

## Performance of Tuberose Genotypes under North Bihar Agro Climatic Conditions

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**ABSTRACT:** Tuberose (*Polianthes tuberosa* L.) has been recognized as one of the most important flowers in the flower industry. The agro-climatic situation of north Bihar has a better future prospect for its commercial cultivation. The screening of suitable genotype has a key role for the successful cultivation as the floral and vegetative characters are greatly influenced by different climatic situations. To address the demand of growers, the present genotype evaluation experiment was carried out with seven tuberose genotypes to assess the vegetative as well as floral characters under north Bihar Agro-climatic conditions. The experiment was laid out in randomized block design (RBD) with three replications at the Hi-tech Horticultural Research Farm of Dr Rajendra Prasad central Agricultural University, Bihar, Pusa (Samastipur) Bihar during the crop periods of 2015-16 to 2017-18 in three consecutive years. The tuberose genotype, 'Bidhan Rajani H-1' has reflected its better floral and other related qualities with reference to other genotypes of tuberose. The study reveals that the genotype, 'Bidhan Rajani H-1' proved to be significantly superior with respect to days taken to spike emergence, days to opening of first florets, flowering duration, spike length, rachis length, number of spikes per clump, cut and loose flower yield and other floral characters, bulb and bulblets quality and its performance was better than other genotypes. Prajwal was the next superior genotype with respect to floral and bulb characters.

**Keywords:** Tuberose, genotypes, single types, double types, loose flowers, cut flowers, spike, rachis, florets, bulb and bulblets.

### INTRODUCTION

The flowers are associated with advancement of the human civilization at the planet. Among the cultivated flowers, tuberose (*Polianthes tuberosa* L.) is one of the most important loose flower as well as the cut flower in India. It is an ornamental bulbous plant and commonly known as 'Rajanigandha', native of Mexico and belongs to the family Amaryllidaceae (Trueblood, 1973). It is popular due to its white waxy fragrant flowering spikes of single (mainly for loose flower) and double (mainly for cut flower) types of longer shelf life and aesthetic value (Rachana *et al.*, 2013). As a loose flower, they are in great demand for making garlands and veni in Southern India. It is being used for worshipping, offerings in religious functions and auspicious days (Krishnamoorthy, 2014). The flowers are also used for the extraction of valuable essential oil, which is having a greater export demand (Martolia, 2010). The commercial cultivation of tuberose is mainly concentrated to tropical and subtropical regions of the world like, India, Kenya, Mexico, Morocco, France, Italy, Hawaii, South Africa, Taiwan, North Carolina, USA, Egypt and the China. In India it is cultivated on a large scale in Tamil Nadu, Karnataka, West Bengal, and Maharashtra. To a lesser extent, it is also grown in

Andhra Pradesh, Haryana, Delhi, Uttar Pradesh and Punjab (Rachana *et al.*, 2013). At that time, cultivation of cut and loose flower of tuberose crops covered around 339 thousand hectare, with an average production of 2865 thousand MT and average productivity was 8.45 MT / ha. (Anonymous, 2020). At present, throughout India, several cultivars and local varieties are available in tuberose. Hence, location specific evaluation of varieties will help the growers to select the most suitable and high yielding variety for that particular region. Critical assessment of germplasm also helps in selecting parents for breeding programmes to improve the yield and quality of the flowers. The information available on the subject so far is scanty and scattered. Thus, a compelling need to evaluate the genotypes as per the need of hours was felt. Hence, the present investigation was conducted to study the relative performance of the seven single type genotypes of tuberose and the variability present among them under humid Agro-climatic conditions of north Bihar.

### MATERIALS AND METHODS

The experiment was conducted at research farm, Hi-tech Horticulture of RPCAU, Pusa in Randomized Block Design (RBD) with three replications during all

three cumulative years i.e. 2015-16, 2016-17 and 2017-18 under All India Coordinated Research Project on Floriculture. The experimental site was located at 25.98°N and 85.67°E with an altitude of 52.0 m above mean sea level. The climate of experimental site is sub-tropical characterized with moderate precipitation, hot and dry summer and cold winter with maximum yearly rainfall (about 90 %) received due to south-west monsoon during June to October and the months of December to February receiving occasional and light winter showers. April, May and June are the hottest months while December and January are the coldest. The temperature varies between 6°C to 45°C with maximum in May-June and minimum in December - January while the relative humidity (RH) ranged from 60 per cent to 93 per cent. Seven tuberose genotypes were evaluated for vegetative growth and flowering and yield in a randomized block design with three replications. Thirty plants per treatment were planted at a spacing of 30 × 30 cm. The observations were taken from five randomly selected plants for recording various vegetative, floral and bulb/bulblets characters viz., days to spike emergence, days to opening of florets, flowering duration, spike length (cm), Rachis length (cm), number of florets per spike, length of florets (cm), floret diameter (cm), weight of 100 florets (g) number of spikes per clump, number of spikes per hectare, loose flower yield (q/ha), number of bulbs per clump, number of bulblets per clump and finally the cost benefit ratio was worked out to evaluate these genotypes economically.

## RESULTS AND DISCUSSION

The findings of the research work conducted on the basis of three year experimentation during 2015-16, 2016-17 and 2017-18 on the screening of seven tuberose single type genotypes revealed that the vegetative and floral characters of the plants are greatly influenced due to its genotypes. The tuberose genotype, Bidhan Rajani H-1 is proved to be the most suitable genotype for Agro-climatic condition of North Bihar having a lot of vegetative and floral characters requisite for a quality i.e. maximum flowering duration (26.52 days), spike length (88.03 cm), rachis length (38.12

cm), number of florets per spike (40.28), length of florets (7.67 cm), floret diameter (4.12 cm), weight of 100 florets (190.28 g), number of spikes per clump (10.78), number of spikes per hectare (449303.6), loose flower yield per hectare (343.85q) and the number of bulb (18.64) and bulblets per clump (6.15) followed by the tuberose genotype, Prajwal with flowering duration (23.24 days), spike length (81.96 cm), rachis length (33.96 cm), number of florets per spike (38.02), length of florets (6.66 cm), floret diameter (3.79 cm), weight of 100 florets (181.06 g), number of spikes per clump (10.02), number of spikes per hectare (380832.7), loose flower yield per hectare (262.55q) and the number of bulb (15.29) and bulblets per clump (5.11). The other superior genotypes, Arka Nirantra and Bidhan Rajani H-2 had recorded flowering duration (21.89, 20.57 days), spike length (78.84, 77.97 cm), rachis length (29.03, 26.00 cm), number of florets per spike (35.63, 32.47), length of florets (6.08, 5.88 cm), floret diameter (3.69, 3.60 cm), weight of 100 florets (150.36, 140.60 g), number of spikes per clump (9.08, 8.58), number of spikes per hectare (378470.70, 357637.90), loose flower yield per hectare (178.96, 173.63q) and the number of bulb (13.52, 11.75) and bulblets per clump (4.61, 4.08), respectively (Table 1 & 2). The local check tuberose genotype had showed significantly inferior suitability for this agro-climatic region recording flowering duration (13.67 days), spike length (64.96 cm), rachis length (18.44 cm), number of florets per spike (22.63), length of florets (3.28 cm), floret diameter (2.72 cm), weight of 100 florets (116.00 g), number of spikes per clump (5.56), number of spikes per hectare (231943.6), loose flower yield per hectare (61.18q) and the number of bulb (6.75) and bulblets per clump (3.45). However the performance of genotypes, GKT-T-C4 and Phule Rajani were significantly superior to local check genotype but not at par with those of superior genotypes, Bidhan Rajani H-1 and Prajwal on the basis of these floral qualities. The local check genotype however had the lowest time taken for spike emergence as well as the days taken to opening of first florets but these characters solely do not signify its floral superiority (Table 1 & 2).

**Table 1: Performance of seven Tuberose genotypes on floral parameters during 2015-16, 2016-17 and 2017-18 (Pooled).**

Sr. no.	Treatments (Genotypes)	Days to spike emergence	Days to opening of first florets	Flowering duration (Days)	Spike length (cm)	Rachis length (cm)	No. of florets / spike	Length of florets (cm)	Floret diameter (cm)
1	Bidhan Rajani H-1	81.32	102.21	26.52	88.03	38.12	40.28	7.67	4.12
2	Bidhan Rajani H- 2	94.07	114.23	20.57	77.97	26.00	32.47	5.88	3.60
3	GKT-T-C4	86.74	106.65	18.22	72.41	22.37	30.49	4.86	3.04
4	Prajwal	83.36	105.25	23.24	81.96	33.96	38.02	6.66	3.79
5	Phule Rajani	79.37	98.83	20.31	75.41	24.57	28.11	5.38	3.30
6	Arka Nirantra	89.99	109.62	21.89	78.84	29.03	35.63	6.08	3.69
7	Local check	75.97	95.39	13.67	64.96	18.44	22.63	3.28	2.72
	CD at 0.05	15.69	17.09	4.11	12.63	5.35	5.74	0.88	0.259
	CV %	11.23	9.87	12.05	9.90	11.76	10.67	9.37	7.82

Now it is obvious that the tuberose genotype, Bidhan Rajani H-1 and Prajwal have the superior floral qualities in comparison to other genotypes for the Agro-climatic situation of North Bihar at the same time due to its higher flower production these genotypes also proved to be the economically highly profitable having maximum Benefit cost ratio (B: C ratio) 6.56 and 4.77, respectively as compared to other genotypes having benefit cost ratios from 1.66 to 3.17 (Table 1 & 2).

The present findings are almost in close conformity with the reports of earlier workers at different Agro-climatic locations (Biswas *et al.*, 2002; Gogoi, *et al.*, 2020; Krishnamoorthy, 2014; Martolia., 2010; Patil *et al.*, 2009; Prashanta *et al.*, 2016; Ramachandrudu *et al.*, 2009; Rachana *et al.* 2013; Singh and Singh, 2013). The variation in spike numbers and spike length, rachis length, number of florets and its length and diameter might be due to the inherent genetic make up of

different varieties under the influence of Agro-climatic conditions of the region and these variations have also been observed by Dogra *et al.* (2020), Patil *et al.*, (2009), Prashanta *et al.*, (2016), Rachana *et al.*, (2013) and Singh *et al.*, (2018). Almost similar observations were recorded by Biswas *et al.*, (2002), Chawla *et al.*, (2019), Prakash *et al.*, (2016) and Singh and Singh (2013) and they observed that the variations in these characters are the result of interaction of genotype with climatic conditions of the particular area. Krishnamoorthy (2014), Singh *et al.*, (2013) and Sivakumar *et al.*, (2020) explained that the genotype with more number of leaves might improved photosynthetic activity, that accumulates more carbohydrates which improve the bulb and bulblets yield per plant, per plot and per hectare however these characters are much influenced by some other factors like, season, environment etc.

**Table 2: Performance of seven Tuberose genotypes on floral yield and bulb / bulb lets parameters during 2015-16, 2016-17 and 2017-18 (Pooled).**

Sr. No.	Treatments (Genotypes)	Weight of 100 florets (g)	No. of spikes/clump	No. of spikes / ha	Loose flower yield (q/ha)	No. of bulbs / clump	No. of bulb lets / clump	B : C ratio
1	Bidhan Rajani H-1	190.28	10.78	449303.60	343.85	18.64	6.15	6.56
2	Bidhan Rajani H- 2	140.60	8.58	357637.90	173.63	11.75	4.08	3.11
3	GKT-T-C4	133.75	8.23	331248.80	124.69	10.51	4.08	2.55
4	Prajwal	181.06	10.02	380832.70	262.55	15.29	5.11	4.77
5	Phule Rajani	128.46	7.35	343056.50	142.33	9.00	3.95	2.75
6	Arka Nirantra	150.36	9.08	378470.70	178.96	13.52	4.61	3.17
7	Local check	116.00	5.56	231943.60	61.18	6.75	3.45	1.66
	CD at 0.05	24.61	0.91	47883.20	29.73	2.59	0.59	-
	CV %	10.00	6.33	8.19	9.77	12.23	7.98	-

## CONCLUSION

The research findings on the basis three years experimentation and pooled data (2015-16, 2016-17 and 2017-18) reveal that the different genotypes of tuberose have the potential to influence the floral and bulb / bulblets characters of the plant. Among the seven single type genotypes evaluated, 'Bidhan Rajani H-1' followed by 'Prajwal', 'Arka Nirantra' and 'Bidhan Rajani H-2' are suitable for cultivation due to their floral qualities as well as shelf life potential over others genotypes under the Agro-climatic situations of North Bihar. It is obvious from the study that both the genotypes have very good economic potential and it would provide maximum net return to the growers/farmers of the State. Further, the performance of varieties of any crop differs from one region to another region. Hence, selection of genotype is an important criterion for successful cultivation of any crop.

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