# Performance of tuberose (*Polianthes tuberosa* L.) genotypes for growth, flower yield and bulb production under Konkan conditions

**ABSTRACT:**

A field experiment was carried out during 2024–2025 at the Hi-tech Nursery block of Floriculture, College of Horticulture, Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri (Maharashtra), to evaluate the Performance of tuberose (*Polianthes tuberosa* L.) genotypes for growth, flower yield and bulb production under Konkan conditions**.** The experiment was laid out in a Randomized Block Design (RBD) with four replications, comprising nine genotypes: Local Single, Arka Shringar, Phule Rajani, Local Varigated, GK- T-S-1, Prajwal, Phule Rajat, Arka Vaibhav, and Arka Suvasini. The results indicated significant variation among the genotypes with respect to various growth, flowering, and bulb production parameters. Among the evaluated genotypes, GK-T-S-1 exhibited superior performance and recorded the highest values for plant height (86.03 cm), number of leaves (42.00), leaf area (75.54 cm2), leaf area index (1.98), dry matter of leaves (16.67 g), maximum spike length (119.97 cm), number of florets per spike (42.45), rachis length (49.12 cm), number of spikes per plant (3.05), spikes per plot (37.00), yield of flowers per plot ( 2.24 kg) and per hectare (116.88 q/ha), bulb yield per plant (3.10), bulb yield per plot (3.31 kg), bulb yield per hectare (172.44 q/ha) and diameter of bulb (67.90 mm) On the other hand, the genotype Prajwal recorded maximum dry matter of spike (13.51 g), diameter of flower stalk (5.55 mm) and flower length (6.83).

Keywords: Tuberose, Genotypes, Konkan, Spikes, Loose flowers, Bulbs

# INTRODUCTION:

Tuberose (*Polianthes tuberosa* L.), commonly known as Nishigandha, Rajanigandha, Gulchhadi and Sugandharaj. Tuberose is a popular ornamental bulbous plant belonging to the family Amaryllidaceae (Anon., 1982). It is native to Mexico and is believed to have spread to various parts of the world during the 16th century (Trueblood, 1973). The generic name *Polianthes* is derived from the Greek words *‘Polis’* meaning white and *‘Anthos’* meaning flower. Tuberose holds a distinctive position among ornamental plants due to its aesthetic appeal, fragrance and economic potential in both the loose flower trade and the essential oil industry. Its florets are commonly used for venis, gajaras, garlands, floral ornaments, and buttonholes. Furthermore, tuberose is a rich source of essential oil used in the perfumery and cosmetic industries.

In India, commercial cultivation of tuberose is mainly practiced in West Bengal, Karnataka, Tamil Nadu, Maharashtra and Andhra Pradesh. Its cultivation is gaining popularity due to ease of cultivation, low input requirement, wider adaptability, multipurpose utility and higher economic returns. Tuberose, being a traditional flower crop, blooms throughout the year. Botanically, tuberose is a half-hardy, perennial bulbous plant. The bulbs are composed of scales and leaf bases, while the stem remains enclosed within the scales. The plant produces shallow, adventitious roots and its leaves are linear, long, grass-like and bright green. The spikes bear paired florets, which open acropetally (i.e., from base to top of the spike). Tuberose is a cross- pollinated crop and its flowers are fragrant, waxy white and approximately 25 mm long, with a funnel-shaped perianth. Each flower consists of six stamens, a three-locular ovary, numerous ovules and produces capsular fruits (Anon., 2006).

In the Konkan region of Maharashtra, the agro-climatic conditions are favorable for tuberose cultivation. However, the performance of different genotypes under these specific conditions has not been extensively evaluated. Genotypic variation plays a critical role in the productivity and quality of tuberose flowers and bulbs. Therefore, systematic evaluation of available genotypes is essential to identify suitable cultivars that can thrive in the Konkan climate and meet the market demand.

# MATERIALS AND METHODS:

The field experiment was conducted at the Hi-tech Nursery, block of Floriculture, College of Horticulture Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist Ratnagiri (M.S.) during 2024-2025. The experiment was laid out in a Randomized Block Design (RBD) with four replications, comprising nine genotypes: Local Single, Arka Shringar, Phule Rajani, Local Varigated, GK-T-S-1, Prajwal, Phule Rajat, Arka Vaibhav, and Arka Suvasini. The land was thoroughly prepared to a fine tilth through deep ploughing in both directions, followed by clod crushing and harrowing. A 27 m × 5 m experimental area was demarcated and subdivided into 36 plots, each measuring 2.4 m × 0.8 m. Raised beds were prepared in each plot and covered with plastic mulch. In each treatment plot, 12 holes were created for planting tuberose bulbs, maintaining a uniform spacing of 40 cm × 40 cm. The planting was done on 17th August, 2024 with one bulb placed per hill at a depth of approximately 5 cm. Nutrient management was carried out by applying 200:150:200 kg NPK per hectare in the form of Trichoderma, single super phosphate (SSP), and vermicompost as a basal dose at the time of bed preparation. Additionally, drenching of 19:19:19 fertilizer was done to ensure proper vegetative and bulb growth. The entire dose of phosphorus and potassium, along with one-third of the nitrogen, was applied at the time of planting. The remaining two-thirds of the nitrogen was administered as a top dressing in three equal splits at 30, 60, and 90 days after planting. The recommended cultural practices such as manuring, irrigation, weeding, earthing-up, staking, and plant protection measures were uniformly followed for all the experimental plots. Observations on vegetative, flowering, and yield attributes were recorded from five randomly selected plants in each treatment. The data obtained were subjected to statistical analysis using the standard method of analysis of variance (ANOVA) as described by Panse and Sukhatme (1985).

# RESULTS AND DISCUSSION:

Vegetative parameters

The data pertaining to vegetative parameters of different tuberose genotypes are presented in Table 1. The vigour of the plant, as reflected by plant height, significantly influences the overall yield. Among the genotypes, the maximum plant height (86.03 cm) was recorded in T₅ (GK-T- S-1) followed by T₄ (83.18 cm), T₁ (81.44 cm), T₆ (76.49 cm), T₉ (74.41 cm), T₇ (67.43 cm), T₈ (64.47 cm) and T₃ (57.54 cm). The minimum plant height **(**56.08 cm) was observed in T₂ (Arka Shringar). Leaves serve as the primary sites of photosynthesis and play a vital role in influencing the overall productivity and yield of the plant. The maximum number of leaves (42.00) was recorded in T₅ (GK-T-S-1) which was followed by T₄ (38.70), T₃ (34.60), T₆

(33.50), T₂ (33.20), T₉ (32.40), T₁ (31.55) and T₇ (31.50). The minimum number of leaves (29.80) was observed in T₈ (Arka Vaibhav). Leaf area is an important growth parameter as it has a direct relationship with light interception and photosynthetic efficiency, ultimately influencing the overall growth and development of the plant. The significantly maximum leaf area (75.54 cm²) was recorded in T₅ (GK-T-S-1), followed by T₄ (69.20 cm²), T₆ (65.59 cm²), T₇ (58.69 cm²), T₁ (57.33 cm²), T₈ (56.38 cm²), T₉ (51.90 cm²) and T₂ (44.51 cm²), while the minimum leaf area (41.33 cm²) was observed in T₃ (Phule Rajani). Significantly maximum leaf area index (1.98) was recorded in T₅ (GK-T-S-1), which was followed by T₄ (1.67), T₆ (1.37), T₇ (1.16), T₁ (1.14), T₈ and T₉ (1.05) and T₂ (0.92), while the minimum leaf area index (0.89) was observed in T₃ (Phule Rajani). The highest dry matter accumulation in leaves (16.67 g) was recorded in treatment T₅ (GK-T-S-1) which was followed by T₄ (15.36 g), T₃ (13.74 g), T₆ (13.30 g), T₂ (13.18 g), T₉ (12.86 g), T₁ (12.52 g) and T₇ (12.50 g). The lowest leaf dry matter (11.83 g) was observed in T₈ (Arka Vaibhav). Significantly maximum dry matter of spikes (13.51 g) was recorded in T₆ (Prajwal) which was at par with T₅ (13.26 g) and T₄ (13.16 g) and was followed by T₉ (12.64 g), T₁ (11.42 g), T₈ (10.49 g), T₇ (9.18 g) and T₂ (9.00 g). The minimum dry matter of spike (8.50 g) was recorded in T₃ (Phule Rajani). The present findings are in agreement with those reported by Gorivale et al. (2020).

Flowering parameters

The data on flowering parameters of different tuberose genotypes as presented in Table 2 revealed significant variations among the treatments. The earliest initiation of flowering (112.75 days) was recorded in T₅ (GK-T-S-1) which was at par with T₄ (113.95 days) and followed by T₆ (114.90 days), T₁ (115.45 days), T₇ (117.65 days), T₂ (119.75 days), T₃ (122.40 days) and T₉ (127.55 days). The genotype T₈ (Arka Vaibhav) exhibited the maximum number of days (127.90) for commencement of flowering. These results are in close agreement with the findings of Mahawer et al. (2013). With respect to days required for 50% flowering, the minimum number of days (117.90) was recorded in T₅ (GK-T-S-1) which was at par with T₄ (119.05 days), followed by T₆ (119.70 days), T₁ (120.75 days), T₇ (123.70 days), T₂ (124.10 days), T₃ (127.60 days) and T₉ (132.80 days). The highest number of days required for 50% flowering (133.15) was observed in T₈ (Arka Vaibhav). Similar results were reported by Sateesha (2004). Spike length, an important parameter for evaluating the quality of cut flowers, varied significantly among the genotypes. The longest spike (119.97 cm) was observed in T₅ (GK-T-S-1), followed by T₄ (112.55 cm), T₁ (110.21 cm), T₆ (100.03 cm), T₉ (89.33 cm), T₇ (81.95 cm), T₈ (80.52 cm) and T₃ (70.44 cm). The shortest spike (69.26 cm) was recorded in T₂ (Arka Shringar). These findings are in accordance with those reported by Mahawer et al. (2013). The number of florets per spike, which is an important floral trait, showed considerable variation among the genotypes. The maximum number of florets per spike (42.45) was recorded in T₅ (GK-T-S-1), followed by T₆ (38.90), T₇ (35.40), T₉ (35.20), T₈ (33.80), T₃ (33.05), T₄

(32.15) and T₂ (31.95). The minimum number of florets per spike (31.75) was recorded in T₁ (Local Single). These observations corroborate the findings of Krishnamoorthy (2014) in Tamil Nadu. The diameter of the flower stalk was found to be highest in T₆ (Prajwal) with 5.55 mm, followed by T₅ (4.68 mm), T₄ (4.55 mm), T₁ (4.46 mm), T₉ (4.38 mm), T₂ (4.20 mm), T₃ (4.15 mm) and T₇ (3.71 mm), whereas the minimum stalk diameter (3.64 mm) was observed in T₈ (Arka Vaibhav). These findings are in conformity with the reports of Dalvi et al. (2021). The rachis length was recorded to be maximum in T₅ (GK-T-S-1) with 49.12 cm, followed by T₆ (45.89 cm), T₉ (40.23 cm), T₁ (39.86 cm), T₇ (37.53 cm), T₈ (36.26 cm), T₄ (31.83 cm) and T₂

(29.92 cm). The minimum rachis length (27.73 cm) was observed in T₃ (Phule Rajani). These results are in agreement with the findings of Prakash et al. (2015). The maximum floret length (6.83 cm) was recorded in T₆ (Prajwal), followed by T₅ (6.47 cm), T₉ (6.27 cm), T₁ (6.16 cm), T₄ (5.85 cm), T₇ (5.60 cm) and T₃ (5.37 cm), while the minimum floret length (5.06 cm) was recorded in T₂ (Arka Shringar) and T₈ (Arka Vaibhav). Similar trends were reported by Rachana et al. (2013) and Gorivale et al. (2020).

**Table 1:** Effect of genotypes on vegetative parameters in tuberose

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Treatments** | **Plant Height (cm)** | **Average****number of leaves** | **Average****Leaf area (cm2)** | **Leaf Area Index (LAI)** | **Dry matter of spikes (g)** | **Dry matter of Leaves (g)** |
| T1 : Local Single | 81.44 | 31.55 | 57.73 | 1.14 | 11.42 | 12.52 |
| T2 : Arka Shringar | 56.08 | 33.20 | 44.51 | 0.92 | 9.00 | 13.18 |
| T3 : Phule Rajani | 57.54 | 34.60 | 41.33 | 0.89 | 8.50 | 13.74 |
| T4 : Local Varigated | 83.18 | 38.70 | 69.20 | 1.67 | 13.16 | 15.36 |
| T5 : GK-T-S-1 | 86.03 | 42.00 | 75.54 | 1.98 | 13.26 | 16.67 |
| T6 : Prajwal | 76.49 | 33.50 | 65.59 | 1.37 | 13.51 | 13.30 |
| T7 : Phule Rajat | 67.43 | 31.50 | 58.69 | 1.16 | 9.18 | 12.50 |
| T8 : Arka Vaibhav | 64.47 | 29.80 | 56.38 | 1.05 | 10.49 | 11.83 |
| T9 : Arka Suvasini | 74.41 | 32.40 | 51.90 | 1.05 | 12.64 | 12.86 |
| SEm ± | 0.179 | 0.145 | 0.39 | 0.01 | 0.147 | 0.058 |
| CD at 5 % | 0.522 | 0.425 | 1.13 | 0.03 | 0.428 | 0.169 |

**Table 2:** Effect of genotypes on flowering parameters in tuberose

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Treatments** | **Days for commencement of flowering** | **Days required for 50 % flowering** | **Spike length (cm)** | **Number of Florets per spike** | **Rachis length (cm)** | **Diameter of flower (mm)** | **Flower length (cm)** |
| T1 : Local Single | 115.45 | 120.75 | 110.21 | 31.75 | 39.86 | 4.46 | 6.16 |
| T2 : Arka Shringar | 119.75 | 124.10 | 69.26 | 31.95 | 29.92 | 4.20 | 5.06 |
| T3 : Phule Rajani | 122.40 | 127.60 | 70.44 | 33.05 | 27.73 | 4.15 | 5.37 |
| T4 : Local Varigated | 113.95 | 119.05 | 112.55 | 32.15 | 31.83 | 4.55 | 5.85 |
| T5 : GK-T-S-1 | 112.75 | 117.90 | 119.97 | 42.45 | 49.12 | 4.68 | 6.47 |
| T6 : Prajwal | 114.90 | 119.70 | 100.03 | 38.90 | 45.89 | 5.55 | 6.83 |
| T7 : Phule Rajat | 117.65 | 123.70 | 81.95 | 35.40 | 37.53 | 3.71 | 5.60 |
| T8 : Arka Vaibhav | 127.90 | 133.15 | 80.52 | 33.80 | 36.26 | 3.64 | 5.06 |
| T9 : Arka Suvasini | 127.55 | 132.8 | 89.33 | 35.20 | 40.23 | 4.38 | 6.27 |
| SEm ± | 0.477 | 0.529 | 0.255 | 0.28 | 0.308 | 0.017 | 0.035 |
| CD at 5 % | 1.392 | 1.543 | 0.744 | 0.819 | 0.898 | 0.05 | 0.102 |

**Table 3:** Effect of genotypes on yield parameters in tuberose

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Treatments** | **No. of spike per****plant** | **No. of spikes****per plot** | **Flower yield****(kg/plot)** | **Flower yield****(q/ha)** | **Bulb yield per plant****(no.)** | **Bulb yield per****plot (kg)** | **Bulb yield****(q/ha)** | **Diameter of bulb****(mm)** |
| T1 : Local Single | 2.60 | 32.25 | 1.88 | 97.93 | 2.65 | 1.84 | 96.06 | 54.19 |
| T2 : Arka Shringar | 1.90 | 22.75 | 1.62 | 84.32 | 1.95 | 1.10 | 57.28 | 43.69 |
| T3 : Phule Rajani | 1.60 | 19.50 | 1.43 | 74.64 | 1.65 | 1.62 | 84.56 | 45.05 |
| T4 : Local Varigated | 2.65 | 32.50 | 1.76 | 91.71 | 2.75 | 2.41 | 125.47 | 55.71 |
| T5 : GK-T-S-1 | 3.05 | 37.00 | 2.24 | 116.88 | 3.10 | 3.31 | 172.44 | 67.90 |
| T6 : Prajwal | 2.10 | 26.25 | 1.94 | 101.03 | 2.15 | 2.24 | 116.91 | 64.67 |
| T7 : Phule Rajat | 1.85 | 22.25 | 1.57 | 81.74 | 1.90 | 1.46 | 76.00 | 53.02 |
| T8 : Arka Vaibhav | 1.75 | 21.00 | 1.50 | 78.35 | 1.75 | 1.03 | 53.59 | 42.51 |
| T9 : Arka Suvasini | 1.95 | 23.75 | 1.69 | 88.07 | 2.05 | 1.94 | 101.22 | 46.55 |
| SEm ± | 0.103 | 1.259 | 0.045 | 2.346 | 0.108 | 0.088 | 4.576 | 0.248 |
| CD at 5 % | 0.303 | 3.676 | 0.131 | 6.849 | 0.316 | 0.256 | 13.36 | 0.723 |

Yield parameters

The data on yield parameters of various tuberose genotypes, as presented in Table 3, revealed significant variation among treatments. The highest number of spikes per plant (3.05) was recorded in T₅ (GK-T-S-1) followed by T₄ (2.65), T₁ (2.60), T₆ (2.10), T₉ (1.95), T₂ (1.90), T₇ (1.85) and T₈ (1.75) whereas the minimum (1.60) was recorded in T₃ (Phule Rajani). These findings are in conformity with the results of Naik et al. (2018) and Martolia (2018). The variation in the number of spikes per plot could be attributed to a higher number of leaves per plant, leading to greater photosynthate production and accumulation, thereby enhancing spike production. The maximum number of spikes per plot (37.00) was observed in T₅ (GK-T-S-1) followed by T₄ (32.50), T₁ (32.25), T₆ (26.25), T₉ (23.75), T₂ (22.75), T₇ (22.25) and T₈ (21.00),

while the minimum (19.50) was recorded in T₃ (Phule Rajani). These results are supported by the findings of Shete et al., (2023). Regarding flower yield, the highest flower yield per plot (2.24 kg) was observed in T₅ (GK-T-S-1) followed by T₆ (1.94 kg), T₁ (1.88 kg), T₄ (1.76 kg), T₉ (1.69 kg), T₂ (1.62 kg), T₇ (1.57 kg) and T₈ (1.50 kg), whereas the lowest flower yield (1.43 kg) was recorded in T₃ (Phule Rajani). The highest loose flower yield per hectare (116.88 q ha⁻¹) was recorded in T₅ (GK-T-S-1) followed by T₆ (101.03 q ha⁻¹), T₁ (97.93 q ha⁻¹), T₄ (91.71 q ha⁻¹), T₉ (88.07 q ha⁻¹), T₂ (84.32 q ha⁻¹), T₇ (81.74 q ha⁻¹) and T₈ (78.35 q ha⁻¹), while the minimum (74.64 q ha⁻¹) was recorded in T₃ (Phule Rajani). These observations are in agreement with the findings of Naik et al. (2018). The variation in bulb production may be attributed to the inherent genetic makeup of the genotypes and the prevailing agro-climatic conditions of the Konkan region. The highest bulb yield per plant (3.10) was recorded in T₅ (GK-T-S-1) followed by T₄ (2.75), T₁ (2.65), T₆ (2.15), T₉ (2.05), T₂ (1.95), T₇ (1.90) and T₈ (1.75), whereas the

lowest (1.65) was recorded in T₃ (Phule Rajani). These results are in line with those reported by Ramchandrudu and Thangam (2009). The highest bulb yield per plot (3.31 kg) was recorded in T₅ (GK-T-S-1) followed by T₄ (2.41 kg), T₆ (2.24 kg), T₉ (1.94 kg), T₁ (1.84 kg), T₃ (1.62 kg), T₇ (1.46 kg) and T₂ (1.10 kg), while the minimum (1.03 kg) was recorded in T₈ (Arka Vaibhav). These findings are in conformity with the results reported by Dalvi et al. (2021). The maximum bulb yield per hectare (172.44 q ha⁻¹) was recorded in T₅ (GK-T-S-1) followed by T₄ (125.47 q ha⁻¹), T₆ (116.91 q ha⁻¹), T₉ (101.22 q ha⁻¹), T₁ (96.06 q ha⁻¹), T₃ (84.56 q ha⁻¹), T₇ (76.00 q ha⁻¹) and T₂ (57.28 q ha⁻¹), whereas the lowest bulb yield (53.59 q ha⁻¹) was recorded in T₈ (Arka Vaibhav). The highest bulb diameter (67.90 mm) was recorded in T₅ (GK- T-S-1) followed by T₆ (64.67 mm), T₄ (55.71 mm), T₁ (54.19 mm), T₇ (53.02 mm), T₉ (46.55 mm), T₃ (45.05 mm) and T₂ (43.69 mm), whereas the smallest bulb diameter (42.51 mm) was recorded in T₈ (Arka Vaibhav). These findings are in accordance with those reported by Chaturvedi et al. (2014) and Dalvi et al. (2021).

# CONCLUSION

From the nine tuberose genotypes evaluated, it can be concluded that T5 GK-T-S-1 exhibited superior vegetative growth performance followed by T4 Local Varigated**.** Furthermore T5 GK- T-S-1 was found to be significantly superior in terms of loose flower yield and bulb production under Konkan climatic conditions, followed by T6 Prajwal and T4 Local Varigated.

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