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Evaluation of different genotype of tuberose (*Polianthes tuberosa* L.) for bulb traits

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Abstract

A field experiment entitled “Evaluation of tuberose (*Polianthes tuberosa* L.) varieties for bulb attributes under Chhattisgarh Plains” was conducted at Horticulture Research cum Instructional Farm, Department of Floriculture and Landscape Architecture, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur during Rabi 2021-22 and 2022-23. The experiment was laid out in Randomized Block Design with 11 cultivars of tuberose viz., Mexican Single (T₁), Hyderabad Single (T₂), Arka Nirantara (T₃), Kalyani Single (T₄), Star 505 (T₅), Arka Sugandhi (T₆), Sikkim Selection (T₇), Kolkata Single (T₈), Prajwal (T₉), Phule Rajni (T₁₀) and GKTC-4 (T₁₁) and replicated each at three times. The results of study revealed that the cultivar Prajwal (T₉) recorded maximum number of bulb plant⁻¹ (5.93), bulb plot⁻¹ (216.06) and bulb ha⁻¹ (380950.72). Diameter of bulb (3.07 cm) and length of bulb (4.84 cm) was recorded in cv. Hyderabad Single (T₂). Maximum individual weight of bulb (31.35 g) and individual weight of bulblet (3.94 g) were observed in Phule Rajni (T₁₀). Number of bulblet plant⁻¹ (28.24) was recorded in GKTC-4 (T₁₁). On the basis of all bulb parameters of different tuberose cultivars, cv. Prajwal (T₉) was identified as promising tuberose varieties may be preferred for bulb and bulblet production under Chhattisgarh plains and recommended for commercial cultivation of tuberose.

Keywords: Flower plant, bulb, bulblets, tuberose, cultivars

Introduction

Human has traditionally used flowers for expressing their feelings towards the God and to be loved ones or proving any plausible emotion. Flowers is being the integral part of human life from birth to death because its multifarious uses. The flowers are used in ceremonial functions and as a component of garlands and bouquets because of the fine and delicate odour which impart freshness. Among flowers, tuberose (*Polianthes tuberosa* L.) occupies a very selective and special position for its elegance and delightful fragrance. Tuberose cut spikes are useful in vase decoration and bouquets while individual florets are used for making garland, veni, button-holes and crown (Bose *et al.*, 1999) [1]. Tuberose is grown commercially in a number of countries including India, Kenya, Mexico, Morocco, France, Italy, Hawaii, South Africa, Taiwan, North Carolina, USA, Egypt, China and many other tropical and subtropical areas in the world. Tuberose (*Polianthes tuberosa* L.) belongs to family Amaryllidaceae and native to Mexico (Trueblood, 1973). Tuberose is half-hardy, bulbous perennial plant. It is a monocotyledon and an erect herb having 60-120 cm height with short and sturdy bulbs. Leaves are basal 30- 45 cm length, about 1.3 cm width, grass like linear foliage, 6-9 in number, bright green color, reddish near the base and bears numerous dots near the base. The foliage is narrow at the base and wider at the top and is arranged in a rosette at the base. Bulbs are made of scales, leaf bases and stem remain concealed within scales. Roots are mainly adventitious, fibrous and shallow. Bulbs are botanically rhizomes. It is a leading bulbous ornamental flowering plant of tropical and subtropical areas and greatly influenced by climatic condition and genetic factor. Once the commercial cultivation of tuberose is gaining importance, introduction and identification of high yielding varieties is necessary. Evaluation of variety or cultivar of any flower crop is a necessary for crop improvement because it provides a rapid, easy, reliable and efficient information to augment the utilization of particular germplasm. Selection of genotype from the different variants can be of more valuable for improvement in plant population.

Hence, the present investigation was conducted to study the relative performance of the eleven genotypes and the variation present among all these cultivars for bulb traits.

Materials and Methods

The present investigation was carried out at Horticulture Research cum Instructional Farm, Department of Floriculture and Landscape Architecture, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur during Rabi 2021-22 and 2022-23. The experiment was laid out in Randomized Block Design with 11 cultivars of tuberose *viz.*, Mexican Single (T₁), Hyderabad Single (T₂), Arka Nirantara (T₃), Kalyani Single (T₄), Star 505 (T₅), Arka Sugandhi (T₆), Sikkim Selection (T₇), Kolkata Single (T₈), Prajjwal (T₉), Phule Rajni (T₁₀) and GKTC-4 (T₁₁) and replicated each at three times. Healthy and disease free bulbs of eleven tuberose genotypes were used in this experiment. The land was brought to fine tilth by repeated ploughing and harrowing. Well decomposed farm yard manure was applied before the land preparation @ 25 tonnes per hectare and mixed well into the soil. Healthy bulbs were planted on ridges at a spacing of 45 X 30 cm and light irrigation was given immediately after planting. Five plants were selected at random within the plot area of each treatment and replication for the purpose of recording the observations. The statistical analysis was done as per the procedures suggested by Panse and Sukhatme (1969) [8]. For the comparison of treatments, the critical difference (CD) values are used wherever the “F” test was significant at 5 per cent level of significance for pooled data of two year study.

Results and Discussion

Bulb traits of 11 cultivars of tuberose *viz.*, diameter of bulb (cm), length of bulb (cm), number of bulb plant⁻¹, number of bulb plot⁻¹, number of bulb ha⁻¹, number of bulblet plant⁻¹, weight of individual bulb (g) and weight of individual bulblet (g) were found statistically significant variation among the cultivars.

Diameter of bulb (cm): The result depicted in table 1 revealed that maximum diameter of bulb (3.07 cm) was resulted in treatment T₂ (Hydrabad Single) that was followed by T₃ (Arka Nirantara) and T₄ (Kalyani Single). Data also clearly depicted that minimum diameter of bulb (1.88 cm) was recorded in cv. GKTC-4 (T₁₁). The variation in diameter of bulb may be due to genetic variability and effect of environmental and growing

conditions among the different cultivars of tuberose. The results are in conformity with the observations of Gorivale *et al.*, (2020) [5] and Chaturvedi *et al.* (2014) [2] in tuberose.

Length of bulb (cm): The tuberose cultivars exhibited significantly wide range of variation with respect to length of bulb was measured during both the experimental years & in pooled mean basis and its pooled data had been presented in table 1. It varied between 3.44 cm to 4.84 cm. It is revealed from the data presented in the table 1 that cv. Hyderabad Single (T₂) recorded significantly longest bulb (4.84 cm) and noted statistically *at par* with treatment T₁ (Mexican Single), T₃ (Arka Nirantara), and T₅ (Star-505). However, treatment T₁₀ (Phule Rajni) resulted shortest size bulb (3.44 cm). It is clearly indicated that the variation in length of bulb among the cultivars was mainly because of different bulb size and genetic characters of the different cultivars taken for the study and prevailing environmental conditions. This variation in length of bulb is in conformity with the findings of Prashanta *et al.* (2016) [9] in tuberose.

Number of bulbs per plant: The results showed significantly differences among different tuberose cultivar for number of bulb plant⁻¹ in pooled mean basis had been presented in table 1. It ranges between 2.62 to 5.93. Significantly highest number of bulb plant⁻¹ (5.93) was recorded in cv. Prajjwal (T₉), which was followed by cv. Hydrabad Single (T₂) and Kolkata Single (T₈). Conversely, the least number of bulb plant⁻¹ (2.62) was observed in cv. Sikkim Selection (T₇). Yield of bulb per plant is directly correlated with bulb yield/ plot and bulb yield/ ha. These results are in tune with the findings of Chawla *et al.* (2019) [3] and Manpreet Kaur (2017) [6] in tuberose.

Number of bulblets per plant: The data regarding displays number of bulblets plant⁻¹ in different cultivars of tuberose had been presented in table 1. It is evident from the data presented in table 2 that cv. GKTC-4 (T₁₁) recorded highest number of bulblets plant⁻¹ (28.24) which was statistically at par with cv. Star- 505 (T₅) and T₆ (Arka Sugandhi). However, cv. Phule Rajni (T₁₀) resulted least (12.19) number of bulblets plant⁻¹. These results are in tune with the findings of Chawla *et al.* (2019) [3] and Manpreet Kaur (2017) [6] who suggested maximum bulblets per plant (12.93 & 18.40) were obtained in cv. Prajjwal which supported present study.

Table 1: Effect of different genotypes on bulb parameters of tuberose (Pooled data of 2021-22 & 2022-23)

Treat.	Treatments (Cultivars)	Diameter of bulb (cm)	Length of bulb (cm)	No. of bulb plant ⁻¹	No. of bulblet plant ⁻¹
T ₁	Mexican Single	2.71	4.71	3.74	16.20
T ₂	Hyderabad Single	3.07	4.84	4.91	20.17
T ₃	Arka Nirantara	2.87	4.77	3.72	19.60
T ₄	Kalyani Single	3.02	4.40	3.53	19.70
T ₅	Star-505	2.73	4.74	3.17	23.53
T ₆	Arka Sugandhi	2.85	4.17	3.35	26.68
T ₇	Sikkim Selection	2.46	3.86	2.62	18.85
T ₈	Kolkata Single	2.62	4.17	4.99	16.97
T ₉	Prajjwal	2.42	4.05	5.93	18.14
T ₁₀	Phule Rajni	2.52	3.44	3.59	12.19
T ₁₁	GKTC-4	1.88	4.15	2.99	28.24
	S.Em (±)	0.06	0.08	0.23	1.94
	CD (P=0.05%)	0.17	0.23	0.67	5.72

Number of bulbs per plot & number of bulbs per ha: The results showed differences among different tuberose cultivar for number of bulb Plot⁻¹ ha⁻¹ had been presented in table 2. Data revealed that highest maximum bulb yield plot⁻¹ (216.06) was recorded in T₉ (Prajwal). This cultivar was followed by treatment T₃ (Arka Nirantara) and T₁₀ (Phule Rajni). On the contrast, least bulb yield plot⁻¹ (160.56) was recorded in cv. Kolkata Single (T₈). While similar trends for bulb yield plot⁻¹ & bulb yield ha⁻¹ was also obtained by Dalvi *et al.* (2021) [4] who recorded maximum bulb yield plot⁻¹ (3.54) & bulb yield ha⁻¹ (13.28 t/ha) in cv. Prajwal. The results of present investigation clearly depicted that maximum bulb yield ha⁻¹ (380950.72) were observed in treatment T₉ (Prajwal). Data also clear that T₉ (Prajwal) was followed by T₃ (Arka Nirantara) and T₁₀ (Phule Rajni). While minimum bulb yield ha⁻¹ (280844.26) was resulted from cv. Kolkata Single (T₈). Variation in bulbs plant⁻¹ Plot⁻¹ ha⁻¹ due to genetic character and prevailing environmental conditions has also been observed by Dalvi *et al.* (2021) [4], Krishnamoorthy (2014) [7], Singh and Singh (2013) [10] and Chaturvedi *et al.* (2014) [2] in tuberose.

Weight of individual bulb (g): The tuberose cultivars exhibited a wide range of variation with respect to fresh weight of individual bulb has been presented in table 2. It is revealed from the data presented in the table 2 that the significantly maximum

weight of individual bulb (31.35 g) it was recorded in treatment T₉ (Prajwal). This treatment T₉ (Prajwal) was noted significantly at par with T₄ (Kalyani Single), T₅ (Star-505) and T₆ (Arka Sugandhi). However, the minimum weight of individual bulb (15.74 g) was recorded in GKTC-4 (T₁₁). The difference in the weight of the bulbs may also be attributed to the number of the leaves and leaf area which might have supplied a larger amount of food to the bulbs increasing the weight. These findings are in accordance with the reporters of Gorivale *et al.* (2020) [5] and Chaturvedi *et al.* (2014) [2] who noticed maximum weight of individual bulb (87.67 g & 56.17 g) were obtained from cv. Prajwal in tuberose.

Weight of individual bulblet (g): The data clearly showed depicted in table 2 that values of weight of individual bulblet differed due to various cultivar of tuberose. It varied between 1.50 g to 3.94 g. It is revealed from the data presented in the table 4 that maximum weight of individual bulblet (3.94 g) was observed in T₁₀ (Phule Rajni) which was statistically at par with treatment T₃ (Arka Nirantara) and T₉ (Prajwal). On the contrast, the minimum weight of individual bulblet (1.50 g) was recorded in T₄ (Kalyani Single). The observed variation among cultivars for weight of individual bulblet could be attributed to inherent genetic and environmental factors.

Table 2: Effect of different genotypes on bulb parameters of tuberose (Pooled data of 2021-22 & 2022-23)

Treat.	Treatments (Cultivars)	No. of bulb plot ⁻¹	No. of bulb ha ⁻¹	Weight of individual bulb (g)	Weight of individual bulblet (g)
T ₁	Mexican Single	173.25	310947.98	23.29	2.97
T ₂	Hyderabad Single	192.70	332748.78	28.34	1.99
T ₃	Arka Nirantara	202.92	358809.53	25.61	3.44
T ₄	Kalyani Single	175.29	309229.87	29.87	1.50
T ₅	Star-505	195.78	345091.38	32.38	1.83
T ₆	Arka Sugandhi	195.75	345762.60	25.80	1.98
T ₇	Sikkim Selection	179.73	316284.54	20.77	3.21
T ₈	Kolkata Single	160.56	280844.26	24.98	2.08
T ₉	Prajwal	216.06	380950.72	30.89	3.80
T ₁₀	Phule Rajni	197.17	348179.02	31.35	3.94
T ₁₁	GKTC-4	194.50	341436.51	15.74	3.26
	S.Em (±)	2.65	4588.83	0.81	0.22
	CD (P=0.05%)	7.81	13535.22	2.40	0.64

Conclusion

From the present research study, it can be concluded that tuberose variety Prajwal exhibits superiority over other the ten cultivars for most of the bulb parameters in the under Chhattisgarh plains and may be recommended for commercial cultivation of tuberose.

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