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Effect of Holding Solutions on Vase life and Quality of Cut Spikes of Gladiolus (*Gladiolus* (Tourn) L.)

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ABSTRACT

A Laborators expearenet was conducted to study the effect of holding solutions such as sucrose 4%+$Al_2(SO_4)_3 16H_2O$(300 ppm), sucrose 4%+NaOCL (50 ppm), sucrose 4% + Dichlorophen (50 ppm), sucrose 4%+Calcium chloride (50 ppm), sucrose 4%+tartaric acid (500ppm), sucrose 4%+$KMno_3$(25 ppm) and tap water on the post-harvest life of gladiolus. The experiment was conducted with cut spikes of gladiolus using completely randomized design with 3 replications. Results revealed that among treatments studied, holding solution containing Sucrose 4%+ Dichloropen significantly improved days for basal floret opening, vase life, diameter of 2nd floret and longevity of opened floret. Maximum increase in floret size and longevity of opened floret were observed in Sucrose 4%+$KMno_4$ (25ppm). Significant effect on vase life and diameter of 2nd floret were recorded in holding solution contains Sucrose 4%+ $Al_2(SO_4)_3$. The maximum and minimum longevity of opened floret was observed in Sucrose 4%+ Dichloropen and tap water respectively. Observations indicated that holding solution containing Sucrose 4%+ Dichloropen significantly prolonged the post harvest life of gladiolus.

Key words : Gladiolus, Holding solution, Vase life

Gladiolus (*Gladiolus* (Tourn) L.) is one of the four famous cut flowers in the world. The longevity of gladiolus cut flowers is very short. The typical vase life of individual florets is just 4 to 6 days and senescent florets remain at the bottom of the spikes after the opening of the upper florets (Yamada *et al*., 2003). Keeping quality is an important parameter for evaluation of cut flower quality for both domestic and export markets. Addition of chemical preservatives to the holding solution is recommended to prolong the vase life of cut flowers. Due to changes in social and cultural life style of people, cut flowers have found important place in various social functions and daily activities. The cut flowers have a long vase life which fetches premium market prices. The flowers are hardy and stand the rigors of transportation admirably. Vase life termination for many cut flowers is characterized by wilting (He *et al.,* 2006). Water balance is a major factor determining quality and longevity of cut flowers. It is influenced by water uptake and transportation and balance between two mentioned processes (Da Silva, 2003). When the amount of transpiration exceeds the volume of water uptake, water deficit and wilting develops (Halevy and Mayak, 1981). Low water uptake is often due to occlusions located mainly in the basal stem end (He *et al*., 2006), and microbes are a common cause of stem end blockage (Van Doorn, 1997).

Gladiolus is an important cut flower prized for its attractive spike with florets of various dazzling colours, sizes and forms. Cut spikes are highly perishable in nature. For a viable cut flower business it is very important to maintain high quality of the produce. The extent of vase life depends upon water relations of spike and senescence rate of florets. Improvement of vase life of gladiolus is an important because, gladiolus has many florets which open sequentially, extension of shelf life of the flower can help the flower industry and also for home consumers (Khan *et al*., 2009). The typical vase life of individual florets is just 4 to 6 days and senescent florets remain at the bottom of the spikes after the opening of the upper florets (Yamada *et al*., 2003). Sucrose serves as a respiratory substrate and prevents desiccation to a certain extent and probably replaces the depleted natural carbohydrates and eliminates the breakdown of other organic compounds (Marousky, 1968). Postharvest factors like storage temperature, light, humidity, use of floral preservative solution and damage during transport and storage, are the major factors which are responsible for the quality of flowers in markets. Besides these post-harvest factors, some pre-harvest factors are also

important as these are also equally responsible for the quality of flowers. (Ganesh and Krishan, 2009). The pre-harvest factors like temperature at growing season, light, humidity and incidence of disease and pest are most important. To enhance the vase life of gladiolus a holding solution or vase solution can be retained with the wholesaler or retailer to keep the flower fresh unit then they are sold or consumers to use continuously in the vase. Keeping these points in view, the present study was undertaken to find out the effect of different holding solutions on the post harvest quality of gladiolus cv. Arun at Laboratory conditions.

MATERIAL AND METHODS

The present study was conducted at All India Coordinated Research Project on Floriculture, ANGRAU, Rajendranagar, Hyderabad during. The commercial cultivar of gladiolus viz., Arun was used for this study. Seven treatments of holding solutions were employed and the experiment was laid out in completely randomized design with three replications. Observations were recorded on days for the basal floret to open, vase life (days), floret opening (%), 2nd floret size (cm) and longevity of open floret (days). The spikes gladiolus cv. Arun was harvested when the three basal florets showing colour and the cut end of the spike of were immediately placed in water for pre-cooling.

After that the basal portion of cut spikes was re-cut at 2 cm from the point of previous cut. Selected spikes were kept in holding solutions to study the keeping quality. Three spikes were randomly selected for each treatment and the treatments were replicated thrice. Glass tubes were used to hold the floral preservatives and uniform volume of 50 ml of vase solution was prepared freshly and dispensed into the tubes. Seven different holding solutions *viz.*, sucrose 4%+$Al_2(SO_4)_3 16H_2O$(300 ppm), sucrose 4%+NaOCL (50 ppm), sucrose 4%+Dichlorophen (50 ppm), sucrose 4%+Calcium chloride (50 ppm), sucrose 4%+tartaric acid (500ppm), sucrose 4%+$KMNO_3$(25 ppm) and tap water as a control were used for the study.

RESULTS AND DISCUSSION

The qualitative and quantitative post harvest losses of gladiolus can be reduced by adopting improved technologies like harvesting at proper stage, use of floral preservatives and bud opening solution, pulsing, pre-cooling, improved storage techniques such as low temperature storage, proper packaging methods etc. The holding solution containing sucrose 4% + Al_2 (SO4)3 200 ppm or KCl 500 ppm + Al_2 (SP4)3 200 ppm + boric acid 200 ppm were found to be the most beneficial for the improvement of days for basal floret opening and vase life in gladiolus (Table 1). $AgNO_3$ 25 ppm can be used very effectively as holding solution for gladiolus cut flowers to increase diameter of the flower and vase life (Directorate of Research (Agri), Assam Agriculture University, Jorhat). A combination of holding solution containing 150-200 ppm 8-hydroxyquinoline sulphate and 4% sucrose is also good for improving vase life (Directorate of Research (Agri), Assam Agriculture University, Jorhat)

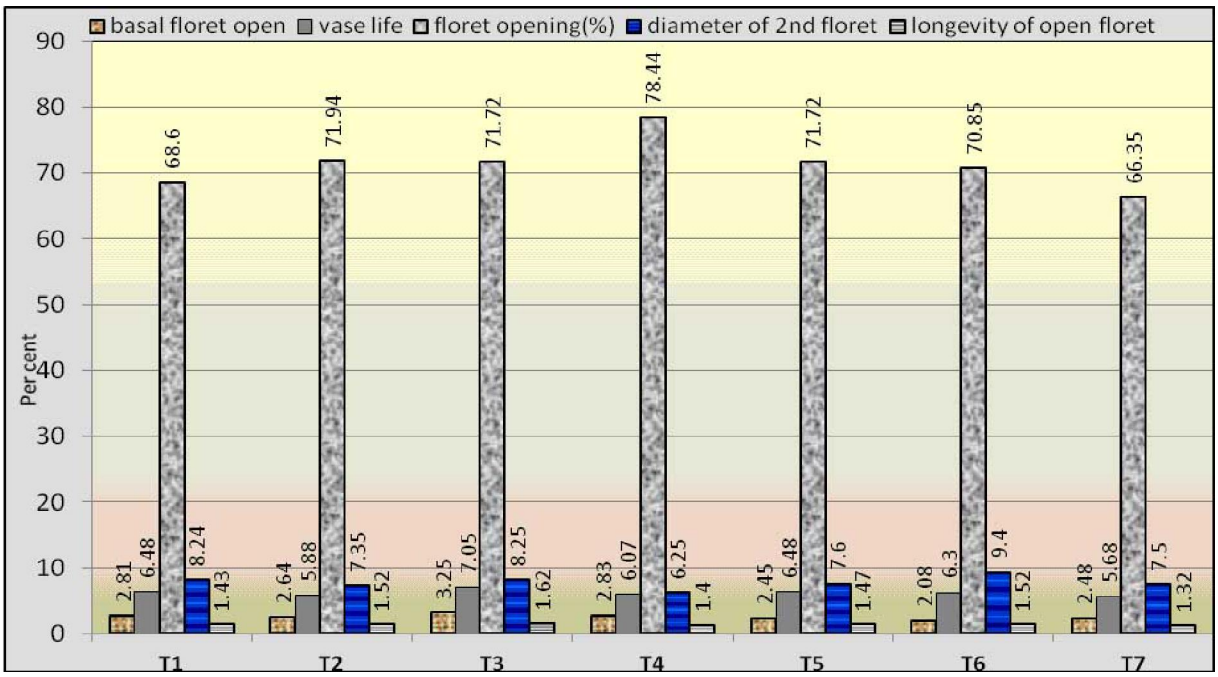
The results indicated that, different holding solutions showed significant differences among the treatments studied (Table 1 and Fig. 1). The days for basal floret open was influenced by Sucrose 4%+ Dichloropen (3.07) and it indicates that there is a provision to prolong the basal floret opening. The minimum number of days for basal floret opening was observed in Sucrose 4%+ $KMno_3$. The holding solution Sucrose 4%+ Dichloropen recorded the maximum vase life (days) followed by Sucrose 4%+ $Al_2(SO_4)_3$ and Sucrose 4%+ Tartaric acid while low vase life was registered in tap water (5.68). The treatment tap water was found to be good for per cent floret opening. Maximum increase of floret size was observed in the holding solution of Sucrose 4%+ $KMno_4$ followed by Sucrose 4%+ Dichloropen and Sucrose 4%+ $Al_2(SO_4)_3$. The $Al_2(SO_4)_3$ has been found to acidify the holding solution to reduce bacterial and fungal growth (Halevy and Mayak, 1981 and Bhattacharjee, 1999). Longevity of opened floret was longer in the treatment Sucrose 4%+ Dichloropen followed by Sucrose 4%+$KMno_4$ and Sucrose 4 %+NaOCl, while tap water recorded low floret longevity.

In the present study, holding solution containing Sucrose 4%+ Dichloropen significantly improved the days for basal floret opening, vase life, diameter of 2nd floret and longevity of opened floret. The maximum increase in floret size and longevity of opened floret were recorded in Sucrose 4%+$KMno_4$ (25ppm). The treatment Sucrose 4%+ $Al_2(SO_4)_3$ showed significant effect for vase life and diameter of 2nd floret. The maximum and minimum longevity of opened floret was observed in Sucrose 4% + Dichloropen and tap water respectively.

Table 1. Post harvest physiology and quality of cut spikes of gladiolus influenced by holding solutions

Treatment	Days for basal floret opening	Vase life (days)	Per cent Floret opening	Diameter of 2nd floret (cm)	Longevity of opened floret (days)
T1:Sucrose 4%+ $Al_2(SO_4)_3$ 16 H_2O, 300 ppm	2.81	6.49	68.60	8.24	1.43
T2:Sucrose 4%+NaOCl, 50 ppm	2.64	5.88	71.94	7.35	1.52
T3:Sucrose 4%+Dichlorophen, 50 ppm	3.25	7.05	71.72	8.25	1.62
T4:Sucrose 4%+ Calcium chloride, 50 ppm	2.83	6.07	78.44	6.25	1.40
T5:Sucrose 4%+Tartaric acid, 500 ppm	2.45	6.48	71.72	7.60	1.47
T6:Sucrose 4%+$KMno_4$, 25 ppm	2.08	6.30	70.85	9.40	1.52
T7:Tap water (control)	2.48	5.68	66.35	7.50	1.32
Mean	2.64	6.27	71.36	7.79	1.47
S Em±	0.190	0.224	0.48	0.285	0.142
C D (0.05)	0.585	0.689	1.50	0.877	NS

Fig. 1 Influence of holding solutions in improving keeping quality of cut spikes of gladiolus.



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