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Suresh Kumar
Department of Floriculture and Landscape Architecture, K.N.K. College of Horticulture Mandsaur, RVSKVV, Madhya Pradesh, India

Hemant Kumar
Department of Floriculture and Landscape Architecture, K.N.K. College of Horticulture Mandsaur, RVSKVV, Madhya Pradesh, India

Vidhya Sankar M
Department of Floriculture and Landscape Architecture, K.N.K. College of Horticulture Mandsaur, RVSKVV, Madhya Pradesh, India

Anuj Kumar
Department of Floriculture and Landscape Architecture, K.N.K. College of Horticulture Mandsaur, RVSKVV, Madhya Pradesh, India

Correspondence
Suresh Kumar
Department of Floriculture and Landscape Architecture, K.N.K. College of Horticulture Mandsaur, RVSKVV, Madhya Pradesh, India

Studies on post-harvest quality of different cultivars of tuberose (*Polianthes tuberosa* Linn)

Suresh Kumar, Hemant Kumar, Vidhya Sankar M and Anuj Kumar

Abstract
The present investigation entitled was "Studies on post harvest quality of different cultivars of tuberose (*Polianthes tuberosa* Linn.) 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 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 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, spikes, different cultivars, post harvest quality and vase-life

Introduction
Tuberose (*Polianthes tuberosa* Linn.) commonly known as 'Rajnigandha' is a bulbous summer flowering perennial ornamental plant which belongs to the family Amaryllidaceae. 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 Bangal, 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 concrete yield from fresh flower is 0.08 to 0.11 percent, of which 18 to 23 percent constitute alcohol soluble absolute. There is high demand for tuberose concrete and absolute in international markets which fetch a very good price. The individual florets are used for making veni and garlands. Excellent keeping quality and easy cultivation are the predominant characteristics of this crop. There are about fifteen species under the genus *Polianthes*, of which twelve species have been reported from Mexico and Central America. Of these, nine species have white flowers, one is white tinged with red and two are red. Except *Polianthes tuberosa Linn*., all the others are found growing wild. Tuberose is a half hardy, bulbous perennial perpetuating itself through the bulblets. Bulbs are made up of scales and leaf bases and the stem is a condensed structure which remains concealed within scales. Roots are adventitious and generally shallow. Numerous lanceolate leaves are green, narrow, linear, long and arise in rosette. The flowers have a funnel shaped perianth, waxy white about 25 mm long, single or double and borne in spike. 'Single' varieties are more fragrant than 'Double' type. The terminal flower spikes arising from the bulb produce flowers for a number of days.

Fruit is a capsule. Flowers being very delicate have a very short life span after harvest and therefore deteriorate quickly. In order to obtain year round flower production and to keep pace with the market demand it is very essential to prolong the life and freshness of the cut flowers. Many scientific techniques are being practised nowadays to retain the flower freshness and prolong the vase life of cut flowers. The longevity of the cut flowers varies, some naturally long lasting while some fade away soon with in very short duration of time. A good flower is judged by its final flower size and shape, number of florets per spike, stem strength, changes in fresh weight, petal colour, and turgidity and freshness of flowers and foliage characteristics. An ideal cut flower should remain fresh and healthy maintaining its colour, texture and fragrance without losting its grade for reasonable length of time, which is often referred to as vase life of cut flowers Much scientific work has been done in recent years to conserve the freshness of cut flowers in various countries, especially in the USA, U.K., Europe, France, Japan, Germany and The Netherlands where the florist trade has assumed great commercial importance. India has also emerged as an economically viable option in Agribusiness for commercial floriculture. Recognizing its potential, the government of India has liberalized and stream lined its policies, which played a catalytic role in transforming this sector into an industry with strong growth potential. The government has further promoted this sector through setting up of post harvest infrastructure facilities, including perishable cargo centre at the gateway airports, wholesale market-cum-flower auction centre and Agri Export Zones. The floriculture produce from India has thus earned a good name in the global markets for its quality, even through its share in the international market is very low. In order to sustain its growth in future, floriculture industry would require firm and consistent technology back up. 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 Basel 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

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.

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 Kumar and Yadav (2006) in gladiolus. Similar results were recorded by Horo *et al.* (2009) [10] and Choudhary *et al.* (2011) in gladiolus.

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.

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] in tuberose and Patra and Mohanty (2015) [21]

also in gladiolus. Kumar *et al.* (2016) [12] 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.

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 Mahawer *et al.* (2008) and Ramachandrudu and Thangam (2010) in tuberose. Kumar (2007) and Kumar and Yadav (2006) also noted significant variation for same parameters in gladiolus. Similar results were reported by Kumar *et al.* (2009) and Choudhary *et al.* (2011) in 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 (Sheikh and Jhon (2005), Pratap and Manohar (2006) 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 (Kumar and Yadav (2005) [13] in gladiolus. Similar results for vase life were reported by Choudhary *et al.* (2011) in 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 Loesser (2005) in gerbera.

Table 1: Fresh weight (g) of cut spike

Variety	Fresh weight (g) at harvest	Fresh weight (g) on 3rd day	Fresh weight (g) on 5th 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.EM.	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.EM.	0.55	0.67
CD (%)	1.62	1.96

Table 3: Water uptake (ml) in vase

Variety	Water uptake on 3rd day (ml)	Water uptake on 5th 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.EM.	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.EM.	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.EM.	0.43
CD (%)	1.27

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.

References

1. Acharya AK, Baral DR, Gautam DM, Pun UK. Influence of seasons and varieties on vase life of gerbera (*Gerbera jamesoni* Hook.) cut flower. Nepal Journal of Science and Technology. 2010; 11:41- 46.
2. Ahlawat TR, Barad AV, Jat G. Evaluation of gerbera cultivars under naturally ventilated polyhouse. Indian journal of Horticulture, 2012; 69(4):606-608.
3. Ahmed Z, Dhatt KK, Singh K. Comparative performance of cultivars for post harvest attributes of gladiolus (*Gladiolus hybridus* Hort L.). Indian Journal of Applied Research. 2014; 4(12):246-248.
4. Bhaskarwar AC, Jadhav GN, Ghube NN, Tayade MM, Patekar TR. International Journal of Researches in Biosciences, Agriculture and Technology. 2016; 4(2):7-10.
5. Chourasia A, Viradia RR, Ansar H, Madle SN. Evaluation of different gladiolus cultivars for growth, flowering, spike yield and corm yield under Saurashtra region of Gujarat. An International Quarterly Journal of Life Sciences. 2015; 10(1):131-134.
6. Dhane AV, Nimbalkar CA. Growth and flowering performance of some dahlia varieties. Journal of Maharashtra Agricultural University. 2002; 27(2):210-211.
7. Faraji S, Naderi R, Ibadali OV, Basaki T, Gasimov SN, Hosseinova S. Effects of post harvesting on biochemical changes in gladiolus cut flowers cultivars (White prosperity). Middle – East Journal of Scientific Research. 2011; 9(5):572-577.
8. Geeta SV, Shirol AM, Kulkarni BS, Omem T, Parvati P. Performance of gladiolus (*Gladiolus hybridus* Hort.) varieties for growth, yield and flower quality characters. Plant Archives. 2014; 14(2):1147-1149.
9. Gupta P, Pathak AC, Banafar RNS. Study on the performance of gladiolus cultivars in Malwa region of Madhya Pradesh. South Indian Horticulture. 2002; 50(4-6):641-644.
10. Horo P, Mishra S, Kispotta LM. Evaluation of gladiolus cultivars for cut flower production in Jharkhand. Journal of Ornamental Horticulture. 2009; 12(3):206-207.
11. Jain R, Janakiram T, Kumawat GL. Studies on post harvest attributes of tuberose (*Polianthes tuberosa*) cultivars as influenced by tinting with edible colours. Current Horticulture. 2015; 3(2):18-24.
12. Kumar BS, Kameswari PL, Pratap M, Venkateswarrao P. Vase life of tinted spikes of tuberose cultivar Suvasini. Environment and Ecology. 2016; 34(3A):1155-1161.
13. Kumar R, Yadav DS. Evaluation of gladiolus cultivars under sub tropical conditions of Himalaya. Journal of Ornamental Horticulture. 2005; 8(2):86-90.
14. Kumari S, Singh KP, Arora A. Screening of cultivars of cut tuberose (*Polianthes tuberosa Linn*) flower for longer vase life on the basis of membrane stability index. Progressive Horticulture. 2013; 45(1):64-68.
15. Loesser H. Trials of cut gerbera. Deutscher Gartenbau, 1989; 43:2894-97.
16. Mahawer LN, Bairwa HL, Shukla AK. Field performance of tuberose cultivars for growth, floral and economic characters under sub-humid southern plains and Aravalli hills of Rajasthan. Indian Journal of Horticulture. 2013; 70(3):411-416.
17. Mahawer TC, Mahawer LN, Bairwa HL. Performance of gladiolus cultivars under sub- humid southern plains of Rajasthan. Journal of Horticultural Science. 2013; 8(2):204-209.
18. Mishra P. Post harvest flowering behaviour of some gladiolus varieties grown under Faizabad climatic condition. Hort Flora Research Spectrum. 2015; 4(1):64-66.

19. Pasannavar R. Evaluation of elite cultivars of gladiolus for cut flower production under transitional tract of Karnataka. M.Sc. (Ag.) Thesis, University of Agricultural Sciences, Dharwad, 1994.
20. Patil VS, Munikrishnappa PM, Shantappa, Tirakannanavar. Performance of growth and yield of different genotypes of tuberose (*Polianthes tuberosa* Linn.) under transitional tract of north Karnataka. Journal of Ecobiology, 2009; 24(4):327-333.
21. Patra SK, Mohanty CR. Vase life study in different varieties of gladiolus. International Journal of Agricultural Science and Research. 2015; 5(2):27-32.
22. Ramachandrudu K, Thangam M. Performance of tuberose (*Polianthes tuberosa* Linn.) cultivars in Goa. Journal of Horticultural Sciences. 2009; 4:76-77.
23. Ranpise SA, Patil SD, Dhakare BB. Performance of Indian varieties of gladiolus for flower and corm production under Dhule condition of Maharashtra. The Asian Journal of Horticulture. 2007; 2(1):124-125.
24. Rao KD, Sushma K. Evaluation of certain tuberose (*Polianthes tuberosa* Linn.) Double genotypes for assessing the yield and quality traits under agro climatic conditions of Telengana. The Journal research PJTSAU. 2015; 43(1-2):51-56.
25. Sankari A, Anand M, Arulmozhiyan R. Evaluation of gladiolus cultivars in Eastern Ghats of Tamilnadu. Journal Horticultural Science. 2012; 7(2):206-208.
26. Sarkar I, Chakravorty S, Maitra S. Evaluation of gladiolus cultivars with respect to flowering attributes in Darjeeling hills of west Bengal. *India.* Indian Journal of Agricultural Research. 2014; 48(5):360-366.
27. Sateesha GR, Kumar A, Biradar MS. Performance of different tuberose (*Polianthes tuberosa* Linn.) varieties under field condition. Plant Archives. 2011; 11(1):359-360.
28. Swaroop K. Morphological variation and evaluation of gladiolus germplasm. Indian Journal of Agricultural Sciences. 2010; 80(8):78-81.
29. Vikas HM, Patil VS, Dorajeerao AVD. Evaluation of Dahlia genotypes based on vegetative and quality characters. Plant Archives. 2015; 15(1):283-286.
30. Wankhede S, Gajbhiye RP. Performance of gerbera varieties for flowering, yield and quality parameters under shade net. Indian Journal of Horticulture. 2012; 69(1):98-100.