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Evaluation on Performance and Superiority of Tuberose (*Polianthes tuberosa* L.) Cultivars for Growth and Flowering under North Indian Plain

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Abstract A field experiment was carried out to evaluate tuberose (*Polianthes tuberosa* L.) cultivars for growth and flowering under north Indian plain. The experiment was laid out in randomized block design comprising thirteen cultivars viz. Local, Mexican Single, Hyderabad Double, Sikkim Selection, Phule Rajani Single, Phule Rajani Double, Suvasani, Prajwal, Shringar, Pearl Double, Hyderabad Single, Calcutta Double and Vaibhav as treatment with three replications. The crop was planted on 6th May 2014 following standard cultivation practices. The experimental result showed that there was significant difference among cultivars for differtent characters studied. Days to sprouting was recorded minimum in cv Local (5.00 days). Length of leaves was recorded maximum in cv Prajwal (38.81 cm). Maximum plant spread was recorded in cv Suvasani (45.06 cm). Maximum dry weight was attained by cv Calcutta Double (2.84 g) followed by cv Prajwal (2.78 g) which were at par. Maximum dry matter of leaves was attained by cv Calcutta Double (14.30%) and minimum in cv Local (11.51%). Minimum days to spike emergence was recorded in cv Local (57.88 days) followed by cv Suvasani (63.66 days) which were at par. Minimum days to full bloom was recorded in cv Local (95.66 days) followlowed cv Shringar (100.33 days). Flower life in field was recorded maximum in cv Suvasani (23.66 days) followed by cv Pearl Double (22.22 days) which were at par. Maximum length of spike was recorded in cv Sikkim Selection (101.56 cm). Maximum number of florets per spike was recorded in cv Pearl Double (43.43) followed by cv Phule Rajani Single (42.10) which were at par. From these findings we can conclude that cv Prajwal, cv Suvasani and cv Local can be recommended for commercial cultivation in northern plain of India under Varanasi Agro-climatic zone.

Keywords *Polianthes tuberosa,* Evaluation, Growth, Flowering, Northern plains of India.

Introduction

Tuberose (*Polianthes tuberosa* L.) belongs to family Amaryllidaceae, popularly known as *Rajnighandha* is one of the most important among bulbous ornamental plants, owing to its beauty and economic importance. Tuberose has gained considerable importance and a versatile crop. It can be successfully grown in pots, beds and borders. The long flower spikes are ecxellent as cut flower for table decoration and bouquets. The loose are widely used for artistic garland, floral ornaments, bouquets, button holes and for extraction of essential oils.

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The natural flower oil of tuberose remains today one of the most expensive of the perfumery's raw materials. Zhou et al. [1] reported the main compounds identified in essential oil includes; 3-cyclohexene-1-methanol, trimethyl-benzoic acid, 2-amino-methyl ester, benzene, 1,2-dimethoxy-4-(1-propenyl)-2,6,10-dodecatried-l-ol, 3,7,11-trimethyl-(E, E) benzyl benzoate, benzoic acid, 2-hydroxy-phenylmethyl ester. Also presence of Methyl iso-eugenol (40.37%) and Indole (1.88%) as major constituents in the absolute obtained from the cultivar of Single petalled florets Shringar, whereas Methyl Palmitate (24.46%) was found to be the major component in the absolute extracted from Double petalled florets of cultivar Vaibhav [2]. Therefore, tuberose is an important flower crop from aesthetic as well as commercial point of view.

In tuberose, less genetic variability and self incompatibility are hindrance to development of new varieties [3]. The productivity of the crop in India is low because of the lack of diversity, weak gene pool, and seed setting problems in addition to the little attention given for improvement of the crop. Keeping this in view, the present investigation was conducted to evaluate and identify the cultivars suitable for north Indian plain with respect to growth and flowering emphasizing on economic traits.

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Materials and Methods

The experiment was conducted during summer season of 2014 at the Horticulture Research Farm, Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, which is located in the northern plains of India. The experimen was laid out in randomized block design comprising thirteen cultivars viz. Local, Mexican Single, Hyderabad Double, Sikkim Selection, Phule Rajani Single, Phule Rajani Double, Suvasani, Prajwal, Shringar, Pearl Double, Hyderabad Single, Calcutta Double and Vaibhav as treatments with three replications. The bulbs were planted on 6th May 2014 in line with a spacing of 20 cm between the rows and 20 cm between the blub. The cultivars were allocated randomly to a unit plot size of 1 m^2 area in each replication. The bulbs were planted in the month of May. The following mean temperatures were recorded during the period of experiment: 2014, May :32.22^{0}C; June: 33.81^{0}C; July: 30.67^{0}C; August: 29.2^{0}C; September: 29.52^{0}C; October: 27.36^{0}C; November: 23.27^{0}C.

Observations were meticulously recorded under two heads: Growth characters viz. days to sprouting; counted from the date of planting to first leaf emergence, length of leaves; measured from the base to the tip of leaves using graduated scale and value expressed in cm, plant spread; measure in north-south and east-west direction and mean value taken and expressed in cm, dry weight of leaves. five leaves were dried in hot air oven for 72 h and the weight was taken on a electronic balance and expressed in gram, dry matter of leaves was calculated taking fresh weight as base and expressed in per cent. Flowering characters viz. days to spike emergence; days to 50% flowering; days to full bloom; were counted from the date of planting, flower life in field condition was recorded from the opening of first floret till the withered of last florets in field condition, length of spike was measured from the prominent base of stalk to the tip of the florets, and florets diameter was measured by using venier calliper and expressed in cm. Recommended manure and fertilizers dose and cultural practices were carefully followed for the experiment conducted. The experimental data obtained are subjected to statistical analysis at 5% level of significance.

Results and Discussion

Growth characters

The experimental data presented in Table 1. indicates that there was significant difference among the cultivars for the different characters under studied. Days to sprouting was recorded minimum in cv Local (500 days) which was significant over all the cultivars under investigation, maximum days to sprouting was recorded in cv Hyderabad Double (11.23 days), also significant to all the cultivars under investigation. Similar findings were reported by Chaturvedi et al. [4]. Days to sprouting were found at par for cultivars;

Table 1. Performance of tuberose cultivars for growth parameters.

CharacterS	Days to sprouting	Length of leaves (cm)	Plant spread (cm)	Dry weight of leaves (g)	Dry matter of leaves (g)
Local	5.0000	34.9333	39.0100	2.4733	11.5167
Mexican Single	9.5567	33.5000	30.9833	1.6733	13.6167
Hyderabad Double	11.2233	35.2100	39.9867	2.0700	12.4800
Sikkim Selection	9.0000	37.3267	41.7600	1.7333	13.9200
Phule Rajni Single	9.0000	32.7300	43.5500	1.8567	13.8233
Phule Rajni Double	8.0000	34.9000	44.6067	1.6900	11.6333
Suvasani	8.1133	35.0033	45.0633	2.2467	13.5867
Prajwal	7.0000	38.8167	36.2200	2.7800	12.9333
Shringar	6.7800	37.1267	38.9433	2.2033	13.3533
Pearl Double	9.7767	30.8033	33.2767	2.3100	14.0000
Hyderabad Single	8.0000	33.5733	34.3333	1.8433	12.8367
Calcutta Double	7.8900	35.0367	38.0700	2.8433	14.3033
Vaibhav	6.6667	33.7500	35.5300	1.6067	12.2967
CD 5%	1.1255	0.7587	1.8811	0.1539	0.7932

Mexican Single (9.55), Sikkim Selection (9.00), Phule Rajani Single (9.00) and Pearl double (9.77). Length of leaves was recorded maximum in cv Prajwal (38.81 cm)and minimum in cv Pearl Double (30.80 cm) which were significant in both cases from all the cultivars. These findings were also reported by Patil et al. [5]. Maximum plant spread was recorded in cv Suvasani (45.06 cm) followed by cv Phule Rajani Single (44.60) which were at par. Minimum was recorded in Mexican Single (30.98 cm) significantly different from all the cultivars studied. Similar findings were also reported by Sateesha et al. [6]. Maximum dry weight was attained by cv Calcutta Double (2.48 g) followed by cv Prajwal (2.78 g) which were at par. Minimum was recorded in cv Vaibhav (1.60 g) which was statistically at par with; cvs. Mexican Single (1.67 g), Sikkim Selection (1.73 g) and Phule Rajani Double (1.69 g). These results were also advocated by Singh and Singh [9]. Maximum dry matter of leaves was attained by cv Calcutta Double (14.30%) but statistically at par with cvs.; Pearl Double (14.00%), Mexican Single (13.68%), Sikkim Selection (13.92%), Phule Rajani Single (13.82%), and Suvasani (13.58%). However, minimum was recorded in cv Loca (11.51%). Similarity result also reported by Singh and Singh [7] and Singh et al. [8]. These variations may be due to genotypic difference among cultivars and it's response to different environmental condition and agro-climatic zone.

Table 2. Performance of tuberose cultivars for flowering parameters.

Characters	Days to spike emergences	Days to 50% flowering	Days to full bloom	Flower life in field	Length of spike (cm)	Number of florets/plant
Local	57.8867	87.4433	95.6667	20.6667	72.6000	35.1833
Mexican Single	82.0000	105.7767	113.0000	16.2200	74.9567	33.3333
Hyderabad Double	91.0000	119.0000	128.5567	20.3333	63.2433	28.7333
Sikkim Selection	136.7800	171.2233	176.1133	17.7800	101.5367	37.9000
Phule Rajni Single	86.8900	115.8900	124.0000	16.3333	54.7200	42.1000
Phule Rajni Double	66.5533	89.0000	100.5533	20.8867	56.9767	39.5667
Suvasani	63.6667	91.8900	106.1100	23.6667	80.2333	41.2333
Prajwal	72.0000	103.4433	109.0000	19.4433	85.1100	33.3333
Shringar	67.0000	93.6667	100.3333	18.7800	68.0567	33.4657
Pearl Double	78.8133	103.5567	114.2233	22.2200	59.9867	43.4333
Hyderabad Single	80.2233	105.5567	114.8900	18.8867	63.0467	39.5900
Calcutta Double	91.4433	112.2233	118.4467	16.6667	66.6767	37.2000
Vaibhav	76.5567	98.7767	110.4433	19.7800	62.3867	30.9667
CD 5%	6.9646	6.2371	6.0148	1.6181	6.7034	1.3685

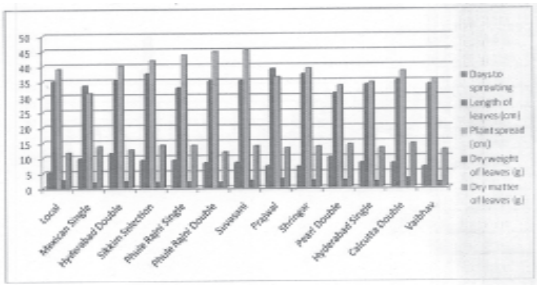

Fig. 1. Performance of tuberose cultivars for growth parameters.

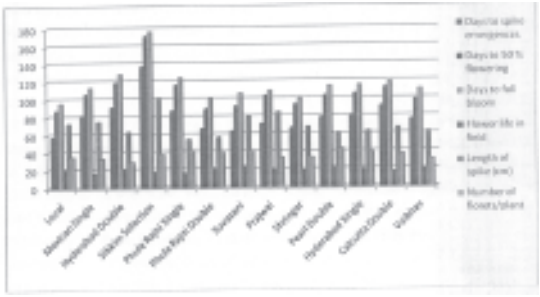

Fig. 2. Performance of tuberose cultivars for flowering parameters.

Flowering characters

Experimental findings on flowering parameters presented in Table 2, showed significant differences in characters studied among cultivars.Days to spike emergence in cv Sikkim Selection (136.78 days) was recorded maximum, which was significantly different from all the cultivars. However, minimum was recorded in cv Local (57.88 days) followed by cv Suvasani (63.66 days) which were at par. Maximum days to 50% flowering was recorded in cv Sikkim Selection (171.22 days), whereas, minimum was recorded in cv Local (87.44 days) statistically at par with cvs Phule Rajani Double (89.00 days), Suvasani (91.89) and Shringar (93.66). Maximum days to full bloom was recorded in cv Sikkim Selection (176.11 days), whereas, minimum was recorded in cv Local (95.66 days), cv Shringar (100.33 days) and cv Phule Rajani Double (100.55 days) were statistically at par. These findings were supported by Ramachandrudu and Thangam [9]. Singh et al. [9], and Chaturvedi et al. [4]. Flower life in field was recorded maximum in cv Suvasani (23.66 days) followed by cv Pearl Double (22.22 days) which were at par. Minimum was recorded in cv Mexican Single (16.22 days) at par with cv Phule Rajani Single (16.33 days), cv Calcutta Double (16.66 days). Similar finding was reported by Mahawer et al. [10], Singh and Singh [7]. Maximum length of spike was recorded in cv Sikkim Selection (101.56 cm) which was statistically significant to all the cultivars. Minimum was recorded in cv Phule Rajani Single (54.72 cm) followed by cv Phule Rajani Double (56.97 cm) and cv Pearl Double (59.98 cm) which were at par. Similar finding was also reported by Ramachandrudu and Thangam [9], Susila [11], Singh and Singh [7] and Chaturvedi et al. [4]. Maximum number of florets per spike was recorded in cv Pearl Double (43.43) followed by cv Phule Rajani Single (42.10) which were at par. Whereas, minimum was recorded in cv. Hyderabad Double (28.73) followed by cv Vaibhav (30.96). Similar finding was also reported by Ramachandrudu and Thangam [9] Singh and Singh [7], Susila [11],Mahawer et al. [10], Chaturvedi et al. [4] and Krishnamoorthy [12]. These variations may be due to genotypic difference among cultivars and its response to different environmental condition and agro-climatic zone. With respect to experimental findings, we can conclude that cv Prajwal, cv Suvasani and cv Local can be recommended for commercial cultivation in northern plain of India under Varanasi Agro-climatic zone.

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