Absent	-	5.83	3.83	4.83
ArkaNirantara	48.66	48.21	48.43	Present	Absent	-	9.55	6.67	8.11
GK-T-C-2	45.82	44.42	45.12	Absent	Absent	-	7.27	4.00	5.64
GK-T-C-4	48.14	47.88	48.01	Absent	Absent	-	6.77	4.61	5.69
L1P4	49.43	57.79	53.61	Absent	Absent	-	7.39	4.67	6.03
L9P7	47.75	44.00	45.87	Present	Absent	-	7.33	4.22	5.77
PhuleRajani X Suvasini	42.61	43.46	43.04	Absent	Absent	-	5.61	4.00	4.80
Mean	**46.28**	**47.58**	**-**	**Present**	**Absent**	**-**	**7.42**	**4.80**	**-**
	SE ±	CD @ 5%		SE ±	CD @ 5%		SE ±	CD @ 5%	
Condition	**0.26**	**0.74**		**-**	**-**		**0.14**	**0.39**	
Interaction	**0.82**	**2.35**		**-**	**-**		**0.43**	**NS**	
Varieties	**0.58**	**1.66**		**-**	**-**		**0.30**	**0.87**	

Under protected condition due to low light intensity, genotypes failed to express the tinge on the buds, as the required light intensity for activation of colouring pigments was absent in protected condition.

The data in Table 2 revealed that the significant difference in vase life in growing conditions and genotypes. The interaction showed non-significant effect on vase life of tuberose. A cultivar Arka Nirantara grown under open field condition registered longest vase life (9.55 days). Whereas, the shortest vase life was observed in cv. Variegated under the protected condition (3.83 days).The average vase life duration was recorded longest in cv. Arka Nirantara (8.11 days) which was at par with cv PhuleRagani (7.72 days) and cv. Shringar (7.24 days) followed by genotype L1P4 (6.03 days). Whereas, shortest vase life was recorded by genotype PhuleRajani X Suvasini (4.80 days) which was at par with cv. Variegated (4.83 days), cv. Local Single (5.24 days), genotype GK-T-C-2 (5.64 days).These findings are in agreement with Mahawer *et al.*, (2013) in single type tuberose.

The Genotype L1P4performed good under protected condition among all the genotypes in respect of spike length, rachis length, no. of floret and spike per sq. m.

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