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Original Research Paper

Evaluation of Different Cultivars of Tuberose (*Polianthes tuberosa* L.) under Humid agro Climatic conditions of Goa

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ABSTRACT

Tuberose (*Polianthes tuberosa* L.) is one of the most important tropical bulbous-ornamental cultivated for production of long-lasting flowers spikes. Adaptation and acclimatization of different cultivars under humid agro-climatic conditions of Goa are to be confirmed for their better performance. The present investigation was conducted to evaluate the performance of tuberose cultivars under agro-climatic conditions of Goa during 2014-2017. Five single and six double cultivars of tuberose were evaluated during the study period. All the cultivars differed in their growth and flowering behaviour. Among the single cultivars, evaluated, maximum number of florets per spike (47.00) was observed in Pune local whereas spike-length (75.59 cm) was maximum in Mexican Single. Among the double cultivars, evaluated, maximum plant height (52.21 cm) and maximum number of leaves per plant (59.63) were recorded with cultivar Arka Suvasini. Leaf length was significantly higher (52.93 cm) in Pearl double whereas leaf width (2.04 cm) was maximum in Calcutta Double. Days to appearance of flower spike were earlier in Arka Suvasini. Minimum days taken for opening of basal floret (84.88 days) were recorded with cultivar Arka Suvasini. Spike girth (0.68 cm), Spike fresh-weight (69.06 cm), floret stalk-length (3.6 cm), floret diameter (5.24 cm), weight of individual floret (3.49 g) and vase life (7.93 days) was significantly maximum in Cv. Arka Suvasini followed by Pearl Double. Based on the performance evaluation cv. Mexican Single among single types and cv. Arka Suvasini and Pearl Double among double types could be recommended for commercial cultivation under agro climatic conditions of Goa.

Key words: Cultivars, double, Evaluation, Single and Tuberose

INTRODUCTION

Tuberose (*Polianthes tuberosa* L.), popularly known as Rajanigandha or Nishigandha is one of the most important tropical ornamental bulbous flowering plants cultivated for production of its long-lasting flower spikes. It is a native of Mexico and belongs to the family Asparagaceae. Flowers of the Single type (single row of perianth) are commonly used for extraction of essential oil, loose flowers, making garland 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). In India, tuberose

is cultivated commercially in Bagnan, Kolaghat, Midnapur, Panskura, Ranaghat, Krishnanagar of West Bengal; Coimbatore, Dindigul, Kadalur, Krishnagiri, Dharmapurui, Sathyamangalam, Theni and Madurai districts of Tamil Nadu; Pune, Nashik, Ahmednagar, Thane, Sangli of Maharashtra; East Godavari, Guntur, Chittoor, Krishna District 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. Some of the tuberose cultivars have been introduced, while some are evolved in India. The information available on recommendations of the suitable tuberose cultivars for growth, floral and

economic parameters under coastal humid agro climatic conditions of Goa is scanty. Adaptation and acclimatization of different tuberose cultivars under humid agro climatic conditions of Goa are to be confirmed for their better performance. This will enable the farmers to grow released and new introduced and improved cultivars of tuberose and helps in making them understand their superiority over local cultivars. Keeping these facts in view, the present study was conducted to evaluate the performance of different tuberose cultivars under coastal humid climatic conditions of Goa and to find out the suitable tuberose cultivar under agroclimatic conditions of Goa.

MATERIALS AND METHODS

The present experiment was conducted at Floriculture Research Farm, Horticulture Science Section, ICAR-Central Coastal Agricultural Research Institute, Ela, Old Goa, Goa, India during 2014-2017. The state of Goa is located between 14° 16" North latitude and 73° 05" East longitude with the states of Maharashtra on the North and Karnataka on the East and South and Arabian Sea on the West. The five single type cultivars, viz., Mexican Single, Calcutta Single, Hyderabad Single, Pune Local Single and Phule Rajni, and six double type cultivars (Pearl Double, Arka Suvasini, Bidhan Rajani, Calcutta Double, Hyderabad double and Pune local double) were used for the present study. The uniform sized bulbs of size (2 cm diameter) were planted with the spacing of 45 x 30 cm in a plot size of 1.50 m x 1.0 m. Uniform cultural practices were adopted for all the cultivars. The

experiment was laid out in randomized block design (RBD) with five replications. Ten plants from each plot were randomly selected for recording various observations. The observations were recorded for two consecutive years on vegetative growth, floral and bulb parameters. The observations, viz., plant height at shoot emergence (cm), number of leaves per plant, leaf length (cm), leaf width (cm), days to appearance of flower spike, number of florets per spike, length of spike (cm), diameter of spike (cm), fresh weight of the spike (g), stalk length of the floret (cm), diameter of the floret (cm), fresh weight of the individual floret (g), vase life of the spikes (days), weight of the bulbs, average number of bulbs per clump and bulblets per clump were recorded. The data recorded on various parameters were compiled and analysed statistically as per the methods described by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

Significant differences were observed for various morphological characters and floral quality traits among different single cultivars of tuberose evaluated (Table 1 and 2) under coastal humid agro climatic conditions of Goa. Tallest plant (49.18 cm), and more number of leaves per plant (82.66) were obtained in cv. Mexican Single in single flower types (Table 1). The highly significant variation in plant height and number of leaves per plant among various tuberose cultivars may be attributable to the hereditary traits, which is further altered by prevailing environmental conditions. The results of the present study are in conformity with the findings of Bhaskar and Reddy

Table 1: Plant growth and floral characteristics in single-type tuberose cultivars under humid agro-climatic conditions of Goa

Treatments	Plant height at shoot emergence (cm)	No. of leaves	Days to appearance of initial spike	No. of spikes/clump	No. of florets/spike	Length of spike (cm)	Diameter of spike (cm)
Mexican Single	49.186	82.660	112.003	3.67	37.083	75.590	0.532
Calcutta Single	46.643	64.047	114.177	3.17	35.223	68.177	0.810
Hyderabad Single	42.640	60.940	136.273	3.50	45.057	61.023	0.905
Pune Local Single	38.030	63.167	123.41	2.83	37.167	62.093	0.915
Phule Rajni	40.387	68.170	131.073	3.13	38.050	58.113	0.540
S.Em +	0.115	0.858	0.564	0.093	0.704	0.294	0.005
CD (0.05)	0.346	2.575	1.693	0.289	2.113	0.882	0.014

(2006), Bhaskaret *al.* (2006) and Mahawer *et al.* (2008) in tuberose.

In case of single flower type cultivars earliest flowering was recorded in cv. Mexican Single (112 days) whereas it was very late in Hyderabad single (136.273days) (Table 1) (Fig. 1). The variation in days to appearance of flower spike was chiefly due to the

different genetic make-up of the cultivars evaluated under the present study and prevailing environmental conditions. Mexican single recorded significantly maximum spike length (75.59 cm) (Table 1). This variation in spike length among various tuberose cultivars evaluated in the present study may be due to different genetic make-up of the cultivars and prevailing environmental conditions.



Fig. 1: Tuberose crop in flowering stage under humid agro-climatic conditions of Goa

Significant variation was noticed with respect to number of florets per spike in single types (Table 1). The variation in number of florets per spike may be due to genetic variability among the different cultivars of tuberose and prevailing environmental condition

during field trial. Further, in single flower type tuberose cultivars, higher trends for floret stalk length (1.84 cm), diameter of floret (4.085 cm) and weight of individual floret (2.123g) was recorded in cv. Mexican single (Table 2). The variations observed in various floral

Table 2: Floral and Bulb characteristics in single-type tuberose cultivars under humid agro-climatic conditions of Goa

Treatments	Floret stalk length (cm)	Diameter of floret (cm)	Weight of individual floret (g)	Vase life (days)	Weight of bulb (g)	No. of bulbs/clump	No. of bulblets/clump
Mexican Single	1.840	4.085	2.123	6.702	31.953	7.467	26.000
Calcutta Single	1.721	3.820	1.543	6.730	22.087	6.123	23.667
Hyderabad Single	1.372	4.047	1.717	6.920	19.700	5.680	22.633
Pune Local Single	1.821	3.803	1.023	5.917	21.517	6.133	20.300
Phule Rajni	1.741	3.123	1.440	5.400	19.003	5.000	20.367
S.Em +	0.007	0.053	0.029	0.019	0.407	0.104	0.525
CD (0.05)	0.020	0.160	0.087	0.059	1.221	0.313	1.575

characters might be due to the presence of sufficient genetic variability as reported earlier by Bichoo *et al.* (2003) in gladiolus.

Among the single flowered types, Mexican single, Calcutta Single and Hyderabad Single had better vase life of 6.70 days, 6.73 days and 6.92 days respectively (Table 2). Sateesha *et al.* (2011) reported good vase-life in tuberose cultivars, Vaibhav and Prajwal. The highly significant variation for the vase-life of cut spike among tuberose cultivars may be due to its different genetic make-up with prevailing environmental conditions, which ultimately affects various physiological processes like turgidity of the cell, water uptake through xylem tissue, water loss through transpiration, respiration and breakdown of their served food, which influences vase-life under laboratory conditions.

In case of single flower type cultivar, highest bulb weight per clump was recorded in cultivar Mexican Single (31.953 g), while, lowest (19.003 g) in Phule Rajni (Table 2). These differences might be due to the genetic characters of the different tuberose varieties taken up for the present study. The variation in weight of bulbs per plant among different tuberose cultivars at bulb harvesting stage can be attributed to the distinguished varietal genetic make-up of the cultivar.

Significant differences were observed for various morphological characters and floral quality traits among different doublecultivars of tuberose evaluated (Table 3 - Table 4) under coastal humid agro climatic conditions of Goa. It is evident from the data in Table 3 that out of the different double type tuberose cultivars evaluated for their vegetative characteristics,

Table 3: Plant growth and floral characteristics in double-type tuberose cultivars under humid agro-climatic conditions of Goa

Treatments	Plant height at shoot emergence (cm)	No. of leaves per plant	Leaf length (cm)	Leaf width (cm)	Days to appearance of flower spike	No. of spikes/ clump	No. of florets/ spike	Length of spike
Pearl Double	42.171	44.633	52.930	1.664	164.417	3.36	43.253	71.018
Arka Suvasini	52.211	59.630	41.449	1.148	105.767	3.97	42.247	70.463
Bidhan Rajani	39.554	48.300	34.767	1.643	172.33	2.28	30.083	57.483
Calcutta Double	37.300	47.500	37.257	2.040	111.433	2.39	33.233	57.507
Pune local	37.377	38.127	37.635	1.456	114.603	2.40	47.033	65.733
Hyderabad double	41.030	49.927	38.307	1.138	138.06	3.17	35.540	69.063
S. Em+	0.214	0.148	0.132	0.086	1.896	0.028	0.292	0.240
CD (0.05)	0.643	0.444	0.392	0.258	5.689	0.088	0.875	0.720

the maximum plant height and number of leaves per plant were recorded in cv. Arka Suvasini (52.21 cm and 59.63 no's). Panse (1957) reported that the variation in plant height and number of leaves per plant among the cultivars might be due to the genetic constitution of the germplasm, which has close bearing in response to selection.

Out of the six tuberose cultivars evaluated for their floral parameters (Table 3) among the double flower types, days to appearance of flower spike were earlier

in Arka Suvasini (105 days) while it was late in Bidhan Rajani (172 days). Similar results with respect to variation in days to first flowering among different cultivars were reported earlier by Bhaskar *et al.* (2006) and Mahawer *et al.* (2008). Among the double flowered types, length of the spike (71 cm) was maximum in Pearl Double as recorded in Table 3. Being genetically controlled factor, significant variation occurred in length of the spike due to the hereditary traits of different cultivars under prevailing

Table 4: Floral and bulb characteristics in double-type tuberose cultivars under humid agro-climatic conditions of Goa

Treatments	Diameter of spike (cm)	Fresh weight of spike (g)	Floret stalk length (cm)	Diameter of floret (cm)	Weight of indi. floret (g)	Vase life (days)	Weight of bulb (g)	No. of bulbs/clump	No. of bulblets/clump
Pearl Double	0.645	62.504	3.523	5.186	3.383	7.600	56.067	12.733	30.167
Arka Suvasini	0.680	69.060	3.600	5.240	3.490	7.930	52.133	11.500	29.600
Bidhan Rajani	0.617	25.897	1.814	4.397	1.580	5.350	34.567	9.400	26.300
Calcutta Double	0.547	25.217	2.007	5.000	1.750	7.023	33.467	9.733	28.167
Pune local	0.563	25.548	3.349	4.726	1.698	5.725	36.267	8.200	19.733
Hyderabad Double	0.542	45.311	3.021	4.068	1.481	6.030	32.800	9.167	17.800
S. Em+	0.017	0.180	0.042	0.032	0.013	0.056	0.236	0.034	0.087
CD (0.05)	0.051	0.540	0.125	0.095	0.038	0.167	0.709	0.103	0.261

environment. Present results are in accordance with the findings of Patil *et al.* (2009) and Mahawer *et al.* (2008) who obtained significant variation among the tuberose cultivars for length of the spike.

The two-year pooled data revealed that maximum trend for number of florets per spike (47) was observed in Pune local while minimum trend was recorded in Bidhan Rajani (30) among the double flowered types (Table 3). These results are in accordance with the findings of Patil *et al.* (2009) and Mahawer *et al.* (2008) who noted significant variation in number of florets per spike in different cultivars of tuberose. The cultivar Arka Suvasini performed better in different floral qualitative traits like spike girth (0.68 cm), stalk length of the floret (3.6 cm), diameter of the floret (5.24 cm) and weight of individual floret (3.49g) which was followed by Pearl Double (Table 4).

Further, the highest fresh weight of the spike was recorded in cultivar Arka Suvasini (69.06 g), followed by the cultivar Pearl Double (62.50 g) among double flower type tuberose cultivars (Table 4). Variation in fresh weight of the spike might be due to different genetic make-up of the different cultivars and prevailing environment conditions. Present findings are in accordance with the findings of Kumar and Yadav (2005) in gladiolus. The vase life was found to

be significantly maximum (7.93 days) in cv. Arka Suvasini followed by Pearl Double (7.60 days) among the double flowered tuberose types (Table 4).

The maximum bulb weight per plant were recorded in cultivar Pearl Double (56.06 g), whereas, minimum (32.80 g) in Hyderabad Double in double flower type of tuberose evaluated under the present study (Table 4). The cultivars with more number of leaves have higher photosynthetic activity, source sink relationship, thereby accumulating more amount of carbohydrates and improved bulb weight per plant under prevailing environmental conditions. The significant variation in bulb weight of different tuberose cultivars were also recorded earlier by Mahawer *et al.* 2008.

Based on results obtained, it may be concluded that cv. Mexican Single among single types and cv. Arka Suvasini and Pearl Double among double types could be recommended for commercial cultivation under coastal humid agro climatic conditions of Goa since they were found to be promising in respect of plant growth, floral and bulb characteristics.

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