

*Original Research Article*

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

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**ABSTRACT**

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An experiment entitled **Varietal performance and aromatic assessment of tuberose (*Polianthes tuberosa* L.) under Prayagraj agro-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 fifteen varieties 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<sup>2</sup>), days to first bud initiation (37.6 days), days taken to 1<sup>st</sup> 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), number of spike per clump (3.6).

**Key words:** *Tuberose, varietal performance, suitable.*

## INTRODUCTION

Tuberose is commonly known as **Rajni Gandha** (Hindi, Bengali), **Gul-e-chari**, **Gul-e-Shabab** (Urdu), **Nishigandha** (Marathi), **Nishi gandhi** (Malayalam) and **Sem pangi** (Tamil) and scientifically-*Pollanthes tuberosa* and belongs to family Amrylladaceae. 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 Britishers 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. Thus, it becomes very important cut flower of summer and rainy season of India. Its flowers are also used as cut, loose flower for making garlands, bracelets or for hair do.

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-it contains one row of petal; semi double-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 Flowered**- The cultivars have single row of petals. Floral buds are greenish white whereas flowers are waxy white. Loose flowers are used for decorations and floral arrangements. Flowers are highly fragrant and, hence, are used for extraction of essential oil which is present at about 0.08-0.11%. Seed setting is observed. Single types are identified with the name of locality like Mexican, Calcutta, Pune, Hyderabad, Coimbatore and Bengaluru. **Semidouble flowered tuberose**- In these type flower petals are in 2-3 rows. Flowers are white. **Double flowered tuberose**- As the name indicates, flowers have more than three rows of petals on long and sturdy spikes. Flowers open slowly. Therefore, it is highly suitable as cut flower. It has

pinkish tinge at the top of flower buds, flower colour in white. The 'Pearl' variety does not open well.

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 alcohol, eugenol, benzyl benzoate and methyl anthranilate. Due to these compounds, 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 Ceylon. 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, Chittoor, 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 depends upon climatic conditions soil type, its fertility level and agronomic practices followed, etc. and hence, different levels of production have 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.

## **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 & 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 30×30 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<sup>2</sup>), appearance of first

bud initiation, first flowering , appearance of 50% flowering, rachic length, Spike length, number of florets per spike, diameter of floret, floret yield, bulb yield.

## **RESULTS AND DISCUSSION**

### **EARLIER PARAMETERS OF DIFFERENT TUBEROSE VARIETIES**

The variation on earlier parameters of tuberose are shown in Table 1. From table 1 exhibited very significant differences amongst varieties in respect of all parameters, viz. Days taken to first sprouting, Days taken to first spike initiation and Days taken to 50% flowering. The review of data presented in Table 1 indicated that among the improved varieties, significantly early sprouting was recorded in the variety Bidhan Snigdha (6.3 days) and BR-18 (Double) (6.3 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.*, (2013) and Kumar *et al.* (2014)** in tuberose. 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, 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, 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. 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 **Ramachndrudu and Thangam (2009), Mahawer *et al.* (2013)** in tuberose.

**Table No.1 Earlier parameters**

| <b>Varities</b>           | <b>Days taken to first sprouting</b> | <b>Days taken to first spike initiation</b> | <b>Days taken to first flowering</b> | <b>Days taken to 50% flowering</b> |
|---------------------------|--------------------------------------|---|--------------------------------------|------------------------------------|
| Mexican Single            | 15.3                                 | 85.6  | 112.6                                | 125.6                              |
| Sikkim Selection          | 19.6                                 | 92.0  | 143.0                                | 164.6                              |
| Bidhan Ujjwal             | 9                                    | 48.6  | 67.6                                 | 85.3                               |
| Bidhan Snigdha            | 6.3                                  | 37.6  | 59.3                                 | 77.3                               |
| Hyderabad Single          | 18.6                                 | 78.6  | 112.0                                | 132.3                              |
| Single                    | 15.6                                 | -   | -                                    | -                                  |
| GKTC-4                    | 21                                   | 84.6  | 109.6                                | 126.0                              |
| Arka Prajjwal             | 14.3                                 | 72.3  | 105.3                                | 122.3                              |
| Arka Nirantara            | 15.6                                 | 89.0  | 121.3                                | 134.0                              |
| Arka Suvasini<br>(Double) | 17.3                                 | 72.0  | 101.6                                | 118.6                              |
| Arka Vaibhav<br>(Double)  | 19.3                                 | 79.3  | 123.3                                | 142.0                              |
| BR-24 (Double)            | 7                                    | 53.0  | 79.0                                 | 99.3                               |
| BR-18 (Double)            | 6.3                                  | 60.6  | 85.3                                 | 105.3                              |
| BR-17 (Double)            | 8.3                                  | 66.6  | 82.0                                 | 102.0                              |
| BR-19 (Double)            | 6.6                                  | 41.3  | 60.3                                 | 79.3                               |
| F-test                    | <b>S</b>                             | <b>S</b>                                    | <b>S</b>                             | <b>S</b>                           |
| SE(d)±                    | 1.04                                 | 2.932                                       | 3.497                                | 2.118                              |
| CD <sub>0.05</sub>        | 2.06                                 | 6.061                                       | 7.228                                | 4.377                              |
| CV                        | 9.49                                 | 5.228                                       | 4.400                                | 2.249                              |

## VEGETATIVE PARAMETERS OF DIFFERENT TUBEROSE VARIETIES

The variation on vegetative parameters of tuberose are shown in Table 2. From table 2 exhibited very significant differences amongst varieties in respect of all parameters, viz. plant height (cm) and plant spread (cm<sup>2</sup>). The review of data presented in Table 2 indicated that among the improved varieties, Significantly taller plants (76.6 cm) were observed in Bidhan Snigdha at par with variety Arka Prajwal (74.4 cm), GKTC-4 (74.2 cm) 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 constitutions 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.* (2013)** in tuberose. Significantly wide plant spread (75.0 cm<sup>2</sup>) was recorded in variety Bidhan Snigdha, which was found to be at par with variety BR-19 (71.7 cm<sup>2</sup>) whereas, the lesser plant spread (51.3 cm<sup>2</sup>) was recorded in the variety Mexican Single. Significant variation in plant spread observed 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.* (2013)** in tuberose.

**Table No. 2 Vegetative parameters**

| <b>Varities</b>    | <b>Plant height (cm)</b> | <b>Plant spread (cm<sup>2</sup>)</b> |
|--------------------|--------------------------|--------------------------------------|
| Mexican Single     | 59.8                     | 51.3                                 |
| Sikkim Selection   | 66.4                     | 60.6                                 |
| Bidhan Ujjwal      | 67.2                     | 65.6                                 |
| Bidhan Snigdha     | 76.6                     | 75.0                                 |
| Hyderabad Single   | 61.6                     | 59.8                                 |
| Single             | 66.6                     | 66.7                                 |
| GKTC-4             | 74.2                     | 59.1                                 |
| Arka Prajjwal      | 74.4                     | 63.4                                 |
| Arka Nirantara     | 62.0                     | 57.7                                 |
| Arka Suvasini      | 68.3                     | 62.7                                 |
| Arka Vaibhav       | 61.5                     | 60.8                                 |
| BR-24              | 66.2                     | 65.1                                 |
| BR-18              | 64.0                     | 70.7                                 |
| BR-17              | 63.6                     | 60                                   |
| BR-19              | 66.4                     | 71.7                                 |
| F-test             | <b>S</b>                 | <b>S</b>                             |
| SE(d)±             | 4.691                    | 4.34                                 |
| CD <sub>0.05</sub> | 9.696                    | 8.90                                 |
| CV                 | 8.624                    | 8.40                                 |

**FLORAL PARAMETERS**

The variation on floral parameters of tuberose are shown in Table 3. From table3 exhibited very significant differences amongst varieties in respect of all parameters, viz. rachis length, spike length, number of florets per spikes and diameter of floret (cm). The review of data presented in Table 2 indicated that among the improved varieties, Bidhan Snigdha recorded significantly longer rachis (49.7 cm), which was found to be at par with the variety BR-19 (46.8 cm) whereas, shorter rachis (32.4 cm) were reported in variety Hyderabad Single and variety Bidhan Snigdha was significant longer spike (101.1 cm), which was found to be followed by with the variety BR-19 (93.8 cm) whereas, shorter spike (71.4 cm) was reported in variety Bidhan Ujjwal (71.4 cm). Significant variation observed in rachis and spike length of different varieties of tuberose may be attributed to the fact that these parameters are genetically controlled traits and varies with genetic makeup of different varieties in a given set of environmental conditions. These findings are accordance with **Singh and Singh (2013), Patil *et al* (2009) and Rachana *et al.*, (2013)** in tuberose. Among the varieties, variety Bidham 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 and 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 spikes per clump might be attributed to the difference in utilization of nutrients differential photosynthetic assimilation and better source to sink varieties (spike) of different genetic constitution thereby, increasing the spike yield under the prevailing environmental conditions. Similar results were also reported by **Kumar *et al.*, (2021) and Susila (2013)** in tuberose.

### **Table No. 3 Floral parameters**

| <b>Varities</b>    | <b>Rachis length</b> | <b>Spike length</b> | <b>Number of florets per spikes</b> | <b>Number of spike per plant</b> |
|--------------------|----------------------|---------------------|-------------------------------------|----------------------------------|
| Mexican Single     | 35.4                 | 96.7                | 44.7                                | 2.8                              |
| Sikkim Selection   | 38.1                 | 128.0               | 31.0                                | 1.0                              |
| Bidhan Ujjwal      | 38.4                 | 71.4                | 48.0                                | 3.2                              |
| Bidhan Snigdha     | 49.7                 | 101.1               | 55.0                                | 3.6                              |
| Hyderabad Single   | 32.5                 | 75.3                | 35.6                                | 2.4                              |
| GKTC-4             | 34.6                 | 83.5                | 38.8                                | 2.4                              |
| Arka Prajjwal      | 36.8                 | 97.3                | 42.2                                | 2.6                              |
| Arka Nirantara     | 38.4                 | 93.7                | 39.3                                | 2.5                              |
| Arka Suvasini      | 39.2                 | 93.7                | 45.0                                | 1.7                              |
| Arka Vaibhav       | 44.8                 | 94.3                | 46.4                                | 1.7                              |
| BR-24              | 36.8                 | 76.0                | 48.4                                | 0.6                              |
| BR-18              | 37.3                 | 81.3                | 45.8                                | 1.8                              |
| BR-17              | 47.3                 | 76.7                | 50.4                                | 2.4                              |
| BR-19              | 46.8                 | 93.8                | 52.2                                | 2.9                              |
| F-test             | <b>S</b>             | <b>S</b>            | <b>S</b>                            | 0.552                            |
| SE(d)±             | 1.417                | 1.879               | 0.44                                | 0.267                            |
| CD <sub>0.05</sub> | 2.929                | 3.883               | 0.91                                | 0.552                            |
| CV                 | 4.365                | 2.550               | 1.22                                | 14.333                           |

## **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 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 and diameter of bulb.

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## **COMPETING INTERESTS**

Authors have declared that no competing interests exist

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