RESEARCH ARTICLE

FIELD PERFORMANCE OF DIFFERENT CULTIVARS OF TUBEROSE (*POLIANTHES TUBEROSA* L.) UNDER AGRO-CLIMATIC CONDITIONS OF PUNE

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Abstract: Adaptation and acclimatization of different tuberose cultivars under agro-climatic conditions of Pune are to be confirmed for obtaining better performance. The present investigation was conducted to evaluate the performance of tuberose cultivars during 2018- 2019. Thirteen single and eight double cultivars of tuberose were evaluated at the research farm of ICAR - DFR, Pune. Among the single cultivars evaluated highest plant height (121.33 cm), spike length (110.45 cm), plant spread (108.63 cm), number of leaves (16.52), leaf length (68.57 cm), number of spikes (6.3), number of florets per spike (41.863) and floret length (7.56 cm) was recorded in cv. Prajwal.Whereas, rachis length was found maximum in cv. Phule Rajani (37.63 cm) among single type varieties. Among the double cultivars, highest number of florets per spike (39.75), number of leaves (17.32), and floret length (7.65 cm) were recorded in cv. Suvasini. While number of spikes (6.62) and leaf length (58.32 cm) was superior in cv. Vaibhav. Plant height (121.70 cm) and spike length (110.56) was highest in cv. Swarna Rekha. Whereas cv. Hyderabad Double recorded highest rachis length (42.56 cm) and cv. Phule Rajat recorded highest plant spread (102.49 cm). Considering all the floral qualities and yield, cv. Prajwal and Phule Rajani among single types and cv. Suvasini, Vaibhav, Phule Rajat and Hyderabad double among double types could be recommended for commercial cultivation under agro-climatic conditions of Pune.

Keywords: Tuberose, Single, Double, Evaluation

INTRODUCTION

Tuberose (*Polianthes tuberosa* L.) belongs to family Agavaceae and is native to Mexico. It is a prominent bulbous ornamental flowering plant of tropical and subtropical areas (Tiwari and Singh, 2002; and Ashish *et al*., 2018). Tuberose needs warm and humid conditions for its luxuriant growth. Flowers of the Single type (single row of perianth) are commonly used for production of loose flowers, extraction of essential oil, making garlands, etc., while that of Double varieties (more than two rows of perianth) are used as cut flowers and for garden display. Flowers of the 'Single' cultivars are more fragrant than 'Double' type and contain 0.08 to 0.14 percent concrete, which is used in high-grade perfumes (Singh and Uma, 1995; and Safeena*et al*., 2019). In India, tuberose is cultivated commercially in Bagnan, Kolaghat, Midnapur, Panskura, Ranaghat, Krishnanagar of West Bengal; Coimbatore, Dindigul, Kadalur, Krishnagiri, Dharmpurui, Sathyamangalam, Theni and Madurai districts of Tamil Nadu; Pune, Nashik, Ahmednagar, Thane, Sangli of Maharashtra; East Godavari, Guntur, Chittoor, Krishna Districts of Andhra Pradesh; Mysore, Tumkur, Kolar, Belgaum and Devanhalli taluk in Karnataka; Guwahati and Jorhat in Assam ; Udaipur, Ajmer and Jaipur in Rajasthan; Navsari and Valsad of Gujarat and parts of Uttar Pradesh and Punjab (Safeena*et al.*, 2019). Though there are many varieties available in the country, location specific evaluation of varieties will help the growers to select the most suitable and high yielding variety (Ramachandrudu and Thangam, 2009). So, there is a need for evaluation of cultivars and recommendation of a cultivar best suited for a particular agro-climatic region. Since Pune is agro-climatically most suited for growing any flower crops including tuberose, besides the presence of one of India's most propitious flower market in Pune, there is a great scope for expanding the crop cultivation by identifying suitable variety in this locality. In this context, efforts were made to identify ideal cultivars for commercial cultivation of tuberose in Pune.

MATERIALS AND METHODS

The present experiment was conducted at Directorate of Floricultural Research, ICAR, Hadapsar farm, Pune, Maharashtra, India during 2017-2019. Pune district is located between 17 degrees 54′ and 10 degrees 24′ North latitude and 73 degrees19′ and 75 degrees 10′ East longitude. Pune district forms a part of the tropical monsoon land and therefore shows a significant seasonal variation in temperature as well as rainfall conditions. Climate of the western region of Pune is cool whereas the eastern part is hot and dry with a mean temperature of 21°C and relative humidity of 64 per cent. The study comprises of 13 single type cultivars *viz*., Prajwal, Mexican Single, Sikkim Selection, ArkaNirantara, Phule Rajani, Hyderabad Single, Shringar, STR 505, ArkaSugandhi, Pune Local Single, Bidhan Ujjwal, BidhanSnigdha and GKTC-4, and eight double type cultivars *viz*., Suvasini, Swarna Rekha, Pearl Double, Vaibhav, Hyderabad Double, Calcutta Double, Pune Local Double and Phule Rajat. The uniform sized bulbs of about 2 cm diameter were planted on raised

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beds measuring 1m × 20 m with a spacing of 30 cm × 30 cm. Uniform cultural practices were adopted for all the cultivars. The experiment was laid out in randomized block design (RBD) with three replications. Ten plants from each plot were randomly selected for recording various observations. The observations were recorded for two consecutive years on vegetative growth and floral parameters from 2017-18 to 2019-2020.The parameters like number of leaves and plant spread were measured at vegetative stage while leaf length and leaf width were recorded from the fifth leaf from the meristem (tip). Floral characteristics like spike length and rachis length were measured at the time of flowering. Flowering is considered to begin when the first flower on the inflorescence has opened and observations on the florets *viz*., number of florets per spike, floret length, floret diameter and inter-floret length were recorded on most recently fully opened flowers on the inflorescence before fading of color. Plant height is measured from ground level to the tip of the inflorescence when the first pair of flowers were opened. The data recorded on various parameters were compiled and analysed statistically as per the methods described by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

Evaluation of performance of single type cultivars

Significant differences were observed for various vegetative and floral characteristics among single type varieties (Table 1). Plant height (121.33 cm), spike length (110.45 cm), plant spread (108.63 cm), number of leaves (16.52), leaf length (68.57 cm), number of spikes (6.3), number of florets per spike (41.863) and floret length (7.56 cm) was highest in cv. Prajwal among all single type varieties. Similar trend was also noticed by Patil *et al*., 2009 (Karnataka); Ramachandrudu and Thangam, 2009 (Goa); Mahawer*et al*., 2013 (Udaipur); Krishnamoorthy, 2014 (Tamil Nadu); Satya *et al*., 2015 (Uttar Pradesh); Lalthawmliana*et al*., 2017 (North-East India) and Chawla *et al*., 2019 (Gujarat) in respective agro-climatic regions. The highly significant variation in plant height and spike length among the varieties is attributed to the genetic makeup of the crop. Whereas, cv. Bidhan Ujjwal recorded lowest plant height (65.69 cm) and spike length (55.41 cm) however, cv. ArkaSugandhi recorded least plant spread (74.89 cm) andcv. Pune Local Single recorded the lowest leaf length (37.56 cm) due to the inherent genetic mechanism complemented by the prevailing climatic conditions in this area. Further, in single flower type, the lowest number of spikes per plant (2.53) and number of florets per spikes (23.45) was obtained in cv. Pune Local Single and Sikkim Selection, respectively. Similar trend was also recorded by Mahawer*et al*., 2013 andSafeena*et al*., 2019. The reduced number of spikes in these cultivars may be due to its genetic make-up which ultimately affects the morphological traits of the crop. Cultivar Hyderabad Single produced short florets (3.96 cm) compared to all other varieties. Cultivar BidhanSnigdha exhibited highest values for rachis length (55.41 cm), followed by cv. Phule Rajani (37.63 cm). Cultivar BidhanSnigdha was also found superior with respect to leaf width (3.96) and floret diameter (6.23 cm) whereas, least rachis length was in cv. Pune Local Single (20.04 cm), lowest leaf width was in cv. Mexican Single (1.553 cm) and lowest flower diameter was recorded by cv. ArkaSugandhi (3.60 cm). The superiority of the cv. BidhanSnigdha over other varieties is attributed to the inherent genetic nature in the prevailing climate. Cultivar GKTC-4 exhibited long Inter-floret length (5.96 cm), while it was short in cv. Hyderabad Single (3.73 cm) but this observation differed to the findings made by Ashish *et al*., 2018 in which cv. Hyderabad Single recorded the highest Inter-floret length, it mightbe attributed to the prominent climatic variations in both the areas of study.

Evaluation of performance of double type cultivars

The two-year pooled data revealed that among the double cultivars (Table 2) cv. Swarna Rekha recorded highest plant height (121.70 cm) and spike length (110.56 cm), followed by cv. Phule Rajat (106.51 and 93.68 cm respectively). These findings were not in tune with the observations made by Mahawer*et al*., 2013 in which cv. Swarna Rekha reported the least plant height as well as spike length. This variation in morphological traits may be attributed to the prevailing climates in respective areas of experimentation. Further, plant height and spike length were short in cv. Pune Local Double (80.64 and 68.69 cm, respectively), these results were in conformity with Safeena*et al*., 2019. Cultivar Hyderabad Double exhibited highest rachis length of 42.56 cm followed by cv. Calcutta Double (42.56 cm), however, this was not in tune with the findings of Ranchana*et al*., 2015 in which Hyderabad Double exhibited the least rachis length. While, cv. Swarna Rekha recorded least rachis length (20.59 cm) in the present study among all the double type cultivars evaluated. This was in accordance with Mahawer*et al*., 2013. It is evident that the agro-climatic conditions of the production area during the growing period have significant impact on the growth and flowering of different varieties of tuberose. Further, it is well known fact variations in floral characteristics might be due to the inherent capacity of the particular genotype. Maximum plant spread was observed in cultivar Phule Rajat (102.49 cm) followed by cv. Calcutta Double (101.52 cm). Number of leaves were found superior in cv. Suvasini (17.32 cm) followed by cv. Phule Rajat (15.66 cm), whereas the lowest plant spread (77.52 cm) was recorded by cv. Swarna Rekha and fewer

number of leaves (11.33) was observed in cv. Pune Local Double. These observations were in conformity with Mahawer*et al.*, 2013 (grown at Udaipur, India); and Ranchana*et al.*, 2015 (grown at Coimbatore, India). Further, Leaf length was highest in cv. Vaibhav (58.32 cm), followed by cv. Pune Local Double (50.46 cm), while lowest leaf length was recorded by cv. Phule Rajat (41.47 cm). Similarly Leaf width was observed highest in cv. Pune Local Double (2.80 cm), followed by cv. Calcutta Double (2.71 cm), whereas the lowest leaf width was recorded in cv. Swarna Rekha (1.54 cm). Safeena*et al*., 2019 also reported the superiority of cv. Calcutta Double with respect to leaf width.

The yield of the cultivar is directly proportionate to the number of spikes obtained. Highest number of spikes (6.62) was observed in cv. Vaibhav followed by cv. Pearl Double (6.00) while least number of spikes was recorded in cv. Phule Rajat (1.50). These findings were in accordance with the observations of Mahawer*et al.*, 2013 and Gawande *et al*., 2018. Highest number of florets per spike (40.66) was noticed in cv. Phule Rajat followed by cv. Suvasini (39.75), while fewer number of florets per spike was observed in cv. Swarna Rekha (31.90). These findings were in accordance with Patil *et al*., (2009); Mahawer*et al.*, (2013);Ranchana*et al.*, 2015 andAshish *et al.*, 2018, who noted significantly highest number of florets per spikes in cv. Suvasini among different cultivars of tuberose. Cultivar Suvasini also produced the lengthiest florets (7.65 cm), followed by cv. Swarna Rekha (6.74 cm), while shortest florets were produced by cv. Pune Local Double (4.86 cm). Floret diameter was recorded highest in cv. Calcutta Double (5.28 cm) followed by Suvasini (4.84 cm), whereas the least diameter was recorded in cv. Pune Local Double (4.01 cm). This was in line with the findings of Safeena*et al.*, 2019. Inter floret length was highest in cv. Vaibhav (6.94 cm), followed by cv. Pune Local Double (6.80 cm), while lowest inter floret length was observed in cv. Phule Rajat (4.60 cm). These variations in flowering parameters might be due to the genotypic differences which resulted in phenotypic expression of the traits and variations in genotype x environment interactions.

Table 1. Evaluation of performance of tuberose (single type) cultivars at Pune during 2018-19

Variety	Plant height (cm)	Spike length (cm)	Rachis length (cm)	Plant spread (cm)	Number of leaves	Leaf length (cm)	Leaf width (cm)	Number of spikes	Number of florets per spike	Floret length (cm)	Floret diameter (cm)	Inter-Floret length (cm)
Prajwal	121.33	110.457	35.440	108.633	16.523	68.573	2.833	6.300	41.863	7.563	4.950	5.450
Mexican single	109.973	99.640	36.437	86.523	12.523	49.540	1.553	5.800	34.407	5.850	3.650	4.643
Sikkim Selection	99.830	86.813	21.650	81.343	11.157	44.997	1.980	5.547	23.453	6.383	4.620	4.370
ArkaNirantara	84.603	72.530	34.483	94.683	14.357	54.300	2.123	5.487	33.670	5.747	3.837	5.380
Phule Rajani	89.757	78.700	37.633	91.817	13.963	55.310	2.657	4.820	38.253	6.487	4.650	4.767
Hyderab ad Single	82.813	71.420	28.670	100.390	14.520	54.267	2.363	3.100	37.503	5.233	3.967	3.730
Shringar	85.563	76.570	37.523	80.457	14.420	55.520	2.553	4.800	36.967	6.670	4.770	4.420
STR 505	91.050	80.670	33.563	99.560	14.423	55.317	2.253	3.453	35.563	6.180	4.250	4.947
ArkaSugandhi	85.557	73.117	37.393	74.897	15.460	39.363	2.623	4.483	39.000	5.693	3.607	5.407
Pune Local Single	104.460	91.350	20.043	84.390	13.687	37.560	1.790	2.533	28.480	6.517	4.560	4.930
Bidhan Ujjwal	65.693	55.417	26.117	76.750	11.457	45.967	2.850	4.343	28.377	6.617	4.443	5.237
BidhanSnigdha	98.483	89.407	48.640	79.277	15.467	47.470	3.967	5.047	36.457	6.820	6.230	5.490
GKTC-4	72.597	69.457	36.413	82.573	11.413	42.473	3.913	4.720	41.117	6.727	5.693	5.967
S.Em ±	3.12	3.92	1.28	1.81	0.280	1.482	0.0297	0.200	1.015	0.195	0.142	0.202
CD 5 %	9.45	11.707	3.806	5.587	0.843	4.437	0.089	0.602	3.049	0.583	0.429	0.611

Table 2. Evaluation of performance of tuberose (double type) cultivars at Pune during 2018-19

Variety	Plant height (cm)	Spike length (cm)	Rachis length (cm)	Plant spread (cm)	Number of leaves	Leaf length (cm)	Leaf width (cm)	Number of spikes	Number of florets per spike	Floret length (cm)	Floret diameter (cm)	Inter-Floret length (cm)
Suvasini	95.893	85.437	40.377	91.347	17.327	47.353	2.667	5.880	39.750	7.650	4.843	4.740
Swarna Rekha	121.707	110.563	20.597	77.523	13.933	44.350	1.540	3.950	31.907	6.740	4.323	5.290

Pearl Double	89.430	77.267	34.330	94.340	14.653	42.643	2.460	6.000	36.000	5.930	4.070	5.147
Vaibhav	89.600	76.523	38.473	87.487	13.403	58.323	2.483	6.623	36.007	4.933	4.200	6.943
Hyderabad Double	94.597	82.857	42.560	84.520	15.163	49.343	2.057	3.373	33.383	5.597	4.740	6.700
Calcutta Double	94.450	83.527	40.457	101.523	15.277	49.747	2.710	3.300	33.563	5.967	5.283	6.367
Pune Local Double	80.640	68.693	40.110	86.900	11.333	50.463	2.800	4.000	37.910	4.867	4.010	6.800
Phule Rajat	106.510	93.683	37.407	102.493	15.667	41.470	2.667	1.500	40.66	6.157	4.353	4.600
S.Em ±	3.364	3.603	1.94	3.48	0.65	2.048	0.136	0.517	1.389	0.244	0.086	0.175
CD 5 %	10.088	10.803	5.805	10.496	1.980	6.140	0.402	1.559	4.217	0.736	0.263	0.527

CONCLUSION

Based on the performance evaluation,among the 21 cultivars Prajwal and Phule Rajani was found superior among allthe single type cultivars; and Suvasini, Vaibhav, Phule Rajat and Hyderabad Double were found superior among all the double type cultivars in the agro-climatic conditions of Pune.Hence, these varieties could be recommended for commercial cultivation in Pune district and surrounding areas of Maharashtra.

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