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## Qualitative and post-harvest studies on tuberose

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#### Abstract

An experiment was carried out at the department of Floriculture and Landscaping, College of Agriculture, Padannakkad, Kasaragod to evaluate tuberose varieties for qualitative and post-harvest characters during the period of 2019-2020. The experiment was laid out in randomized block design using ten varieties and three replications. In the present study concrete recovery ranges from 0.117 to 0.012 %. Maximum concrete obtained from the variety Arka Sugandhi (0.117%). Longest vase life were recorded in variety Culcutta Double (8.53 days) followed by Arka Suvasini (8.13 days) which are significantly on par. Fresh weight of spike found to be maximum in Arka Suvasini (133.52 g). Amount of water uptake recorded highest in Arka Niranthara (10.80 ml).

**Keywords:** tuberose, varieties, concrete, vase life

#### Introduction

Floriculture is a fast emerging major venture in the world. Now a days, floriculture is lucrative profession with more returns per unit area than other agricultural or horticultural crops. In India area under floriculture was 324 thousand hectares with a production of 823 thousand metric tonnes of loose flowers and 1962 thousand metric tonnes of cut flowers (NHB, 2017-18) [12]. Among the wide varieties of commercially cultivated flowers in India tuberose (*Polianthes tuberosa* L.) occupies an important position due to its popularity as cut flower as well as loose flower. The flowers of tuberose are source of essential oil also, which is considered as one of the most valuable perfumery material in the world because of its beautiful fragrance. Its unique and exotic aroma strengthen and rejuvenate an individual's mind and body. It also has anti-inflammatory and antispasmodic properties. The long lasting flower spikes are largely used for vase decoration, flower arrangement and bouquet preparations. Loose flowers have great demand for making garland, veni, worshipping and offerings in religious functions and auspicious days.

Flowers are highly perishable in nature which are vulnerable to large postharvest losses. Delayed flower senescence and good presentability are essential for the marketable flowers and are also important goal for researcher. As the large scale cultivation of tuberose is gaining popularity, the present study was carried out to evaluate tuberose varieties for quality and post-harvest characters.

#### Materials and methods

The materials used for the experiment were ten genotypes of tuberose (*Polianthes tuberosa* L.) comprising viz. single (7 genotypes), semi-double (1 genotype) and double (2 genotypes). The bulbs of genotype Arka prajwal, Arka niranthara, Arka shringar, Arka sugandhi, Arka suvasini and Arka vaibhav being collected from the Department of Floriculture and Landscaping, Indian Institute of Horticultural Research, Bangalore and other genotypes Culcutta single, Culcutta double, Bidhan ujwal and Phule rajani were collected from Bidhan Chandra Krishi Viswavidyalaya, Mohanpur. The experiment was laid out in Randomized Block Design with three replications having forty plants per each replication under open field condition. Land was brought to a fine tilth by tractor ploughing and levelled properly. Pest and disease free bulbs, preferably those of size 2-5 cm were selected for planting. Uniform cultural operations and crop management practices were carried out in all varieties during the period of study. The varieties were screened for qualitative and post-harvest parameters and the observations were taken from five randomly selected and tagged plants per replication.

Observations on bud colouration, Floret colouration and Pigmentation on peduncle are recorded based on the guidelines for the conduct of test for Distinctiveness, Uniformity and Stability. The method of extraction of concrete from tuberose florets was standardized.

Solvent extraction was best suited for tuberose. In this method, flowers which are about to open were harvested carefully at early morning as crushing would damage concrete recovery. Florets were cut into small bits and soaked in 20 ml hexane and left over night. Hexane was filtered in the next morning. The flower bits were rinsed with fresh hexane and the entire hexane fraction was evaporated in a rotary evaporator at 50-55°C to get semi liquid yellow coloured concrete.

For the studies on post-harvest characters of tuberose varieties, spikes were harvested in early morning hours using sharp knife when the lower most two florets shows colour. Placed in bucket containing water to remove field heat and immediately brought to the laboratory. Spikes were placed in 250 ml conical flasks containing distilled water.

The mean value of the data recorded was taken to represent a particular variety with respect to a character. The observation recorded on various biometric parameters were subjected to statistical analysis.

## Results and discussion

### Qualitative characters

The data recorded for qualitative characters are represented in Table. 1a and 1b.

Most of the varieties under study showed pinkish green colouration on bud. Buds of Arka Vaibhav and Arka Sugandhi was green in colour. Whereas variety Bidhan Ujwal observed with yellowish green buds. There was no significant variation observed in floret colouration among the ten varieties studied. All the varieties showed white florets. Arka Niranthara, Arka Sugandhi and Culcutta Double have strong pigmentation on peduncle. Whereas varieties like Arka Vaibhav, Arka Shringar, Arka Suvasini, Phule Rajani and Culcutta Single have medium pigmentation on peduncle. Peduncle have weak pigmentation in Arka Prajwal and Bidhan Ujwal.

Variation in bud colouration, floret colouration and intensity of pigmentation on peduncle is due to different genetic makeup and colouring pigment present in the different cultivars under study. Pinkish colouration may be due to flavonoid pigments and greenish may be due to chlorophyll pigments present in these cultivars. Similar findings were reported by Mahawer *et al.* (2013) [9] in tuberose.

Now a days tuberose flowers being widely used in perfumery industry as a source of natural essential oils and aroma compounds due to its unique and exotic aroma. Concrete represent crude form of essential oil. Selection of different genotypes in terms of concrete recovery is the primary base for breeding programme. In the current investigation concrete recovery ranges from 0.117 to 0.012 %. Maximum concrete obtained from the variety Arka Sugandhi (0.117%) followed by Culcutta Single (0.079%). Minimum concrete content was recorded by variety Arka Vaibhav (0.012%).

Single type cultivars had more concrete content compared to semi double and double type cultivars and also concrete recovered from single petalled tuberose has stronger aroma than the aroma obtained from double petalled tuberose concrete, it might be due to accumulation of more fragrant components in single type. The results were in conformity with the findings of Mahoviya (2003) [10], Martolia (2010) [11] and Chaudhari and Kumar (2017) [2] in tuberose. Stage of harvest, growing environmental condition, season and method of extraction have significant influence on the recovery of concrete. Variation in concrete content of harvested flowers in

different months may be due to variation in temperature, as the temperature increases concrete recovery decreases due to evaporation of volatile aromatic compounds and reduction in weight of flowers. Kumar *et al.* (2013) [5, 6] reported similar results in damask rose under Indian condition.

**Table 1a:** Tuberose varietal influence on bud colouration, floret colouration and pigmentation on peduncle

Sl. No.	Treatments (Varieties)	Bud colouration	Floret colouration	Pigmentation on peduncle
1	Arka Vaibhav	Green	White	Medium
2	Arka Prajwal	Pinkish green	White	Weak
3	Arka Niranthara	Pinkish green	White	Strong
4	Arka Shringar	Pinkish green	White	Medium
5	Arka Suvasini	Pinkish green	White	Medium
6	Arka Sugandhi	Green	White	Strong
7	Bidan Ujwal	Yellowish green	White	Weak
8	Phule Rajani	Pinkish green	White	Medium
9	Culcutta Single	Pinkish green	White	Medium
10	Culcutta Double	Pinkish green	White	Strong

**Table 1b:** Tuberose varietal influence on concrete recovery

Sl. No.	Treatments (Varieties)	Concrete recovery (%)
1	Arka Vaibhav	0.012
2	Arka Prajwal	0.023
3	Arka Niranthara	0.023
4	Arka Shringar	0.030
5	Arka Suvasini	0.017
6	Arka Sugandhi	0.117
7	Bidan Ujwal	0.033
8	Phule Rajani	0.020
9	Culcutta Single	0.079
10	Culcutta Double	0.019
	C.D (p=0.05)	0.016
	SEm (±)	0.005

### Post-harvest spike characters

The data recorded for post-harvested characters are depicted in Table 2.

Flowers are more vulnerable to post harvest losses due to its high perishability. Prolonged post-harvest life of flower is essential to satisfy the consumers. The major factors which leads to the deterioration of harvested flowers are; Pre-harvest factors, Harvest factors and Post-harvest factors (Gupta and Dubey, 2018) [3].

Fresh weight of spike is an important parameter which indicates the size and freshness. High moisture content leads to more weight of spike. The growing environmental condition have significant influence on this parameter. In the present study variety Arka Suvasini (133.52g) followed by Culcutta Double (115.21g) recorded maximum value for this parameter and minimum was recorded by Arka Sugandhi (36.81g). Maximum fresh weight of spike in Arka Suvasini and Culcutta Double might be due to double type (more than 3 rows of corolla segments) nature of flower. The minimum value in Arka Sugandhi might be due to its single type (one row of corolla segment) nature. Mahoviya (2003) [10] and Kumar *et al.* (2018) [8] reported similar results previously in tuberose.

In the present investigation vase life of tuberose varies significantly among different cultivars. Maximum vase life was recorded in variety Culcutta Double (8.53 days) followed by Arka Suvasini (8.13 days) which are significantly on par. Minimum number of days in vase was recorded in variety Arka Sugandhi (6.53 days). Performance of spike in vase determines the quality of tuberose as cut flower. Variation in

vase life might be due to difference in genetic makeup of the cultivars and it is directly related to the number of florets per spike. More the number of florets it will takes longer time to open the last floret in spike. It is in accordance with the findings Angmo (2017) [1] and Kumar *et al* (2018) [8] in tuberose. Better vase life may be due to the longer spike length, hence it can absorb more water thereby maintain high turgidity and freshness of spike. Moreover, longer spike containing higher amount of reserved carbohydrates. This is in line with the findings of Varu and Barad (2010) [15] in tuberose.

Freshness of cut flower is directly correlated with uptake of water. Deficiency of water and wilting of flower occurs when the rate of transpiration exceeds the rate of absorption. In the current study amount of water uptake is significantly influenced by the varietal difference. Maximum water uptake (10.80 ml) was recorded by variety Arka Niranthara and minimum was recorded in Arka Sugandhi and Bidhan Ujwal

which are statistically on par. Longer spike can absorb more amount water due to greater area of xylem as well as more amount of reserved carbohydrates. Lower pH of holding solution may be one of the reason for greater uptake of water. Blockage of xylem vessels by air, microorganism like bacteria, fungi, *etc.* will interrupt the upward movement of water this will lead to water deficit in cut flowers. Variation in amount of water uptake by cut spikes was previously reported by Singh *et al.* (2018) [14], Kumar *et al.* (2018) [8] in tuberose, Kumar *et al.* (2007) [7] in gladiolus and Kim *et al.* (2004) [4] in gerbera.

Number of florets opened at a time increases the attractiveness of cut spike in vase. The variation in number of florets opened at first day was noticed by Singh *et al.* (2017) [13]. Number of florets opened at the first day was maximum in variety Arka Shringar followed by Bidhan Ujwal (4.33 and 4, respectively).

**Table 2:** Tuberose varietal influence on post-harvest characters

Sl. No.	Treatments (Varieties)	Fresh weight of spike (g)	Vase life days	No. of florets opened on first day	Water uptake (ml)
1	Arka Vaibhav	70.54	6.93	2.33	7.27
2	Arka Prajwal	110.67	7.20	2.67	9.80
3	Arka Niranthara	67.10	7.20	3.01	10.80
4	Arka Shringar	59.19	7.33	4.33	6.53
5	Arka Suvasini	133.52	8.13	2.67	9.00
6	Arka Sugandhi	36.81	6.53	3.01	4.87
7	Bidan Ujwal	48.39	6.73	4.00	4.87
8	Phule Rajani	53.51	7.13	1.67	6.07
9	Culcutta Single	59.42	7.07	2.67	7.20
10	Culcutta Double	115.21	8.53	3.01	9.33
	C.D (p=0.05)	15.62	0.70	0.015	0.90
	SEm (±)	5.22	0.23	0.005	0.30

## Conclusion

Single type cultivars had more concrete content compared to semi double and double type cultivars. Variation in bud colouration, floret colouration and intensity of pigmentation on peduncle is due to different genetic makeup and colouring pigment present in the different cultivars under study. Longest vase life were recorded in variety Culcutta Double (8.53 days) followed by Arka Suvasini (8.13 days) which are significantly on par. Fresh weight of spike found to be maximum for Arka Suvasini (133.52 g). Amount of water uptake highest in Arka Niranthara (10.80 ml).

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