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Studies on vase life of different cultivars of tuberose (*Polianthes tuberosa* Linn)

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Abstract

The present investigation entitled “Studies on vase life of different cultivars of tuberose (*Polianthes tuberosa* Linn)” was conducted during the period from September, 2016 to January, 2017 at the Department of Floriculture and Landscape Architecture, K.N.K. College of Horticulture, Mandsaur, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (M.P.). The varietal difference had significant influence on the vase life parameters and biochemical parameters of tuberose in the present study. Among the varieties studied Suvasini recorded the maximum fresh weight (g) of cut spike during the all stages of observation (at harvest, on 3rd day and 5th day in vase and at senescence). Suvasini recorded the maximum moisture percent of cut spike both at harvest and at senescence. Suvasini recorded the maximum water uptake (ml) in vase during all the stages (on 3rd day and 5th day in vase and at senescence i.e., total water uptake) Suvasini recorded the maximum number of florets per spike, length of florets (cm) and diameter of florets (cm) Suvasini recorded the longest vase life (days) of cut spike Suvasini recorded the maximum sugar content (mg/g fresh weight) in petals. Suvasini recorded the maximum peroxidase content (Units g tissue⁻¹ min⁻¹) in petals.

Keywords: tuberose cultivars, vase- life, post harvest studies for cut spike and biochemical

Introduction

Tuberose (*Polianthes tuberosa* Linn.) commonly known as ‘Rajnigandha’ is a bulbous summer flowering perennial ornamental plant which belongs to the family Amaryllidaceae. The basic chromosome number of tuberose is $n = x = 30$ and $2n = 60$. It is considered to have originated in Mexico. It is believed that tuberose was brought to India via Europe in 16th century. The name tuberose is derived from tuberosa, this plant being the tuberous hyacinth as distinguished from the bulbous hyacinth. The generic name *Polianthes* is derived from Greek word *Polis* meaning white and *Anthos* meaning flower. It is grown in many tropical and subtropical parts of the world. In India, it is commercially grown in West Bengal, Karnataka, Tamil Nadu and Maharashtra. It is a multipurpose flower which is used for artistic garlands, floral ornaments, bouquets and buttonholes. The long flower spikes are excellent as a cut flower for table decoration when arranged in vases. It is commercially cultivated for cut and loose flower trade, and also for extraction of its highly valued natural flower oil which is used in high value perfumes and cosmetic products. The use of different tuberose varieties for cut flower has proved to be beneficial for increasing their vase life and quality. Tuberose (*Polianthes tuberosa* Linn.) is essentially a florist’s flower and a leading commercial crop because of its multipurpose use. Due to its immense fragrance and highly valued natural flower oil it is cultivated on a large scale in some parts of the world. The flower spikes last for a long duration and withstand long distance transportation. Different varieties like Vaibhav, Pearl Double, Calcutta Double, JK T – 4, Mexican Single, Srinagar, Suvasini, Phule Rajani, Hyderabad Single, and Hyderabad Double have been reported by various research workers in vase solution to improve the vase life quality of cut tuberose.

Materials and Methods

The present investigation entitled “Studies on vase life of different cultivars of tuberose (*Polianthes tuberosa* Linn)” was carried out in the laboratory of the Department of Floriculture and Landscaping and the Department of Biochemistry, K.N.K. college of Horticulture, Mandsaur (M.P.) during the period from September, 2016 to January, 2017. Single and Double tuberose flowers were taken for studies. The details of the technique followed and materials used during the period of experimentation are described below:

The experiment was laid out in Completely Randomized Design with three replications. Tuberose varieties like Vaibhav, Pearl Double, Calcutta Double, JK T- 4, Mexican Single, Shringar, Suvasini, Phule Rajani, Hyderabad Single, and Hyderabad Double was used for the experiment. The observations on different vase life parameters and biochemical analysis were recorded and the results obtained are summarized below. These varieties grow in the field, standard packages of cultural practices were followed during the field experiment. For Studies on vase life of different cultivars of tuberose (*Polianthes tuberosa* Linn) the cut spikes were harvested in the morning when two lower florets of spike shows color are harvested with the help of sharp knife and placed in bucket containing water and immediate brought to the laboratory. Spikes were placed in 250 ml conical flasks which contain distilled water. During the experiment basal ends of spikes were re-cut 1.00 cm, with the help of sharp knife to proper uptake of distilled water solution. Different observations were recorded with the help of essential tools and equipments and these data statistically analyzed.

Results and Discussion

1. Vase life parameters

Significant varietal difference was observed in increase in fresh weight (g) of cut spike from harvest to 3rd day in vase and decrease in fresh weight (g) of cut spike in vase from 5th day to senescence. The vase life parameters like fresh weight (g) of cut spike (at harvest, on 3rd day and 5th day in vase and at senescence, moisture percent of cut spike both at harvest and at senescence, water uptake (ml) on 3rd day and 5th day in vase and at senescence i.e., total water uptake, floret characters like number of florets per spike, length of florets (cm) and diameter of florets (cm) as well as vase life of cut spike (days) were significantly influenced by the varietal difference.

2. Fresh weight (g) of cut spike

In the current investigation it was observed that fresh weight (g) of cut spike was significantly influenced by the varietal difference. Suvasini recorded the maximum fresh weight (g) of cut spike followed by Phule Rajani, Vaibhav and Shringar during the all stages of observation (at harvest, on 3rd day and 5th day in vase and at senescence). The minimum fresh weight (g) of cut spike during all these stages of observation was recorded by JK T-4. Variation in fresh weight (g) might be due to different genetic make-up of the different cultivars and prevailing environment conditions. Present findings are in accordance with the findings of Mahawer *et al.* (2008) in tuberose and gladiolus. Similar results were recorded by Horo *et al.* (2009)^[10] and Choudhary *et al.* (2011) in gladiolus.

3. Moisture percent of cut spike

In the present investigation it was observed that moisture percent of cut spike both at harvest and at senescence was significantly influenced by the varietal difference. Suvasini recorded the maximum moisture percent of cut spike followed by Phule Rajani, Vaibhav and Shringar while the minimum moisture percent of cut spike was recorded by JK T- 4. In all the varieties studied the moisture percent in cut spike reduced from harvest to senescence. These results were in accordance with Varun and Barad (2010) in tuberose.

4. Water uptake (ml) in vase

In the present investigation it was observed that water uptake

(ml) in vase during all the stages (on 3rd and 5th day in vase and at senescence i.e., total water uptake) was significantly influenced by the varietal difference. Suvasini recorded the maximum water uptake followed by Phule Rajani, Vaibhav and Shringar and the minimum water uptake was recorded by JK T-4. The results are in line with the findings of Kumar *et al.* (2016)^[12, 13] in tuberose and Patra and Mohanty (2015)^[21] also in gladiolus. Kumar *et al.* (2016)^[12, 13] observed significant difference in water uptake by the spikes harvested at different stages. Spikes harvested at partially open stage recorded maximum water uptake. Similar results have been reported by Jain *et al.* (2015)^[11] in tuberose.

5. Number of florets per spike, length of florets (cm) and diameter of florets (cm)

In the present investigation it was observed that all floral characters were significantly influenced by the varietal difference. Suvasini recorded the maximum number of florets per spike, length of florets (cm), and diameter of florets (cm) followed by Phule Rajani, Vaibhav and Shringar. The minimum values in all these parameters were recorded by JK T- 4. The variation in number of florets per spike, length of florets (cm) and diameter of florets (cm) may be due to genetic variability among the different cultivars of tuberose and prevailing environmental condition during field trial. Present findings are in conformity with the findings of Ramachandrudu and Thangam (2010) in tuberose. Also noted significant variation for same parameters in gladiolus. Similar results were reported by gladiolus. In the present investigation it was observed that vase life of cut spike was significantly influenced by the varietal difference. Suvasini recorded the longest vase life of cut spike followed by Phule Rajani, Vaibhav and Shringar. The shortest vase life was recorded by JK T- 4. The variation in vase life might be due to genetical make up of the plants. Horo *et al.* (2009)^[10], Pasannavar (1994)^[19] and Gupta *et al.* (2002)^[9] also reported similar results on the variation of vase life in gladiolus. Similar results are in conformity and Kumar and Roy (2012) in gladiolus. Variation in vase life may be attributed to the differential accumulation of carbohydrates due to varied leaf production and sensitivity of cultivars to ethylene. Variation in these aspects might also be due to genetical make up of the plants in gladiolus. Similar results for vase life were reported by gladiolus The variation among the cultivars was mainly because of genetical factors. Variations expected among the accessions of dahlia, Dhane and Nimbalkar (2002)^[6]. Similar results were supported by the gerbera.

6. Sugar content (mg/g fresh weight)

In the present investigation it was observed that the sugar content was influenced significantly by varietal difference. The maximum sugar content (total sugar, reducing sugar and non reducing sugar) was recorded by Suvasini followed by Phule Rajani, Vaibhav, and Shringar. The minimum sugar content was recorded by JK T- 4. The variation in varietal difference was observed that a dramatic decrease in sugar content was reported earlier by Arora *et al.* (2007) in tuberose and Faraji *et al.* (2011)^[7] also in gladiolus. Similar results have been recorded by Singh (2005), in gladiolus in day lily.

7. Peroxidase activity (Units g tissue-1 min.-1)

In the present investigation it was observed that the peroxidase content was influenced significantly by varietal difference. The maximum peroxidase content was recorded by Suvasini followed by Phule Rajani, Vaibhav and Shringar.

The minimum peroxidase content was recorded by JK T- 4. Vijaya Bhaskar *et al.* (2006) reported a marked increase and then a subsequent decrease in the peroxidase (POD) activity, which explains the onset of senescence in rose petals. Shewfelt and Del Rosario (2000) reported that the lipid peroxidation is generally relegated to the status of a secondary effect of a primary event responsible for the degradation process, could actually be a critical, controllable event common to the mechanism of many of the post harvest disorders

Conclusions

The varietal difference had significant influence on the vase life parameters and biochemical parameters of tuberose in the

present study. Among the varieties studied Suvasini recorded the maximum fresh weight (g) of cut spike during the all stages of observation (at harvest, on 3rd day and 5th day in vase and at senescence). Suvasini recorded the maximum moisture percent of cut spike both at harvest and at senescence. Suvasini recorded the maximum water uptake (ml) in vase during all the stages (on 3rd day and 5th day in vase and at senescence i.e., total water uptake) Suvasini recorded the maximum number of florets per spike, length of florets (cm) and diameter of florets (cm) Suvasini recorded the longest vase life (days) of cut spike Suvasini recorded the maximum sugar content (mg/g fresh weight) in petals. Suvasini recorded the maximum peroxidase content (Units g tissue⁻¹ min.⁻¹) in petals.

Table 1: Fresh weight (g) of cut spike

| Variety | Fresh weight (g) at harvest | Fresh weight (g) on 3 rd day | Fresh weight (g) on 5 th day | Fresh weight (g) at senescence |
|------------------|-----------------------------|---|---|--------------------------------|
| Vaibhav | 36.37 | 38.53 | 32.83 | 32.17 |
| Pearl Double | 35.33 | 35.83 | 32.40 | 31.40 |
| Calcutta Double | 34.20 | 34.55 | 31.50 | 30.43 |
| JK T- 4 | 31.50 | 32.50 | 28.70 | 24.23 |
| Mexican Single | 33.10 | 33.50 | 29.63 | 27.80 |
| Shringar | 35.82 | 36.52 | 32.55 | 31.73 |
| Suvasini | 39.00 | 41.00 | 36.00 | 34.00 |
| Phule Rajani | 37.23 | 39.25 | 34.23 | 32.55 |
| Hyderabad Single | 33.43 | 33.85 | 29.90 | 28.67 |
| Hyderabad Double | 32.33 | 33.17 | 29.30 | 26.30 |
| S.E.M. | 0.20 | 0.22 | 0.20 | 0.22 |
| CD (%) | 0.59 | 0.64 | 0.59 | 0.63 |

Table 2: Moisture percent of cut spikes

| Variety | Moisture percent at harvest | Moisture percent at senescence |
|------------------|-----------------------------|--------------------------------|
| Vaibhav | 79.79 | 47.52 |
| Pearl Double | 76.64 | 45.27 |
| Calcutta Double | 75.51 | 43.31 |
| JK T- 4 | 71.76 | 37.52 |
| Mexican Single | 73.34 | 41.22 |
| Shringar | 77.39 | 45.88 |
| Suvasini | 84.07 | 51.55 |
| Phule Rajani | 80.83 | 49.50 |
| Hyderabad Single | 74.61 | 42.27 |
| Hyderabad Double | 72.72 | 40.18 |
| S.E.M. | 0.55 | 0.67 |
| CD (%) | 1.62 | 1.96 |

Table 3: Water uptake (ml) in vase

| Variety | Water uptake on 3 rd day (ml) | Water uptake on 5 th day (ml) | Total water uptake (ml) |
|------------------|--|--|-------------------------|
| Vaibhav | 32 | 35 | 67 |
| Pearl Double | 30 | 33 | 63 |
| Calcutta Double | 29 | 32 | 61 |
| JK T- 4 | 25 | 28 | 53 |
| Mexican Single | 27 | 30 | 57 |
| Shringar | 31 | 34 | 65 |
| Suvasini | 35 | 38 | 73 |
| Phule Rajani | 33 | 36 | 69 |
| Hyderabad Single | 28 | 31 | 59 |
| Hyderabad Double | 26 | 29 | 55 |
| S.E.M. | 1.15 | 1.15 | 2.31 |
| CD (%) | 3.41 | 3.41 | 6.81 |

Table 4: Number of florets, length and diameter of florets (cm) per spike

| Variety | Number of florets per spike | Length of florets(cm) | Diameter of florets(cm) |
|------------------|-----------------------------|-----------------------|-------------------------|
| Vaibhav | 32.17 | 5.35 | 4.20 |
| Pearl Double | 30.03 | 4.87 | 3.65 |
| Calcutta Double | 29.30 | 4.63 | 3.40 |
| JK T- 4 | 25.14 | 3.70 | 2.58 |
| Mexican Single | 27.30 | 4.25 | 2.95 |
| Shringar | 31.13 | 5.15 | 4.05 |
| Suvasini | 34.39 | 5.90 | 4.62 |
| Phule Rajani | 33.37 | 5.65 | 4.38 |
| Hyderabad Single | 28.22 | 4.45 | 3.12 |
| Hyderabad Double | 26.18 | 3.37 | 2.75 |
| S.E.M. | 0.53 | 0.05 | 0.05 |
| CD (%) | 1.57 | 0.16 | 0.14 |

Table 5: Vase life of cut spike (days)

| Variety | Vase life of cut spike (days) |
|------------------|-------------------------------|
| Vaibhav | 9.35 |
| Pearl Double | 8.84 |
| Calcutta Double | 8.54 |
| JK T- 4 | 7.59 |
| Mexican Single | 8.07 |
| Shringar | 9.08 |
| Suvasini | 11.0 |
| Phule Rajani | 10.17 |
| Hyderabad Single | 8.23 |
| Hyderabad Double | 7.78 |
| S.E.M. | 0.43 |
| CD (%) | 1.27 |

Table 6: Sugars (mg/g fresh weight)

| Variety | Total sugars (mg/g fresh weight) | Reducing sugars (mg/g fresh weight) | Non-reducing sugars (mg/g fresh weight) |
|------------------|----------------------------------|-------------------------------------|---|
| Vaibhav | 17.61 | 14.65 | 2.96 |
| Pearl Double | 15.68 | 13.28 | 2.40 |
| Calcutta Double | 14.29 | 12.31 | 2.10 |
| JK T- 4 | 11.22 | 10.01 | 0.33 |
| Mexican Single | 12.69 | 11.04 | 1.65 |
| Shringar | 16.28 | 13.69 | 2.59 |
| Suvasini | 19.40 | 15.84 | 3.56 |
| Phule Rajani | 18.54 | 15.36 | 3.18 |
| Hyderabad Single | 13.61 | 11.61 | 2.00 |
| Hyderabad Double | 12.03 | 10.59 | 1.44 |
| S.E.M. | 0.49 | 0.63 | 0.27 |
| CD (%) | 1.44 | 1.85 | 0.79 |

Table 7: Peroxidase activity (Units g tissue⁻¹ min⁻¹)

| Variety | Peroxidase activity (Units g tissue ⁻¹ min ⁻¹) |
|------------------|---|
| Vaibhav | 0.044 |
| Pearl Double | 0.040 |
| Calcutta Double | 0.038 |
| JK T- 4 | 0.030 |
| Mexican Single | 0.034 |
| Shringar | 0.042 |
| Suvasini | 0.048 |
| Phule Rajani | 0.046 |
| Hyderabad Single | 0.036 |
| Hyderabad Double | 0.032 |
| S.E.M. | 0.00 |
| CD (%) | 0.01 |

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