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Varietal performance of tuberose (*Polianthes tuberosa* L.) under different spacing in North Gujarat condition

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Abstract

A field trial was carried out to understand performance of different tuberose (*Polianthes tuberosa* L.) varieties with different spacing which comprised of two factors viz. three spacing and five varieties and it was laid out in split plot design and replicated thrice. Among different varieties, significantly maximum plant height and number of leaves per plant at 120 & 180 DAP, spike length, rachis length, weight of ten florets, yield of florets and shelf life were recorded with Arka Prajwal, while significantly maximum plant height and number of leaves per plant at 60 DAP was found with Mexican Single, earliness in days taken to spike emergence, first floret opening after spike emergence and number of florets per spike were found superior with Shringar and maximum number of spikes per plant were recorded with Phule Rajani. Among all the treatments combination of spacing of 45 cm x 20 cm + Arka Prajwal had recorded maximum yield of florets per plot as well as per hectare. Moreover, significantly longer shelf life was recorded with treatment of 45 cm x 20 cm + Arka Prajwal and 45 cm x 30 cm + Arka Prajwal.

Keywords: Tuberose, single type, variety, spacing

Introduction

Tuberose (*Polianthes tuberosa* L.) crop is widely grown for loose and cut flower in India. It is an ornamental bulbous plant belonging to family Asparagaceae and is native of Mexico (Trueblood, 1973) [22]. It is widely grown for sweet smelling white flowers which is used for veni and garlands in South India. It is also used for worshipping, offerings in religious functions and on auspicious days (Krishnamoorthy, 2014) [10]. The flowers are used for the extraction of valuable essential oil, which is having greater export demand (Martolia, 2012) [12]. Now a days there are many cultivars and local varieties are available of this crop and among these, some varieties which perform well in one region may not do well in other regions of varying climatic conditions. Hence the varietal evaluation for specific location allows grower to select the most suitable and high yielding variety for that particular region. The successful cultivation of any crop is influenced not only by the high yielding variety but also by various agro techniques like optimum spacing. Therefore, spacing between plants is particularly important for the cultivation of tuberose for obtaining optimum quality and quantity of tuberose flowers. Considering the above facts, the present investigation was conducted to study the performance of different tuberose varieties and to determine the optimum spacing for better growth, flowering and spike yield.

Materials and Methods

The present investigation was carried out at College of Horticulture, Sardarkrushinagar Dantiwada Agricultural University, Jagudan, Dist. Mehsana, Gujarat during March, 2021 to January, 2022. The experiment was laid out in split plot design with fifteen treatments combinations involving three spacing 30 cm x 30 cm (s₁), 45 cm x 20 cm (s₂) and 45 cm x 30 cm (s₃) and five varieties Arka Prajwal (v₁), Phule Rajani (v₂), Shringar (v₃), Mexican Single (v₄) and Arka Nirantara (v₅). The combination of treatments comprised of spacing 30 cm x 30 cm + Arka Prajwal (T₁), 30 cm x 30 cm + Phule Rajani (T₂), 30 cm x 30 cm + Shringar (T₃), 30 cm x 30 cm + Mexican Single (T₄), 30 cm x 30 cm + Arka Nirantara (T₅), 45 cm x 20 cm + Arka Prajwal (T₆), 45 cm x 20 cm + Phule Rajani (T₇), 45 cm x 20 cm + Shringar (T₈), 45 cm x 20 cm + Mexican Single (T₉), 45 cm x 20 cm + Arka Nirantara (T₁₀), 45 cm x 30 cm + Arka Prajwal (T₁₁), 45 cm x 30 cm + Phule Rajani (T₁₂), 45 cm x 30 cm + Shringar (T₁₃), 45 cm x 30 cm + Mexican Single (T₁₄) and 45 cm x 30 cm + Arka Nirantara (T₁₅), the treatments were replicated thrice. The bulbs having diameter of 2.5-3.0 cm were planted in the month of March

and uniform recommended package practices were followed. All parameters were noted from five tagged plants from each plot and were subjected to statistical analysis following analysis of variance technique (Panse and Sukhatme, 1985) [4].

Results and Discussion

Inspection of data in table 1 showed that significantly maximum number of leaves per plant at 120 DAP (61.4) was observed with s_1 . Minimum days to first spike emergence (131.61 days) were observed with s_1 which was found at par with s_2 . While minimum days taken to first floret opening after spike emergence (14.48 days) was found with 45 cm x 30 cm (s_3) which was found statistically at par with 45 cm x 20 cm (s_2). Earliness in flowering is an important character, which helps farmer to fetch early market. This might be due to the fact that less competition among the plants for growth which ultimately resulted in early flowering. Spacing of s_3 (45 cm x 30 cm) among the different spacing resulted in flowering earliness which is in agreement with the results of Desai and Thirumala (2015) [4].

Significantly maximum plant height at 60 DAP (20.13 cm) was recorded with v_4 which was at par with v_1 and v_2 . While at 120 DAP and 180 DAP, significantly maximum plant height *i.e.* 45.67 cm and 68.81 cm respectively were found with Arka Prajwal (v_1). Phule Rajani (v_2) and Arka Nirantara (v_5) has shown plant height of 43.68 cm and 43.62 cm respectively at 120 DAP which was at par with that of Arka Prajwal (v_1). The increased plant height and significant variation among variety may be related to genetic difference in varieties. Maximum plant height observed with Arka Prajwal (v_1) is experimentally supported by the findings of Ashok *et al.* (2020) [1], Gogoi and Taukdar (2020) [7] and Hasna and Manjusha (2021) [9] in tuberose.

Treatment v_4 (Mexican Single) showed maximum leaves per plant at 60 DAP (9.49) which was statistically at par with other variety v_5 and v_3 . While at 120 DAP significantly maximum number of leaves per plant (45.47) was observed with variety Arka Prajwal (v_1), which was at par with variety v_2 and v_5 . At 180 DAP also significantly maximum number of leaves (119.98) were observed with variety Arka Prajwal (v_1). The variation in the number of leaves might be due to their genetic alignment, which interacts differently to soil and climatic conditions (Dimri *et al.*, 2017) [5]. The result of maximum number of leaves per plant with variety Mexican Single is in agreement with the results of Safeena *et al.* (2019) [19] and Symplic *et al.* (2019) [21], while Gorivale *et al.* (2020) [8] and Dalvi *et al.* (2021) [3] has reported maximum number of leaves with Arka Prajwal variety of tuberose.

The significantly minimum days to first spike initiation (109.93 days) were taken in the variety Shringar (v_3). The effect of variety on minimum days taken to first spike emergence may be due to varietal character. These minimum days to first spike emergence are in agreement with the results of Dogra *et al.* (2020) [6] and Hasna and Manjusha (2021) [9] in tuberose.

Result revealed that minimum days to first floret opening after spike emergence (12.02 days) reported with Shringar (v_3) which was statistically at par with v_4 . The effect of variety on days to first floret opening after spike emergence may be due to varietal character. These minimum days to first floret opening after spike emergence are in agreement with the results of Singh *et al.* (2018) [20] and Hasna and Manjusha (2021) [9].

It is evident from the data presented in table 2 that

significantly maximum plant height at 60 DAP (22.33 cm) was found with (45 cm x 20 cm + Phule Rajani) s_2v_2 which was at par with s_1v_4 , s_1v_1 , s_1v_3 , s_1v_5 , s_2v_4 , s_3v_4 and s_1v_2 treatment combinations. Maximum plant height (54.67 cm) at 120 DAP was recorded with treatment combinations s_1v_1 which was statistically at par with s_1v_2 , s_2v_5 , and s_1v_3 . Significantly maximum plant height at 180 days after planting (74.71 cm) was recorded with treatment s_3v_1 . An examination of data indicates that maximum number of leaves at 120 DAP (54.67) was observed with s_1v_1 which was statistically at par with s_1v_3 , s_1v_2 and s_2v_5 .

As per the data presented in table 3, the significantly maximum yield of florets per plot (3033 g) observed with s_1 (30 cm x 30 cm) which was found at par with s_2 . Spacing 45 cm x 20 cm (s_2) recorded significantly maximum yield of florets per hectare (23280 kg). The increased yield might be due to s_1 & s_2 spacing gave more number of plants per hectare. The result revealed that maximum number of spikes per plant (6.04) was recorded with v_2 (Phule Rajani). The variation in number of spikes per plant might be due to inherent capability of particular genotype as well as prevailing climatic conditions during growing period (Madhumathi *et al.*, 2018) [11]. It is evident from the data that there was significantly maximum yield of florets per plant (247.36 g) were recorded with the v_1 (Arka Prajwal) which was found at par with v_5 . The data recorded on florets yield per plot (3174 g) was significantly highest with v_1 . The data indicates that among the different varieties v_1 (Arka Prajwal) resulted in significantly maximum yield of florets per hectare (24756 kg). Increase in yield with v_1 (Arka Prajwal), might be due to genetic character of the variety and its capacity to produce florets with more weight (Rajamanickam and Ravindran, 2019) [17]. This was in line with the findings of Madhumathi *et al.* (2018) [11], Krishnamoorthy (2014) [10], Ashok *et al.* (2020) [1], Gorivale *et al.* (2020) [8] and Dalvi *et al.* (2021) [3] in tuberose.

Perusal of table 4 shows that significantly maximum yield of florets per plot (3828 g) was reported with s_2v_1 (45 cm x 20 cm + Arka Prajwal) which was found at par with s_1v_1 . Interaction effect of spacing and variety with respect to yield of florets per hectare was found significant. Maximum yield of florets per hectare (30378 kg) was observed with s_2v_1 (45 cm x 20 cm + Arka Prajwal).

As per table 5, significantly maximum spike length (97.06 cm) and rachis length (53.13 cm) was recorded with v_1 (Arka Prajwal). Variation in spike length might be due to the inherent capacity of the particular genotype as well as the prevailing climatic conditions during growing period (Madhumathi *et al.*, 2018) [11]. The similar findings have also been reported by Prakash *et al.* (2015) [16], Naik *et al.* (2018) [13], Gorivale *et al.* (2020) [8], Dalvi *et al.* (2021) [3], Hasna and Manjusha (2021) [9] and Rajput *et al.* (2022) [18] in tuberose. The increase in rachis length might be due to inherent characters of the particular variety (Dogra *et al.*, 2020) [20]. Prakash *et al.* (2015) [16], Gorivale *et al.* (2020) [8], Dalvi *et al.* (2021) [3] and Rajput *et al.* (2022) [18] has studied on tuberose and got the similar results.

The significantly maximum number of florets per spike (52.02) reported in variety Shringar (v_3) which was found at par with v_4 . The variation in number of florets per spike might be due to genetic make-up of variety and environmental reciprocal action (Rajput *et al.*, 2022) [18]. Similar results were also reported by Naik *et al.* (2018) [13] and Gorivale *et al.* (2020) [8] in tuberose.

The result revealed that significantly maximum weight of ten floret (25.49 g) reported with Arka Prajwal (v_1). The variation in weight of floret might be due to genetic makeup of cultivars under the study (Bharathi and Umamaheswari, 2018) [2] and similar observations were made by Madhumathi *et al.* (2018) [11], Bharathi and Umamaheswari (2018) [2], Pocha *et al.* (2019) [15] and Ashok *et al.* (2020) [1] in tuberose cultivar

Arka Prajwal. Significantly maximum shelf life (3.58 days) had been reported with Arka Prajwal (v_1) which was found at par with v_5 . The variation in shelf life might be attributed to loss of weight of flowers and genetic inherent character of varieties as it has been reported earlier by Naik *et al.* (2018) [13] in tuberose. There was no significant effect of interaction observed on quality parameters in tuberose.

Table 1: Effect of spacing and variety on growth parameters

Treatments	Plant height (cm)			Number of leaves per plant			Days taken to first spike emergence	Days to first floret opening after spike emergence
	60 DAP	120 DAP	180 DAP	60 DAP	120 DAP	180 DAP		
s ₁	20.33	48.54	61.51	9.08	61.40	92.10	131.61	15.20
s ₂	18.03	42.37	57.87	8.11	37.30	92.57	133.75	14.60
s ₃	16.07	36.13	60.10	8.09	39.90	97.88	136.51	14.48
S.Em.±	1.17	2.42	1.07	0.37	2.44	2.72	0.63	0.11
C. D. at 5%	NS	NS	NS	NS	9.57	NS	2.48	0.41
C. V. %	25.01	22.14	6.95	17.05	22.13	11.19	1.83	2.77
v ₁	18.33	45.67	68.81	6.98	45.47	119.98	167.87	19.38
v ₂	18.44	43.68	59.08	8.00	43.69	87.93	123.87	14.98
v ₃	16.73	38.84	54.44	8.47	40.44	93.29	109.93	12.02
v ₄	20.13	40.13	55.14	9.49	40.13	80.24	117.42	12.38
v ₅	17.07	43.62	61.66	9.20	43.62	89.98	150.69	15.04
S.Em.±	0.70	1.38	1.24	0.37	1.33	3.76	2.13	0.20
C. D. at 5%	2.05	4.04	3.63	1.07	3.89	10.97	6.21	0.57
C. V. %	11.61	9.80	6.24	13.05	9.38	11.96	4.77	3.99

Table 2: Effect of interaction on growth parameters

Treatment	Plant height (cm)			Number of leaves per plant			Days taken to first spike emergence	Days to first floret opening after spike emergence
	60 DAP	120 DAP	180 DAP	60 DAP	120 DAP	180 DAP		
s ₁ v ₁	20.67	54.67	66.99	7.13	54.67	120.53	170.53	20.20
s ₁ v ₂	19.00	49.40	59.09	7.33	49.40	88.00	120.53	15.47
s ₁ v ₃	20.00	48.00	61.94	9.60	52.80	95.47	108.87	12.13
s ₁ v ₄	22.27	47.60	58.46	10.80	47.60	73.40	110.73	12.53
s ₁ v ₅	19.72	43.07	61.07	10.53	43.07	84.60	147.40	15.67
s ₂ v ₁	16.93	41.40	64.73	6.80	41.40	115.93	167.80	19.27
s ₂ v ₂	22.33	46.67	59.80	8.87	46.67	92.00	124.07	14.80
s ₂ v ₃	15.47	36.67	48.28	8.00	36.67	78.20	106.33	11.93
s ₂ v ₄	19.07	38.27	53.87	8.47	38.27	88.80	120.53	12.00
s ₂ v ₅	16.33	48.87	62.67	8.40	48.87	123.47	150.00	15.00
s ₃ v ₁	17.40	40.33	74.71	7.00	40.33	87.93	165.27	18.67
s ₃ v ₂	14.00	35.00	58.37	7.80	35.00	92.40	127.00	14.67
s ₃ v ₃	14.73	31.87	53.11	7.80	31.87	89.13	114.60	12.00
s ₃ v ₄	19.07	34.53	53.09	9.20	34.53	96.47	121.00	12.60
s ₃ v ₅	15.16	38.93	61.25	8.67	38.93	97.88	154.67	14.47
S.Em.±	1.22	2.40	2.15	0.63	2.31	6.51	3.69	0.34
C. D. at 5%	3.55	7.00	6.29	NS	6.75	NS	NS	NS
C. V. %	11.61	9.80	6.24	13.05	9.38	11.96	4.77	3.99

Table 3: Effect of spacing and variety on yield parameters

Treatments	Number of spikes per plant	Yield of florets		
		Per plant (g)	Per plot (kg)	Per hectare (kg)
s ₁	5.09	194	3033	21062
s ₂	5.21	207	2933	23280
s ₃	5.17	191	1568	14516
S.Em.±	0.08	3.93	57.68	475.82
C. D. at 5%	NS	NS	226.48	1868.28
C. V. %	6.33	7.73	8.90	9.39
v ₁	4.56	247	3175	24756
v ₂	6.04	174	2189	17032
v ₃	4.47	164	2147	16765
v ₄	5.13	163	2181	17027
v ₅	5.60	233	2866	22517
S.Em.±	0.08	5.26	63.73	516.74
C. D. at 5%	0.23	15.36	186.03	1508.25
C. V. %	4.53	8.02	7.61	7.90

Table 4: Effect of interaction on yield parameters

Treatments	Number of spikes per plant	Yield of florets		
		Per plant (g)	Per plot (kg)	Per hectare (kg)
S1V1	4.53	250	3825	26565
S1V2	6.07	183	2782	19321
S1V3	4.33	154	2613	18145
S1V4	5.07	153	2551	17714
S1V5	5.47	221	3393	23565
S2V1	4.60	256	3828	30377
S2V2	6.13	184	2471	19609
S2V3	4.53	174	2474	19635
S2V4	5.20	181	2710	21512
S2V5	5.60	240	3183	25265
S3V1	4.53	236	1871	17325
S3V2	5.93	159	1314	12165
S3V3	4.53	165	1352	12514
S3V4	5.13	156	1280	11855
S3V5	5.73	240	2022	18721
S.Em.±	0.13	9.12	110.3	895.02
C. D. at 5%	NS	NS	322.21	2612.37
C. V. %	4.53	8.02	7.61	7.90

Table 5: Effect of spacing and variety on quality parameters

Treatments	Spike length (cm)	Rachis length (cm)	Number of florets per spike	Weight of ten floret (g)	Shelf life (days)
s1	79.03	43.12	46.12	16.03	2.75
s2	74.02	39.97	45.47	16.01	2.83
s3	76.67	41.22	45.40	16.00	2.88
S.Em.±	0.98	0.72	0.25	0.02	0.08
C. D. at 5%	NS	NS	NS	NS	NS
C. V. %	4.98	6.70	2.16	0.56	10.66
v1	97.06	53.13	48.58	25.49	3.58
v2	79.46	43.04	37.16	14.39	2.29
v3	56.28	33.07	52.02	12.40	2.44
v4	64.82	35.10	50.09	9.52	2.31
v5	85.25	42.84	40.29	18.26	3.47
S.Em.±	1.11	1.00	0.77	0.19	0.05
C. D. at 5%	3.24	2.93	2.24	0.56	0.15
C. V. %	4.35	7.27	5.03	3.62	5.34

Conclusion

From the present study, it could be concluded that planting of variety Arka Prajwal under spacing 45 cm x 20 cm spacing was found most beneficial in terms of growth, yield and quality as compared to other varieties and spacings under study.

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