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# Varietal Performance of Tuberose (*Polianthes tuberosa* L.) under Prayagraj Agro Climatic Conditions

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***Authors' contributions***

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

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## ABSTRACT

An experiment 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 for loose flower production under the agro-climatic conditions of Prayagraj. There were fifteen varieties replicated thrice with a spacing of 30 cm x 30 cm in randomized block design. Significant difference among different varieties of tuberose were observed for all the parameters observed. For loose flower production, variety Bidhan Snigdha was found significantly 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) and number of spike per clump (3.6) and flower yield(18.9).

*Keywords: Tuberose, varietal performance.*

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## 1. INTRODUCTION

Tuberose is commonly known as Rajnigandha (Hindi, Bengali), Gul-e-chari, Gul-e-Shabab (Urdu), Nishigandha (Marathi), Nishigandhi (Malayalam) and Sem pangi (Tamil) and scientifically-*Pollianthes tuberosa* and belongs to the family Asparagaceae. It is native of Mexico from where it reached to different parts of world during 16th century when Spanish conquered it. At first, it reached Europe than to Africa and Asia. Its arrival to India is not well documented but British might have introduced it. Tuberose has long, narrow, light green leaves. Plant grows about 25-30 cm tall. The flowering stalk is 75-100 cm long having 25-50 florets per spike. It produces, waxy, white, highly fragrant single, semi double or double flowers on a long spike which open from base to the top. Single variety has been named after the place of growing as Mexican Single, Calcutta Single, Hyderabad Single, Coimbatore Single, Bangalore Single, etc. Tuberose blooms during summer, rainy season and autumn. Tuberose is a half hardy bulbous crop and happily grows in mild climate. It can tolerate wide range of climatic conditions and areas having a range of 20-35°C temperature are considered good for its successful growing. For its luxuriant growth and high productivity the mild temperature of about 30°C with high humidity is most ideal. The temperature above than 40°C reduces the productively and quality of spikes. There are four type of varieties viz. Single flowerd varieties - it contains one row of petal; semidouble flowerd varieties - it contains two to three rows of petals; double having more than three row of petals; and variegated-in these leaf margins are variegated which there highly suitable for landscape planting.

Single white flowers are highly fragrant and hence, are used to extract its valuable essential oil which is sold on premium. Its essential oil is rich in geraniol, nerol, benzyl achohol, eugenol, benzyl benzoate and methyl anthranilate. Due to these compound, flowers emit a delightful fragrance and are source of tuberose essential oil.

Now, it is a commercial crop of France, Spain, Morocco, South Africa, Israel, New Zealand, U.S.A., tropical and sub-tropical areas of India and Cylone. Tuberose is well adopted and grown commercially in various parts of India. It is prominently grown in West Bengal-Bargan, Golaghat, Midnapur, Panskura, Ranaghat, Thakur Nagar; Karnataka- Mysore, Bangalore; Andhra Pradesh- East Godavari, Guntur, Chitoor, Nellore, Visakhapatnam, Krishna districts; Tamil Nadu- Coimbatore, Madurai; Uttar Pradesh- Meerut, Saharanpur, Muzaffarnagar, and in limited areas of Haryana and Punjab. In all total area under tuberose in India is estimated to be about 12,000 ha. Flower production depend upon climatic conditions soil type, its fertility level and agronomic practices followed, etc. and hence, different level of production has been reported from various parts of India. Under optimum conditions single tuberose yields about 5,00,000 flower spikes/ha or 10.5 tones/ha of loose flower. In a cycle of three years, first two years flower yield is high and in third year it is comparatively lower. In one year about 9.2 to 10 kg concrete/ha can be obtained and in turn 1.75 kg of tuberose absolute can be obtained.

## 2. MATERIALS AND METHODS

The investigation was carried out at the Horticulture Research Field, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.) during April, 2022 –March, 2023. The experiment was conducted in Randomized Block Design with 15 varieties in three replications *viz.* V1: Mexican Single, V2: Sikkim Selection, V3: Bidhan Ujjwal, V4: Bidhan Snigdha, V5: Hyderabad Single, V6: Single, V7: GKTC-4, V8: Arka Prajjwal, V9: Arka Nirantara V10: Arka Suvasini, V11: Arka Vaibhav, V12: BR-24, V13: BR-18, V14: BR-17, V15: BR-19. Crop was planted with the spacing of 30 cm × 30 cm.

## 3. RESULTS AND DISCUSSION

### 3.1 Vegetative Parameters of Different Tuberose Varieties

The variation on vegetative parameters of tuberose are presented in Table 1. Significant differences amongst varieties in respect of all parameters, *viz*. days taken to first sprouting, plant height (cm) and plant spread ($cm^2$) were observed.

The review of data presented in Table 1 indicated that among all the varieties, significantly early sprouting was recorded in the variety Bidhan Snigdha (6.3 days) and BR-18 (6.3 days), which was found to be at par with the variety BR-24 (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 might be due to genetic nature of cultivars, vigour of the bulbs and prevailing environmental conditions. Similar report was also investigated in different varieties of tuberose by Singh et al. [1] and Naik et al. [2] in tuberose.

Among the varieties, variety Bidhan Snigdha recorded significantly taller (76.6cm), which was found to be at par with variety Arka Prajjwal (74.4 cm), GKTC-4 (74.2 cm), Arka Suvasini (68.3 cm) and Bidhan Ujjawal (67.2cm) whereas, shorter plants (59.8 cm) recorded in variety Mexican Single. Plant height is genetically controlled vegetative parameter which varies from variety to variety depending upon the genetic contitutions of a variety and is also affected by a given environmental condition, cultural practices and production technology. These result are in agreement to those reported by the Mahawar et al. [3] and Bhaskar and Reddy [4] in tuberose.

Among the varieties, significantly more plant spread (75.0 $cm^2$) was recorded in variety Bidhan Snigdha, which was found to be at par with variety BR-19 (71.7 $cm^2$) whereas, the lesser plant spread (51.3 $cm^2$) was recorded in the variety Mexican Single. Significant variation in plant spread observed the among different varieties may be attributed to variation in growth of different varieties due to their hereditary traits and their manifestation in a given set of environmental conditions. These result are in agreement to those reported by the Mahawar et al. [5] and Sateesha et al. [6] in tuberose.

### 3.2 Floral Parameters of Different Varieties of Tuberose

The variation on floral parameters of tuberose are shown in Table 2. From Table 2 exhibited very significant differences amongst varieties in respect of all parameters, *viz.* days taken to first spike initiation, days taken to first flowering, days taken to 50% flowering, Avg. floret weight, number of florets per spikes and number of spike per clump.

The review of data presented in Table 2 indicated that among the varieties, significant earliness for first spike initiation (37.6 days) was recorded in variety Bidhan Snigdha which was found to be at par with variety BR-19 (41.3 days) whereas, more number of days (92.0 days) was recorded in Sikkim Selection.

Among the varieties, significant earliness for first flowering (59.3 days) was recorded in variety Bidhan Snigdha, which was found to be at par with variety BR-19 (60.3 days) whereas, more number of days for first flowering (143.0 days) was recorded in Sikkim Selection.

Among the varieties, significant earliness for 50% flowering (77.3 days) was recorded in variety Bidhan Snigdha, which was found to be at par with variety BR-19 (79.3 days) whereas, more number of days for 50% flowering (164.0 days) was recorded in Sikkim Selection.

**Table 1. Vegetative parameters of different tuberose varieties**

| 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 |
| **CD0.05** | 2.06 | 9.696 | 8.90 |
| **CV** | 9.49 | 8.624 | 8.40 |

**Table 2. Floral parameters of different tuberose varieties**

| Varieties | Days taken to first spike initiation | Days taken to first flowering | Days taken to 50% flowering | Number of florets per spikes | Weight of florets (g) | Number of spike per plant | Flower yield per hectare (tons) |
|---|---|---|---|---|---|---|---|
| **Mexican Single** | 85.6 | 112.6 | 125.6 | 44.7 | 1.7 | 2.8 | 8.4 |
| **Sikkim Selection** | 92.0 | 143.0 | 164.6 | 31.0 | 1.4 | 1.0 | 4.8 |
| **Bidhan Ujjwal** | 48.6 | 67.6 | 85.3 | 48.0 | 1.5 | 3.2 | 7.9 |
| **Bidhan Snigdha** | 37.6 | 59.3 | 77.3 | 55.0 | 3.1 | 3.6 | 18.9 |
| **Hyderabad** | 78.6 | 112.0 | 132.3 | 35.6 | 1.5 | 2.4 | 5.9 |
| **GKTC-4** | 84.6 | 109.6 | 126.0 | 38.8 | 1.6 | 2.4 | 6.8 |
| **Arka Prajjwal** | 72.3 | 105.3 | 122.3 | 42.2 | 1.8 | 2.6 | 8.4 |
| **Arka Nirantara** | 89.0 | 121.3 | 134.0 | 39.3 | 2.0 | 2.5 | 8.7 |
| **Arka Suvasini** | 72.0 | 101.6 | 118.6 | 45.0 | 4.3 | 1.7 | 21.4 |
| **Arka Vaibhav** | 79.3 | 123.3 | 142.0 | 46.4 | 3.5 | 1.7 | 18 |
| **BR-24** | 53.0 | 79.0 | 99.3 | 48.4 | 4.2 | 0.6 | 22.5 |
| **BR-18** | 60.6 | 85.3 | 105.3 | 45.8 | 4.8 | 1.8 | 24.4 |
| **BR-17** | 66.6 | 82.0 | 102.0 | 50.4 | 3.8 | 2.4 | 21.2 |
| **BR-19** | 41.3 | 60.3 | 79.3 | 52.2 | 5.1 | 2.9 | 29.5 |
| **F-test** | **S** | **S** | **S** | **S** | **S** | **S** | **S** |
| **SE(d)±** | 2.932 | 3.497 | 2.118 | 0.44 | 0.098 | 0.267 | 0.680 |
| **$CD_{0.05}$** | 6.061 | 7.228 | 4.377 | 0.91 | 0.203 | 0.552 | 1.400 |
| **CV** | 5.228 | 4.400 | 2.249 | 1.22 | 4.127 | 14.333 | 5.63 |

Variation in days to first spike initiation, first flowering and 50 % flowering 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. The data for days to early spike initiation, first flowering and 50 % flowering varied significantly in conformity with the finding of Ramachandrudu and Thangam [7], Mahawer et al. [3] and Patil et al. [8] in tuberose.

Among the varieties, variety Bidhan Snigdha recorded significantly more number of florets per spike (55.0), which was found to be at par with variety BR-19 (52.2) whereas, lesser number of florets per spike (31.0) was observed in variety Sikkim Selection.

Among the varieties, variety BR-19 recorded significantly higher floret weight (5.1 g), which was found to be at par with variety BR-18 (4.8 g) whereas, lesser floret weight (1.4 g) was observed in variety Sikkim Selection.

Among the varieties, variety Bidhan Snigdha recorded significantly more number of spikes per clump (3.6), which was found to be at par with variety BR-19 (2.9) whereas, lesser number of spikes (1.0) was observed in variety Sikkim Selection.

Variation spotted in number of florets per spike, Avg. weight of florets and number of spikes per clump might be attributed to the difference in utilization of nutrients differential photosynthetic assimilation and better source to sink mobilization (spike) of different genetic constitution thereby, increasing the spike yield under the prevailing environmental conditions. Similar results were also reported by Susila [9], Ramachandrudu and thangam [10] and Singh and Singh [11] and Rachana et al. [12] in tuberose.

Among the varieties, variety BR-19 recorded significantly more flower yield per hectare (29.5 tons), which was found to be followed by variety BR-18 (24.4 tons) whereas, lesser flower yield per hectare (6.5 tons) observed in variety Sikkim Selection. Variation observed in floret yield per spike and per hectare in different varieties of tuberose can be attributed to different genetic constitution of the variation which is responsible for varieties specific floral characters and performance of these varieties in the prevailing agro- climatic condition. Variation in number of florets among the varieties was also reported Ramachandrudu and Thangam [10] and Singh and Singh [8] Singh et al. [13] in tuberose.

## 4. CONCLUSION

From the present investigation it is concluded that different varieties of tuberose showed significant variation for all the parameters observed. Variety Bidhan Snigdha was found significantly 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, Avg. floret weight, number of florets and flower yield per hectare.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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