



## Research Article

# EFFECT OF PLANT SPACING ON GROWTH FLOWER QUALITY AND YIELD OF FOUR DIFFERENT VARIETIES OF TUBEROSE (*Polianthes tuberosa*)

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Received: June 28, 2019; Revised: July 11, 2019; Accepted: July 12, 2019; Published: July 15, 2019

**Abstract:** The aim of the study was to find out the effect of plant spacing on flower quality and yield of four different varieties of tuberose (*Polianthes tuberosa*) during 2018-2019. The experiment was conducted in Randomized Block Design with three replications. The results revealed that wider spacing 30cm × 30cm recorded maximum in plant spread (with Arka niranantara), number of leaves (with Arka shringar), floret diameter and spike yield (with Arka prajwal). Medium spacing 30cm × 20cm recorded maximum in days to basal floret opening (with Arka shringar) and spike length (with Arka prajwal). However, low spacing 25cm × 25cm recorded maximum in days to first spike emergence (with Arka prajwal), floret length (with Arka niranantara) and shelf life (with Arka prajwal).

**Keywords:** Tuberose, Spacing, Varieties, Spike, Floret

**Citation:** Sympli H., et al., (2019) Effect of Plant Spacing on Growth Flower Quality and Yield of Four Different Varieties of Tuberose (*Polianthes tuberosa*). International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 11, Issue 13, pp.- 8706-8708.

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**Academic Editor / Reviewer:** Dr Arshad Bhat, Dr N Umashankar Kumar, Dr Vivek Hegde

## Introduction

*Polianthes tuberosa* commonly called as tuberose belonged to the family Amaryllidaceae. It is believed that the native place is Mexico and is popularly known as "Rajnigandha". It is commercially propagated by bulbs. Tuberose is an important commercial loose flower and is mostly used for oil extraction, making garland and floral ornaments. Tuberose are of four types viz. Single (corolla segment has only one row), Semi-double (corolla segments bears double to triple rows), Double (corolla segments bears more than three rows) and Variegated (with golden striped leaf). Of these, single and double are commercially grown on large scale. Single flowers are mostly used as loose flower and are highly fragrant whereas double flowers are used as cut flower purpose. Spacing is an important factor in planting of tuberose. Optimum spacing provides good amount of sunlight, moisture and nutrient availability for successful crop production and quality, high plant growth and yield. Planting at a wider spacing records higher plant height, maximum number of leaves and spikes per clump per plant and longer flowering duration [1].

## Materials and Methods

The investigation was carried out during 2018-2019 at Horticulture Research Field, Sam Higginbottom University of Agriculture Technology & Sciences, Prayagraj (Uttar Pradesh), India. The treatments comprised of three levels of spacing viz. 30cm × 30cm, 25cm × 25cm and 30cm × 20 cm and four varieties viz. Arka sugandhi, Arka prajwal, Arka niranantara and Arka shringar. The 12 treatment combinations T<sub>1</sub> 30cm × 30cm + Arka sugandhi, T<sub>2</sub> 25cm × 25cm + Arka sugandhi, T<sub>3</sub> 30cm × 20cm + Arka sugandhi, T<sub>4</sub> 30cm × 30cm + Arka prajwal, T<sub>5</sub> 25cm × 25cm + Arka prajwal, T<sub>6</sub> 30cm × 20cm + Arka prajwal, T<sub>7</sub> 30cm × 30cm + Arka niranantara, T<sub>8</sub> 25cm × 25cm + Arka niranantara, T<sub>9</sub> 30cm × 20cm + Arka niranantara, T<sub>10</sub> 30cm × 30cm + Arka shringar, T<sub>11</sub> 25cm × 25cm + Arka shringar and T<sub>12</sub> 30cm × 20cm + Arka shringar was conducted in Randomized Block Design. Bulbs were planted in each plot with different spacing at 5cm depth. The observations on growth, flowering and yield parameters were recorded and analysed statistically.

## Results and Discussion

### Vegetative growth

The data presented in [Table-1] and [Fig-1] revealed that the maximum plant spread was recorded in T<sub>7</sub> 30cm × 30cm + Arka niranantara (55.10cm) which was statistically at par with T<sub>10</sub> (55.00cm) whereas minimum plant spread was recorded in T<sub>2</sub> (36.63cm). Table 1 and fig.1 revealed that the maximum number of leaves was recorded in T<sub>10</sub> 30cm × 30cm + Arka shringar (41) followed by T<sub>12</sub> (38.67) which was significantly different with each other whereas minimum number of leaves was recorded in T<sub>2</sub> (28.00cm). The wider spacing recorded maximum vegetative growth. This is due to better uptake of moisture, nutrients and better utilization of sunlight at wider spacing [2-4].

### Flowering

The data presented in [Table-1] and [Fig-1] revealed that the least number of days for spike emergence was recorded in T<sub>5</sub> 25cm × 25cm + Arka prajwal (59.67 days) which was statistically at par with T<sub>6</sub>, T<sub>12</sub>, T<sub>4</sub>, T<sub>10</sub> and T<sub>11</sub> (60, 61, 63.3, 64 and 65 days respectively) and maximum number of days for spike emergence was recorded in T<sub>2</sub> (101.67 days). Low and medium spacing recorded least number of days for spike emergence in different varieties. The data presented in table 1 and fig.1 revealed that the least number of days for basal floret opening was recorded in T<sub>12</sub> 30cm × 20cm + Arka shringar (70 days) which was statistically at par with T<sub>5</sub> (71.33 days), T<sub>6</sub> (71.33 days), T<sub>10</sub> (72.67 days) and T<sub>11</sub> (73 days) and maximum number of days for basal floret opening was recorded in T<sub>2</sub> (113.33 days). The minimum number of days taken for flowering in wide and medium spacing was due to availability of adequate sunlight and nutrition, proper plant space, air and water [5-7].

### Flower quality

The data presented in [Table-1] and [Fig-2] revealed that the maximum spike length was recorded in T<sub>6</sub> 30cm × 20cm + Arka prajwal (93.17cm) which was statistically at par with T<sub>5</sub> (86.30cm) and the minimum spike length was recorded in T<sub>2</sub> (46.17cm).

Table-1 Effect of plant spacing on four different varieties of tuberose.

Treatment No.	Treatment Combination	Plant spread (cm)	Number of leaves	Days to first spike emergence (days)	Days to basal floret opening (days)	Spike length (cm)	Floret diameter (cm)	Floret length (cm)	Shelf life (hours)	Spike yield per plant
T <sub>1</sub>	30cm x 30cm + Arka sugandhi	39.17	32.00	87.33	98.67	46.33	2.97	5.00	48.00	2.33
T <sub>2</sub>	25cm x 25cm + Arka sugandhi	36.63	28.00	101.67	113.33	46.17	3.07	4.70	43.33	1.67
T <sub>3</sub>	30cm x 20cm + Arka sugandhi	41.90	30.33	99.67	106.33	43.63	3.53	5.37	46.67	1.67
T <sub>4</sub>	30cm x 30cm + Arka prajwal	50.47	36.00	63.33	74.33	72.53	5.77	5.57	65.67	3.33
T <sub>5</sub>	25cm x 25cm + Arka prajwal	47.97	32.67	59.67	71.33	86.30	4.33	6.00	67.33	3.33
T <sub>6</sub>	30cm x 20cm + Arka prajwal	48.93	34.67	60.00	71.33	93.17	4.50	5.90	48.00	3.00
T <sub>7</sub>	30cm x 30cm + Arka nirantara	55.10	35.00	99.33	110.00	80.00	4.03	5.97	47.00	3.33
T <sub>8</sub>	25cm x 25cm + Arka nirantara	51.53	31.67	75.33	83.00	80.80	3.77	6.33	46.00	3.33
T <sub>9</sub>	30cm x 20cm + Arka nirantara	53.00	33.00	86.33	97.67	80.23	3.77	5.70	43.33	2.33
T <sub>10</sub>	30cm x 30cm + Arka shringar	55.00	41.00	64.00	72.67	60.30	4.07	5.37	46.00	3.00
T <sub>11</sub>	25cm x 25cm + Arka shringar	50.20	37.33	65.00	73.00	61.17	4.10	5.30	47.00	3.33
T <sub>12</sub>	30cm x 20cm + Arka shringar	51.83	38.67	61.33	70.00	73.03	3.57	5.13	43.00	3.00
	C.D. at 5%	1.54	1.51	19.93	20.52	11.04	0.67	0.73	8.32	1.02
	F-test	S	S	S	S	S	S	S	S	S
	S.Ed. (±)	0.74	0.73	9.5	9.83	5.29	0.32	0.34	3.98	0.49

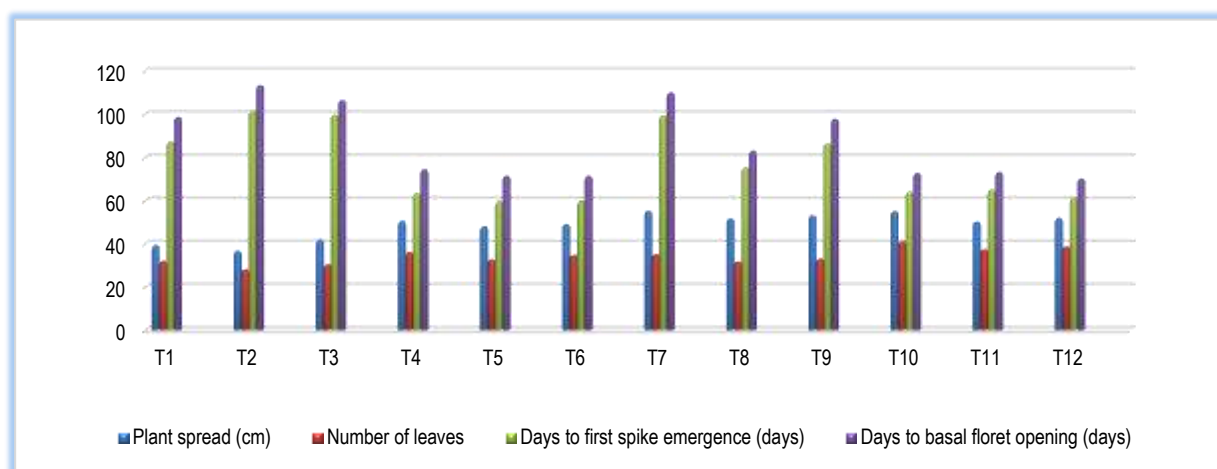


Fig-1 Effect of plant spacing on plant spread, number of leaves, days to first spike emergence and days to basal floret opening of four different varieties of tuberose

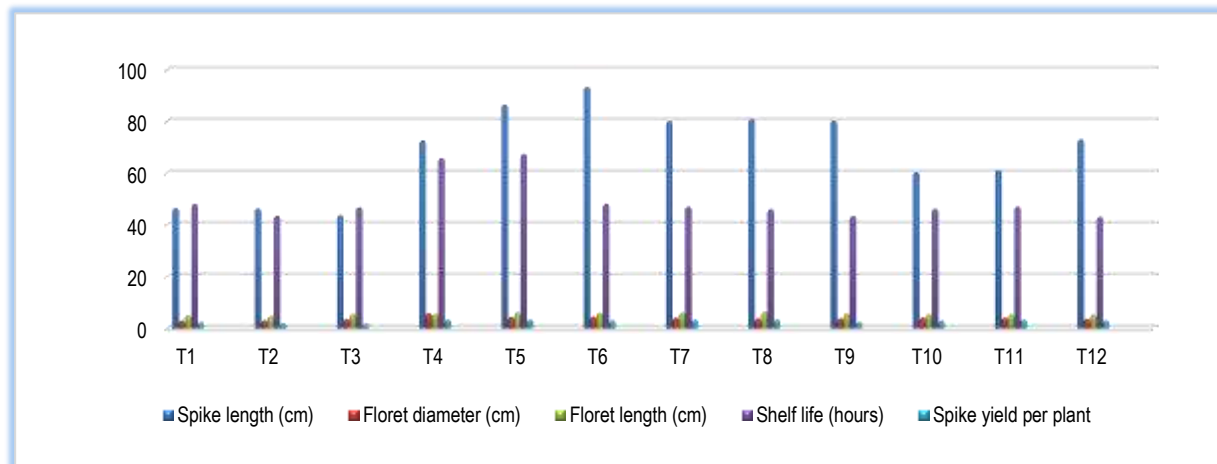


Fig-2 Effect of plant spacing on spike length, floret diameter, floret length, shelf life and spike yield per plant of four different varieties of tuberose

The plants at medium and wide spacing grows more rapidly as there is more uptake of moisture, nutrients and more amount of sunlight as compared to closer spacing. Similar result was supported by [8] and [9]. The data presented in [Table-1] and [Fig-2] revealed that the maximum floret diameter was recorded in T<sub>4</sub> 30cm x 30cm + Arka prajwal (5.77cm) followed by T<sub>11</sub> (4.1cm) was significantly different with each other whereas the minimum floret diameter was recorded in T<sub>1</sub> (2.97cm). Wider spacing shows significant effect in floret diameter. In wider spacing the plants grow well as there is less competition between the plants for sunlight. Similar result was supported by [10] and [11]. The data presented in [Table-1] and [Fig-2] revealed that the maximum floret length was recorded in T<sub>8</sub> 25cm x 25cm + Arka nirantara (6.33cm) which was statistically at par with T<sub>5</sub>

(6.00cm), T<sub>7</sub> (5.97cm), T<sub>6</sub> (5.90cm) and T<sub>9</sub> (5.70cm) whereas the minimum floret length was recorded in T<sub>2</sub> (4.70cm). Low spacing shows significant effect in floret length. This is due to different character of the cultivars that responded differently to the environment. Similar result was supported by [12]. The data presented in [Table-1] and [Fig-2] revealed that the maximum shelf life was recorded in T<sub>5</sub> 25cm x 25cm + Arka prajwal (67.33hours) which was statistically at par with T<sub>4</sub> (65.67hours) whereas the minimum shelf life was recorded in T<sub>12</sub> (43.00 hours). Variations in shelf life can also be attributed to the differential accumulation of carbohydrates due to varied leaf production, flower size and sensitivity of cultivars to ethylene. Similar result was supported by [13] and [14].

## Flower yield

The data presented in [Table-1] and [Fig-2] revealed that the maximum spike yield per plant (3.33) was recorded in T<sub>4</sub> 30cm x 30cm + Arka prajwal, T<sub>5</sub> 25cm x 25cm + Arka prajwal, T<sub>7</sub> 30cm x 30cm + Arka nirantara, T<sub>8</sub> 25cm x 25cm + Arka nirantara and T<sub>11</sub> 25cm x 25cm + Arka shringar which was statistically at par with (3.00) T<sub>6</sub>, T<sub>10</sub> and T<sub>12</sub> whereas the minimum spike yield per plant was recorded (1.67) in T<sub>2</sub> and T<sub>3</sub>. The increased yield might be due to its capacity to produce maximum number of spikes per plant which is a genetic makeup of the genotype [15,16].

## Conclusion

Based on the above discussion, it is observed that different spacing has different effects on different varieties. But of all the observations spacing 30cm x 30cm and variety Arka prajwal was found to be the best whereas minimum observations was recorded in T<sub>2</sub>.

**Application of research:** Study of growth flower quality and yield of four different varieties of tuberose

**Research Category:** Horticulture, Floriculture

**Acknowledgement / Funding:** Authors are thankful to Department of Horticulture, Floriculture and Landscaping, Sam Higginbottom University of Agriculture Technology & Sciences, Prayagraj, Uttar Pradesh, 211007, India.

**\*Research Guide or Chairperson of research:** Dr Urfi Fatmi and Dr Devi Singh

University: Sam Higginbottom University of Agriculture Technology & Sciences, Prayagraj, Uttar Pradesh, 211007

Research project name or number: PhD Thesis

**Author Contributions:** All authors equally contributed

**Author statement:** All authors read, reviewed, agreed and approved the final manuscript. Note-All authors agreed that- Written informed consent was obtained from all participants prior to publish / enrolment

**Study area / Sample Collection:** Horticulture Research Field, Sam Higginbottom University of Agriculture Technology & Sciences, Prayagraj

**Cultivar / Variety / Breed name:** Tuberose (*Polianthes tuberosa*) - Arka nirantara, Arka shringar, Arka Prajwal, Arka sugandhi

**Conflict of Interest:** None declared

**Ethical approval:** This article does not contain any studies with human participants or animals performed by any of the authors.

Ethical Committee Approval Number: Nil

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