

Original Research Article

Comparative Performance of Tuberose Genotypes in the Sub-Himalayan Terai Region of West Bengal

Abhinash Moirangthem^{1*}, Soumen Maitra², Punabati Heisnam³ and Priyanka Irunbam³

¹Department of Horticulture, College of Agriculture,
Central Agricultural University, Imphal, India

²Department of Horticulture, Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, India

³Department of Natural Resource Management, College of Horticulture and Forestry, Central
Agricultural University, Pasighat, India

*Corresponding author

ABSTRACT

An experiment was conducted at the experimental farm of Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, West Bengal at the Department of Floriculture, Medicinal and Aromatic Plants, in 2013-2014 and 2014-2015 to identify the suitable cultivar of Tuberose for Sub-Himalayan Terai region of West Bengal. For this experiment, seven different Tuberose cultivars namely Suvasini, Vaibhav, Calcutta Double, Phule Rajni, Prajwal, Calcutta Single and Shringar were used where in the cultivars showed distinct performance regarding various growths and yield attributes. Results revealed that the cultivar Calcutta Double recorded better performance in respects of plant height and leaf production at monthly intervals. Earlier sprouting (9.32 days) of bulbs was observed with cultivar Calcutta Double and the same cultivar also showed earliness in flowering (80.97 days), more number of florets per spike (46.30) with greater diameter of both florets and spikes (0.95 cm). Higher fresh (114.60 g and 141.18 g) and dry weights (23.16 g and 17.91 g) of florets and cut spikes as well as improved field-life (17.04 days) and vase-life (8.29 days) of spikes were obtained from the same Tuberose cultivar Calcutta Double along which the month wise data and annual data (45.66) for flower production was also found maximum with the same cultivar. Therefore, cultivar Calcutta Double showed better performance in growth and flowering in open field cultivation in Sub-Himalayan Terai region of West Bengal and hence maybe recommended for commercial cultivation in this region for cut flower production.

Keywords

Tuberose,
Comparative,
Cultivars, Growth
parameters, Yield
parameters

Introduction

Tuberose (*Polianthes tuberosa* L.) is one the most important bulbous ornamental of tropical and subtropical areas and is always in great demand for its nice-looking fragrant spikes (Biswas *et al.*, 2002). It occupies a very selective and special position in human mind because of its prettiness, elegance and pleasant fragrance. The white flower spikes

remain fresh for a quite long time and able to withstand long distance shipment thus occupy a useful place in the flower market (Patel *et al.*, 2006). It blooms profusely almost throughout the year except peak winter (Samia *et al.*, 2016) and most artistic garlands and floristry items are made from its flowers (Shen *et al.*, 1987). Tuberose possesses a great economic potential in cut flower trade

and essential oil industry (Sadhu and Bose, 1973; Panigrahi and Saiyad, 2013). The total area under Tuberose cultivation in the country is estimated at about 7.95 lakh hectares with an estimated production of 27.71 '000 MT of loose and 1560.70 lakh numbers of cut flowers respectively (Tiwari *et al.*, 2014). In India, the commercial cultivation of Tuberose is generally practiced in West Bengal, Karnataka, Maharashtra, Tamil Nadu, Haryana, Punjab, Gujarat, Rajasthan, Andhra Pradesh and Assam (Biswas *et al.*, 2002; Khan and Pal, 2001). Hutchinson (1934) placed Tuberose (*Polianthes tuberosa* L.) in the family Agavaceae but afterwards it was categorized under Amaryllidaceae by Bailey (1939). It is a native of Mexico (Waithaka *et al.*, 2001), where it was reared and cultivated before the conquest in 1522 AD (Trueblood, 1973; Benschop, 1993). It belongs to the sub-class monocotyledonae and its generic name *Polianthes* is derived from Greek word 'Polis' which means white and 'Anthos' meaning a flower (Bryan, 1989). Though it is originated in Mexico it is so suited to our climatic condition that sometimes it is considered as a flower of India.

The growth, development, flowering and yield vary considerably with changing agro-input and agrotechnique. Higher dose of fertilizer has greatly influenced some of the vegetative growth parameters (Khanam *et al.*, 2017). Several works on Tuberose have been conducted earlier in different parts of India in respect of agro-technique development regarding better growth and increase in quality and yield of flowers. Planting in April-May produced more vegetative growth in Tuberose (Rathore *et al.*, 2009). Maximum spike yield were obtained from Tuberose planted in the month of April at Uttarakhand (Rathore *et al.*, 2009). The present investigation was carried out to test the comparative performance of various

genotypes of Tuberose in the Sub-Himalayan Terai region of West Bengal.

Materials and Methods

The present investigation was conducted under the Department of Floriculture, Medicinal and Aromatic Plants, Faculty of Horticulture, Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, West Bengal, during the year 2013-14 and 2014-15. Geographically the farm is situated at 26° 19'86" N latitude and 89° 23'53" E longitude, at an elevation of 43 meter above mean sea level. The experimental material consists of seven cultivars of Tuberose including Calcutta Double, Calcutta Single, Phule Rajni, Shringar, Prajwal, Vaibhav and Suvasini. The investigation was laid out in Randomized Block Design with three replications. The soil of the experimental site was acidic (pH 5.74), high in Organic carbon (1.117 %), Nitrogen (186.35 kg ha⁻¹) and Potassium (111.69 kg ha⁻¹) content while Phosphorus (39.67 kg ha⁻¹) content was medium. The entire experimental land was divided into raised beds measuring 2.0 m x 1.0 m and there were 21 plots in total. Each bed was separated to the other through a 50 cm wide path in both ways and a uniform dose of FYM (Well rotten) @ 5 kg/m² along with 4: 3.33: 3.33 g/m²: N : P₂O₅ : K₂O (Patil *et al.*, 1999) were applied as a basal fertilizer. The same dose was repeated at 4 months interval for two times as first and second top dressing. Bulbs of tuberose were planted in the raised bed at a depth to which it exposed its tip on the surface on 5th May, 2013 and 5th May, 2014 at a spacing of 25 cm x 25 cm. For both the respective years 2014 and 2015, pooled mean was calculated for every parameter recorded. The growth parameters (Plant height, number of leaves) were recorded at 30 days interval till upto 360 days.

Table.1 (a) Comparative performance of tuberose on the plant height

Variety	Sprouting of bulbs (days)	Plant height (cm)											
		30 days	60 days	90 days	120 days	150 days	180 days	210 days	240 days	270 days	300 days	330 days	360 days
Suvasini	9.83	20.05	29.48	36.42	41.54	53.83	58.08	59.72	59.00	60.80	60.08	60.89	61.44
Vaibhav	9.71	20.21	29.01	36.14	41.82	54.03	57.94	58.47	58.65	60.22	60.35	60.59	60.37
Calcutta Double	9.32	21.25	30.91	37.90	42.95	54.61	62.11	64.98	65.38	65.57	65.89	65.63	64.61
Phule Rajni	9.69	20.19	29.05	36.14	41.49	54.33	57.65	56.98	57.88	58.90	59.77	60.29	60.00
Prajwal	10.10	20.11	28.60	36.24	41.54	54.40	57.58	58.59	59.00	59.90	60.05	60.26	60.73
Calcutta Single	9.78	21.06	30.81	37.43	42.68	55.08	59.87	61.11	62.19	62.69	62.29	62.37	62.30
Shringar	9.82	20.71	29.83	37.25	42.63	55.60	61.08	63.87	64.39	64.86	65.41	64.19	64.99
S. Em (±)	0.07	0.19	0.15	0.24	0.31	0.28	0.51	0.51	0.41	0.40	0.61	0.53	0.38
C.D. at 5%	0.21	0.57	0.45	0.69	0.90	0.81	1.47	1.47	1.20	1.17	1.79	1.55	1.10

Table.1 (b) Comparative performance of Tuberose on the Number of leaves

Variety	Number of leaves											
	30 days	60 days	90 days	120 days	150 days	180 days	210 days	240 days	270 days	300 days	330 days	360 days
Suvasini	8.61	29.89	69.80	94.06	81.11	77.46	72.30	72.76	79.04	92.70	92.89	99.43
Vaibhav	8.46	29.56	69.24	93.43	80.09	76.13	71.11	71.18	77.74	92.32	92.59	98.78
Calcutta Double	10.65	31.48	72.39	96.72	87.45	82.24	77.85	78.06	82.32	95.46	95.94	102.78
Phule Rajni	8.52	28.63	68.76	93.33	77.91	74.32	69.98	70.30	76.13	91.76	92.00	98.22
Prajwal	8.33	28.19	68.58	92.96	75.85	72.33	69.35	69.44	74.87	91.04	91.15	97.56
Calcutta Single	9.26	30.67	70.85	95.74	85.70	80.34	75.35	75.78	80.89	94.11	94.50	101.59
Shringar	9.18	30.15	69.83	94.46	84.61	78.93	73.82	74.45	79.85	93.80	93.93	100.72
S. Em (±)	0.08	0.10	0.13	0.14	0.27	0.24	0.27	0.26	0.18	0.10	0.17	0.18
C.D. at 5%	0.23	0.30	0.37	0.41	0.80	0.69	0.78	0.75	0.53	0.29	0.49	0.52

Table.2 (a) Comparative performance of Tuberose on the Yield attributes of Tuberose

Variety	Days required for flower bud initiation (days)	Days from flower bud initiation to flower bud development (days)	Days from flower bud development to blooming of floret (days)	Days from blooming of floret to wilting of floret (days)	Number of florets per spike	Diameter of florets (cm)	Length of florets (cm)	Fresh weight of 100 florets (g)	Dry weight of 100 florets (g)
Suvasini	88.17	93.47	97.53	110.94	39.11	0.51	5.34	95.15	19.09
Vaibhav	87.57	92.73	96.82	109.91	41.08	0.58	5.53	84.36	16.79
Calcutta Double	80.97	86.10	90.28	107.32	46.30	0.67	5.77	114.60	23.16
PhuleRajni	88.50	93.67	97.47	110.27	39.80	0.51	5.13	71.84	14.15
Prajwal	87.63	92.77	97.18	111.61	36.69	0.55	5.47	68.26	13.87
Calcutta Single	83.87	89.07	93.28	105.65	44.41	0.64	5.81	101.23	20.22
Shringar	84.67	89.53	93.88	109.23	42.94	0.55	5.61	80.46	16.58
S. Em (\pm)	0.23	0.22	0.25	0.24	0.27	0.01	0.03	0.77	0.27
C.D. at 5%	0.68	0.65	0.74	0.71	0.80	0.017	0.08	2.24	0.79

Table.2 (b) Comparative performance of Tuberose on the yield attributes and yields of Tuberose-

Variety	Spike length (cm)	Spike diameter (cm)	Fresh weight of cut spike (g)	Dry weight of cut spike (g)	Field-life of spike (days)	Vase-life of spike (days)	Fresh weight of plants (g)	Dry weight of plants (g)	Flower spike yield/ m ² /year
Suvasini	72.45	0.90	122.39	17.53	13.41	7.20	246.60	40.40	40.14
Vaibhav	65.67	0.85	116.50	16.35	13.09	6.74	228.12	38.22	38.70
Calcutta Double	76.30	0.95	141.18	17.91	17.04	8.29	276.27	45.32	45.66
PhuleRajni	68.22	0.78	73.56	10.68	12.80	6.58	225.26	38.36	37.98
Prajwal	71.58	0.77	67.73	9.45	14.43	7.28	221.15	37.56	36.47
Calcutta Single	81.66	0.89	81.87	11.76	12.37	6.37	263.77	42.84	43.39
Shringar	64.53	0.83	79.53	11.44	15.35	7.71	254.82	41.62	41.40
S. Em (\pm)	0.38	0.01	0.38	0.50	0.05	0.03	0.35	0.09	0.10
C.D. at 5%	1.11	0.017	1.10	1.46	0.15	0.08	1.03	0.27	0.29

Yield attributing characters i.e. Days required for flower bud initiation (days), Days from flower bud initiation to flower bud development (days), Days from flower bud development to blooming of floret (days), Days from blooming of floret to wilting of floret (days), Number of florets per spike, Diameter of florets (cm), Length of florets (cm), Fresh weight of 100 florets (g), Dry weight of 100 florets (g), Spike length (cm), Spike diameter (cm), Fresh weight of cut spike (g), Dry weight of cut spike (g), Field-life of spike (days), Vase-life of spike (days), Fresh weight of plants (g), Dry weight of plants (g) and Yield (Flower spike/ m² /year). The effect of the experiment was recorded according to the varieties for every parameter. Statistical analysis of all the collected data from the experiment was computed on analysis of variance method as suggested by Gomez and Gomez (1984) at 5% level of probability.

Results and Discussions

Comparative performance of Tuberose on the Growth parameters

The pooled data of Table 1(a) result represented the cultivar Calcutta Double as the lowest time period requiring variety of tuberose in respect of sprouting of bulbs (9.32 days) followed by Phule Rajni (9.69 days) which was statistically at par with the cultivars Vaibhav (9.71 days), Calcutta Single (9.78 days), Shringar (9.82 days), and Suvasini (9.83 days). The cultivar Prajwal required the highest time period for sprouting of bulbs (10.10 days). The plant height was recorded at monthly intervals and the cultivar Calcutta Double recorded the maximum plant height (21.25 cm) at 30 days after planting, at 60 days after planting (30.91 cm), at 90 days after planting (37.90 cm), at 120 days after planting (42.95 cm), at 180 days after planting (59.73 cm), at 210

days after planting (64.98 cm), at 240 days after planting (65.38 cm), at 270 days after planting (65.57 cm), at 300 days after planting (65.89 cm) and at 330 days after planting (65.63 cm). The cultivar Shringar produced higher plant heights (55.60 cm) during 150 days after planting and at 360 days after planting (64.99 cm). The plant height was found minimum with the cultivar Suvasini (20.05 cm) at 30 days after planting and at 150 days after planting (53.83 cm). Cultivar Vaibhav produced minimum plant height (36.14 cm) at 90 days after planting. Cultivar Prajwal showed minimum plant heights (28.60 cm) at 60 days after planting, at 180 days after planting (57.58 cm) and at 330 days after planting (60.26 cm) as shown in the Table 1(a). The genotypic variation with regards to plant height was also observed by Ramachandrudu and Thangam (2009) in Tuberose, Negi *et al.* (2014) in Gladiolus and Vikas *et al.* (2011) in Dahlia. Tuberose cultivar Phule Rajni produced minimum plant heights (36.14 cm) at 90 days after planting, at 120 days after planting (41.49 cm), at 210 days after planting (56.98 cm), at 240 days after planting (57.88 cm), at 270 days after planting (58.90 cm), at 300 days after planting (59.77 cm) and at 360 days after planting (60.00 cm).

In Table 1(b), leaf production was found maximum with cultivar Calcutta Double in all the 12 months (10.65 at 30 days after planting, 31.48 at 60 days after planting, 72.39 at 90 days after planting, 96.72 at 120 days after planting, 87.45 at 150 days after planting, 82.24 at 180 days after planting, 77.85 at 210 days after planting, 78.06 at 240 days after planting, 82.32 at 270 days after planting, 95.46 at 300 days after planting, 95.94 at 330 days after planting and 102.78 at 360 days after planting) but Tuberose cultivar Prajwal produced least number of leaves per plant every time (8.33

at 30 days after planting, 28.19 at 60 days after planting, 68.58 at 90 days after planting, 92.96 at 120 days after planting, 75.85 at 150 days after planting, 72.33 at 180 days after planting, 69.35 at 210 days after planting, 69.44 at 240 days after planting, 74.87 at 270 days after planting, 91.04 at 300 days after planting, 91.15 at 330 days after planting and 97.56 at 360 days after planting). Though leaf production is genetically governed still the adaptability of the genotype determines the quantity which is also influenced by agroclimatic conditions Barooah and Talukdar (2009).

Comparative performance of tuberose on the yield attributes and yields

In the table 2 (a), plants of cultivar Calcutta Double reached the flower bud initiation stage earliest (80.97 days) and the same cultivar took the least time period for flower bud development (86.10 days) and blooming of floret (90.28 days). The time period requirement for wilting of floret was found maximum with cultivar Prajwal (111.61 days). Cultivar Suvasini showed the most delayed effect (97.53 days) in respect of blooming of floret. The minimum days required for wilting of floret (105.65 days) was found with cultivar Calcutta Single but the time period required for flower bud development (93.67 days) was maximum in cultivar Phule Rajni and the same cultivar reached flower bud initiation stage (88.50 days) last of all. The cultivar Calcutta Double produced the maximum number of florets per spike (46.30), diameter of florets (0.67 cm), spike diameter (0.95 cm) with higher fresh weight (114.60 g) and dry weight (23.16 g) of 100 florets. The same cultivar showed maximum fresh (141.18 g) and dry weight (17.91 g) of cut spikes as well as field-life (17.04 days) and vase-life (8.29 days) of flower spikes as shown in Table 2(b). Whereas in case of length of

florets (5.81 cm) and spike (81.66 cm), maximum was observed under the cultivar Calcutta single. On the other hand, The least field (12.37 days) and post-harvest (6.37 days) life of Tuberose flowers were recorded with the cultivar Calcutta Single as well as the cultivar Prajwal recorded the minimum number of florets per spike (36.69), fresh (68.26 g) and dry (13.87 g) weight of 100 florets, spike diameter (0.77 cm) and fresh (67.73 g) and dry weight (9.45 g) of cut spikes. The highest fresh weight of plants (276.27 g), dry weight of plants (45.32 g) and flower spike yield/m²/year (45.66) was observed in the cultivar Calcutta Double which was at par with Calcutta Single i.e. fresh weight of plants (263.77 g), dry weight of plants (42.84 g) and flower spike yield/m²/year (43.39) whereas the lowest in the cultivar Prajwal, respectively (Table 2b). The qualitative traits related to flower spikes of Tuberose like number of florets, diameter of florets, fresh weight of florets and spike which are directly related to yield were found highest with the cultivar Calcutta Double might be due to better vegetative growth and leaf production during the different stages of crop growth leading to higher photosynthesis which ultimately expressed during flowering. The varietal difference in performance regarding floral characters was also observed by Krishnamoorthy (2014). Mahawer *et al.*, (2013) in Tuberose, Sankari *et al.*, (2012) in Gladiolus and Vikas *et al.*, (2011) in Dahlia also advocated such variation in floral characters due to genetic makeup.

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