Original Research Article

VARIETAL PERFORMANCE AND AROMATIC ASSESSMENT OF TUBEROSE (*Polianthes tuberosa* L.) UNDER PRAYAGRAJ AGRO CLIMATIC CONDITIONS

ABSTRACT

An experiment entitled**Varietal performance and aromatic assessment of tuberose (*Polianthes tuberosa* L.) under Prayagrajagro-climatic conditions**was conducted in Horticulture Research Field, Department of Horticulture, Naini Agricultural Institute, SHUATS, Prayagraj during April 2022-March 2023 with an aim to identify the most suitable variety under the agro-climatic conditions of Prayagraj. There were fifteenvarieties replicated thrice in spacing of 0.3 m x 0.3 m randomly. Significant difference in different varieties of tuberose were recorded for all the parameters observed. For loose flower production, variety Bidhan Snigdha was found superior in terms of days taken to first sprouting (6.3 days),plant height (74.4 cm), plant spread (70.7 cm^2), days to first bud initiation (37.6 days), days taken to 1^{st} flowering (59.3 days), days taken to 50% flowering(77.3 days), rachis length (49.7 cm), spike length (101.1 cm), number of florets (61.4), shelf life (4.0 days), number of bulb per clump (24), diameter of bulb (4.3 cm), average bulb weight (64.4 g), number of spike per clump (3.6), number of spike per hectare (399999.6), clump weight (1832.2 g), bulb yield per clump (1550.4), bulb yield per hectare (150.8 tons), gross returns (6,121,328 Rs/ ha), net returns (5,588,790 Rs/ ha) and B:C ratio (10) while for cut flower production, variety BR 19 was found best in early sprouting (6.3 days), plant height (74.4 cm), days to first bud initiation (37.6 days),spike length (101.1 cm),shelf life (13 days), number of bulblets (43.0) while Oil content (0.380%) was found to be more in varietyGKTC-4.

K**ey words:** *Tuberose, varietal performance, suitable.*

Introduction

Tuberose (*Polianthes tuberosa* L.) is one of the commercially significant loose and cut flowers in India. Two group of tuberose flowers viz., single and double cultivars are available for

cultivation. The waxy white flowering spikes of both single as well as double types of tuberose infuse the environment with sweet **(Sadhu and Bose, 1973, Benschop*et al.*, 1993).** Tuberose is cultivated on a large scale in Tamil Nadu, Karnataka, West Bengal and Maharashtra. Valuable natural aromatic oil is extracted from the flowers fetches high cost in perfume industry. It is widely grown as a specimen for display as cut flower too. Its essential oil is exported at an attractive price to France, Italy and other countries, as long as there is no synthetic flavor to replace its fragrance. There are only a few varieties and hybrids of tuberose under cultivation. As the commercial cultivation of tuberose is gaining importance, identification and assessment of high yielding varieties is necessary for particular region to obtain sustainable and economic profit by the farmers. Since the performances of crops may vary from region to region **(Kamble *et al.*2004)** it is important to study the variation and performance of varieties in a new location to enhance the production efficiency. Hence, the present field study was undertaken to find out the suitable tuberose varieties for Thiruvarur district of Tamil Nadu.

Materials and Methods

The investigationwas carried out at the Horticulture Research Field, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology AndSciences, Prayagraj (U.P.) during April 2022 -March 2023.The experiment was conducted in Randomized Block Design with 15Varieties in three replications *viz.* V_1: Mexican Single, V_2: Sikkim Selection, V_3:, V_4:, V_5:, V_6:, V_6:, V_7:, V_8:, V_9: V_{10}: $V_{11:}$ $V_{12:}$, $V_{13:}$, V_{14} and V_{15}: . Crop was planted with the spacing of 30×30 cm with the addition of NPK as basal dose. The data was recorded for the following parameters *viz* Earliness in sprouting, plant height(cm), plant spread (cm^2),appearance of first bud initiation, first flowering , appearance of 50% flowering, Spike length, number of florets per spike, diameter of floret, floret yield, bulb yield.

Results and Discussion

Vegetative parameters

Days taken to first sprouting -Among all the varieties, significantly early sprouting was recorded in the variety Bidhan Snigdha (6.3 days) and BR-18 (Double) (6.3 days), which was found to be at par with the variety BR-24 (Double) (7.0 days), whereas, the variety that took more number of days for first sprouting was Arka Vaibhav (21.0 days).The differences in days to first

sprouting in different cultivars of tuberose due to genetic nature of cultivar, vigor of the bulbs of tuberose and prevailing of environmental condition. Similar report was also investigated in different varieties of tuberose by **Singh *et al.* (2013), Kumar *et al.* (2014).**

Plant height - Among all the varieties, variety Bidhan Snigdha was significantly taller (76.6cm),which was found to be at par with the variety Arka Prajjwal (74.4 cm), GKTC-4 (74.2 cm), Arka Suvasini (68.3 cm) and Bidhan Ujjawal (67.2cm), whereas, shorter plants were reported in variety Mexican Single (59.8 cm). It is genetically controlled vegetative parameter which varies from variety to variety depending upon the genetic constitutions of a variety and is also affected by a given environmental condition, cultural practices and production technology. The functional components for photosynthesis are leaves, which have a significant impact on the growth of any crop. The variance in the number of leaves per plant among the cultivars is driven by variation in the rate of vegetative growth among the genotypes, which can be related to genetic makeup and may also have been influenced by agro climatic conditions. Similar results were reported by **(Dhane and Nimbalkar, 2002)and (Mounika and Saravanan, 2019)** in Dahlia.**Lalthawmliana*et al.* (2017)** reported maximum plant height in Arka Suasini(58.13) under the foot hill conditions of Nagaland. The increased plant height may be due to increased photosynthetic capacity of plant.

Plant spread - Among all the varieties, significantly more plant spread was recorded in variety Bidhan Snigdha (75.0 cm^2), which was found to be at par with the variety BR-19 (Double) (71.7 cm^2), whereas, the lesser plant spread was recorded in the variety Mexican Single (51.3 cm^2). Significant variation in plant spread observed among the different varieties may be attributed to hereditary traits and their manifestation in a given set of environmental conditions. The maximum plant spread observed among the plants to synthesize more carbohydrate due to more uptakes of moisture, nutrients and better utilization of sunlight which leads to more expansion of leaves. The results are in confirmation of findings of **Yaqoob *et al.* (2010)** in gladiolus.

Table 1. Vegetative parameters record

Varities	Days taken to first sprouting	Plant height (cm)	Plant spread (cm^2)
Mexican Single	15.3	59.8	51.3

Sikkim Selection	19.6	66.4	60.6
Bidhan Ujjwal	9	67.2	65.6
Bidhan Snigdha	6.3	76.6	75.0
Hyderabad Single	18.6	61.6	59.8
Single	15.6	66.6	66.7
GKTC-4	21	74.2	59.1
Arka Prajjwal	14.3	74.4	63.4
Arka Nirantara	15.6	62.0	57.7
Arka Suvasini	17.3	68.3	62.7
Arka Vaibhav	19.3	61.5	60.8
BR-24	7	66.2	65.1
BR-18	6.3	64.0	70.7
BR-17	8.3	63.6	60
BR-19	6.6	66.4	71.7
F-test	**S**	**S**	**S**
SE(d)±	1.04	4.691	4.34
$CD_{0.05}$	2.06	9.696	8.90
CV	9.49	8.624	8.40

Floral Parameters

Day taken to first spike initiation - Among all the varieties, significantly earliness for first spike or bud initiation was recorded in the variety Bidhan Snigdha (37.6 days), which was found to be at par with the variety BR-19 (41.3 days), whereas, the variety that took more number of days for first spike or bud initiation was Sikkim Selection (92.0 days).Early bud initiation may be attributed to higher photosynthetic assimilation due to vigorous plant growth, a factor governed by genetic composition of different varieties and impact of the growing environment. These variation in primarily due to the genetic inheritance and difference in the environmental conditions. The significantly difference in days to spike initiation was also reported by **Ramachandrudu and Thangam (2009).**

Days taken to 50 % flowering - Among all the varieties, significantly earliness for 50% flowering was recorded in the variety Bidhan Snigdha (77.3 days), which was found to be at par with the variety BR-19 (79.3 days), whereas, the variety that took more number of days for 50% flowering was Sikkim Selection (164.0 days).This variation in days to first flowering and 50 % flowering was primarily due to difference in genetic makeup of the cultivars under study and prevailing environmental conditions. The data for days to first flowering varied significantly in conformity with the finding of **Ramachndrudu and thangam (2009), Mahawer*et al.* (2013).**

Spike length - Among all the varieties, variety Bidhan Snigdhawas significantly longer spike (101.1 cm), which was found to be followed by with the variety BR-19 (Double) (93.8 cm),whereas, shorter spike were reported in variety Bidhan Ujjwal (71.4 cm). Spike length is genetically controlled traits and varies with genetic make-up of the varieties and the prevailing environmental conditions. This variation among cultivars might be due to genetic traits and prevailing climatic condition. These findings are accordance with **Singh and Singh (2013), Patil *et al.* (2009) and Rachana *et al.*, (2013).**

Number of florets per spike -Among all the varieties, variety Bidham Snigdha was significantly gave more number of florets per spike (55.0), which was found to be at par with the variety BR-19 (Double) (52.2), whereas, lesser number of florets per spike were observed in variety Sikkim Selection (31.0). Number of florets per spike is genetically herited characters. This variation in number of florets per spike may be due to genetic variability among the different cultivars of tuberose and prevailing environmental conditions. Variation in number of florets among the varieties was also reported **Ramachandrudu and thangam (2004) and Sing and Singh (2013).** The variation in the total number of florets per spike might be attributed to the difference in utilization of nutrients by plants. The genetic composition and environmental circumstances in the Prayagraj region may also be directly connected to the variance in the total number of flowers per plant. Similar results were also reported by **Kumar *et al.* (2021).**

Diameter of florets -Among all the varieties, variety BR-19 (Double) was significantly longer floret diameter (5.7 cm), which was found to be followed by the variety Bidham Snigdha (4.9 cm), whereas, lesser floret diameter were observed in variety Sikkim Selection (3.2 cm) and

BR-24 (Double) (3.2 cm). Variation in this parameter is may be due to difference in genetic constitution of genotypes Similar variation was reported previously in tuberose by **Rushd *et al.* (2010), Ranchana *et al.* (2013) and Patil *et al.* (2009).**

Table 2. Floral parameters record

Varieties	Days taken to first spike initiation	Days taken to 50% flowering	Spike length	Number of florets per spikes	Diameter of floret (cm)
Mexican Single	85.6	125.6	96.7	44.7	4.2
Sikkim Selection	92.0	164.6	128.0	31.0	3.2
Bidhan Ujjwal	48.6	85.3	71.4	48.0	3.7
Bidhan Snigdha	37.6	77.3	101.1	55.0	4.9
Hyderabad Single	78.6	132.3	75.3	35.6	4.2
GKTC-4	84.6	126.0	83.5	38.8	4.3
Arka Prajjwal	72.3	122.3	97.3	42.2	4.5
Arka Nirantara	89.0	134.0	93.7	39.3	4.4
Arka Suvasini	72.0	118.6	93.7	45.0	4.3
Arka Vaibhav	79.3	142.0	94.3	46.4	4.1
BR-24	53.0	99.3	76.0	48.4	3.2
BR-18	60.6	105.3	81.3	45.8	4.1
BR-17	66.6	102.0	76.7	50.4	4.8
BR-19	41.3	79.3	93.8	52.2	5.7
F-test	**S**	**S**	**S**	**S**	**S**
SE(d)±	2.932	2.118	1.879	0.44	0.102
$CD_{0.05}$	6.061	4.377	3.883	0.91	0.211
CV	5.228	2.249	2.550	1.22	2.890

Bulb Parameter

Number of bulb - Among all the varieties, variety Bidhan Snigdha was significantly gave more number of bulb per per clump (24), which was found to be at par with the variety Single (20), whereas, lesser number of bulb per clump were observed in variety Sikkim selection (12).The highly significant variation in number of bulbs per clump among various cultivars may be due to the hereditary traits, which is further modified by prevailing environmental condition. Similar finding was observed in tuberose with respect to bulb of plant by **Rushd *et al.* (2010) and Chaturvedi *et al.* (2014).**These differences might be due to the genetic character of different varieties taken for the study. The similar results were found in tuberose by **Chaturvedi *et al.* (2014), and Ramchandrudu and Thangam (2009).**

Diameter of bulb - Among all the varieties, variety Bidhan Snigdha was significantly higher bulb diameter (4.3 cm), which was found to be at par with the variety Bidhan Ujjwal (3.5 cm), whereas, lesser bulb diameter was observed in variety Sikkim Selection (2.9). This variation in bulb diameter among different cultivars at bulb harvesting stage might be due to distinguish varietal genetic make-up of the cultivar. Similar finding was observed in tuberose with respect to weight of individual bulb by Ramchadrudu and **Thangam (2009) and Singh *et al.* (2013).**

Number of bulblets - Among all the varieties, variety BR-19 (Double) was significantly gave more number of bulblets (43.2), which was found to be at par with the variety Single (42.8), whereas, lesser number of bulblets were observed in variety Bidhan Ujjwal (13.7).This variation is in number of bulblets per clump being due to genetic traits. Similar vanation in number of bulblets per clump with observed previously in tuberose by **Chaturvedi *et al.* (2014) and Rushd *et al* (2010).**

Table 3. Bulb parameters record

Varities	Number of bulb	Diameter of bulb (cm)	Number of bulblets
Mexican Single	16	3.1	18.0
Sikkim Selection	12	2.9	18.6
Bidhan Ujjwal	19	3.5	13.7
Bidhan Snigdha	24	4.3	28.4

Hyderabad Single	17	3.0	25.3
Single	20	3.4	42.8
GKTC-4	20	3.3	40.6
Arka Prajjwal	19	3.0	18.8
Arka Nirantara	19	3.2	22.6
Arka Suvasini	17	3.4	27.2
Arka Vaibhav	13	3.1	32.6
BR-24	9	3.3	15.6
BR-18	21	3.0	36.1
BR-17	14	3.1	23.6
BR-19	16	3.3	43.2
F-test	**S**	**S**	**S**
SE(d)±	0.670	0.218	4.707
$CD_{0.05}$	1.370	0.449	9.692
CV	4.840	8.069	21.200

Yield Parameter

Flower yield per hectare - Among all the varieties, variety BR-19 (Double) was significantly gave more flower yield per hectare (29.5ton), which was found to be followed by the variety BR-18 (Double) (24.4ton), whereas, lesser flower yield per hectare were observed in variety Sikkim Selection (6.5 ton). While similar trend was obtained by **Naik *et al.* (2018)**, who observed that among eight tuberose genotypes showed significant difference with respect to loose flower per plant. The genotype Prajwal recorded maximum loose flower yield per plant (169.95 g).

Bulb yield per hectare -Among all the varieties, variety Bidhan Snigdha was significantly gave higher bulb yield per hectare (150.8 ton), which was found to be followed by the variety GKTC-4 (111.2 ton), whereas, lesser bulb yield per hectare were observed in variety Sikkim Selection (40.2 ton).This might be due to the wide adoptable capacity of the particular variety to diverse climatic conditions are in confirmation with the findings of **Bindiya *et al.* (2018)** in tuberose.

Bulblet yield per hectare - Among all the varieties, variety Single was significantly gave higher bulblet yield per hectare (67.5 ton), which was found to be followed by the variety Bidhan Snigdha (46.5 ton), whereas, lesser bulblet yield per hectare were observed in variety Bidhan Ujjwal (8.9 ton).This might be due to the wide adoptable capacity of the particular variety to diverse climatic conditions are in confirmation with the findings of **Bindiya *et al.* (2018)** in tuberose. The observed variation among cultivars for number of bulblets per plant could be attributed to inherent genetic and environmental factors under study. The differences due to genetic characters and environmental conditions are in confirmation with thefindings of **Arya *et al.* (2006), Malam *et al.* (2008)** and **Chaturvedi *et al.* (2014)** in tuberose

Table 4. Yield parameters record

Varities	Flower yield per hectare (tonns)	Bulb yield per hectare (ton)	Bulblet yield per hectare (ton)
Mexican Single	8.4	74.4	32.7
Sikkim Selection	4.8	40.2	19.0
Bidhan Ujjwal	7.9	78.6	8.9
Bidhan Snigdha	18.9	150.8	31.4
Hyderabad Single	5.9	67.7	22.3
Single	-	109.4	67.5
GKTC-4	6.8	111.2	26.8
Arka Prajjwal	8.4	75.0	14.8
Arka Nirantara	8.7	77.	19.3
Arka Suvasini	21.4	88.8	10.6
Arka Vaibhav	18	57.2	33.5
BR-24	22.5	43.6	35.5
BR-18	24.4	84.6	23.0
BR-17	21.2	61.6	11.6
BR-19	29.5	92.7	46.5
F-test	**S**	**S**	**S**
SE(d)±	0.680	0.600	0.320

$CD_{0.05}$	1.400	0.840	0.650
CV	5.63	0.460	1.440

Conclusion

From the present investigation it is concluded that different varieties of tuberose showed significant variation for all the parameters observed. For loose flower production, variety Bidhan Snigdha was found superior in terms of days taken to first sprouting,plant height, plant spread, days to first bud initiation, days taken to first flowering, days taken to 50% flowering, rachis length, spike length, number of florets, shelf life, number of bulb per clump, diameter of bulb, average bulb weight, number of spike per clump, number of spike per hectare, clump weight, bulb yield per clump, bulb yield per hectare, gross returns, net returns and B:C ratio, while for cut flower production variety BR 19was found best in early sprouting, plant height, days to first bud initiation,spike length, vase life, number of bulblets bulb, yield and oil content was found to be more in variety (GKTC-4).

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