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HORTICULTURE

Effect of precooling and chemical preservatives on post harvest longevity of tuberose (*Polianthes tuberosa L.*) florets

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ABSTRACT

Investigations were carried out to study the effect of precooling and preservative chemicals on post harvest longevity of the florets of tuberose (Polianthes tuberosa L.) cv. Prajwal. The effect of precooling of tuberose florets in combination with four chemical treatments were studied and observations were recorded based on quality parameters like freshness of the florets, colour retention, physiological loss in weight and days to fifty per cent wilting. Pre-cooling of flower buds was found to improve the longevity (shelf life) of flower buds. Soaking of florets in 4 % Boric acid solution for two hours and air drying them before packing increased the shelf life up to six days.

Highlights

- Soaking the buds in 4% Boric acid solution for two hours after pre-cooling at 4 º C proved to be the best treatment to improve shelf life of the tuberose florets.

Keywords: Tuberose, florets, precooling, chemical treatment, shelf life.

Tuberose (Polianthes tuberosa L.) belonging to the family Amaryllidaceae is an important crop among the flower crops cultivated for traditional uses in India. It is a perennial flowering plant popular worldwide as cut flower (Singh and Shanker 2011). The florets from the single petal types are usually used for value addition in the form of garlands and venis for religious and social purposes. Single types are highly fragrant and hence, are used to extract concrete which is sold at a premium. The florets of tuberose are highly perishable; therefore treating florets with chemicals may improve the flower quality and shelf life (Talukdar and Barooah 2011). Post harvest treatment is a very important step in maintaining product quality and extending the shelf life. Among the different post harvest technologies available precooling is considered to be a critical process in enhancing the post harvest longevity of the produce (Brosnan and Sun 2001). Hence an attempt was made to study the effect of precooling in improving the shelf life of tuberose florets, besides the use of some chemical preservatives.

Materials and Methods

An experiment was conducted at the Indian Institute of Horticultural Research, Hessaraghatta during 2013-14 to study the influence of precooling and chemical preservatives (sucrose and boric acid at different concentrations) on the shelf life of florets of tuberose cv. Prajwal. The experiments were

conducted in completely randomized design with 2 factors (Precooling and chemical treatments). The fully developed unopened buds were harvested from the field and were subjected to different treatments. The details of the treatments are: P1- Buds pre-cooled at 4oC, P2 – Without pre-cooling of buds. Chemical treatments used are: T1-2 % Sucrose, T2- 4 % Sucrose, T3- 2 % Boric acid, T4- 4 % Boric acid, T5-Without soaking of buds. The buds after pre-cooling soaked in the preservative solutions for two hours and then they are air dried. The air dried buds were packaged in sealed polyethylene bags without vents. The samples for shelf life studies were kept under laboratory conditions (24.2±1 0C and R.H. 68±4%). Visual observations like freshness of florets, colour retention, days to fifty per cent flower wilting and a physiological parameter like physiological loss in weight (PLW) were recorded. Statistical analysis was carried using SAS-GLM (SAS 2008) V 9.2 available at Statistics Laboratory, IIHR, Bengaluru.

Table 1. Effect of pre-cooling and preservative chemicals on freshness (days) and fifty per cent wilting (days) of tuberose florets.

Preser-vative Chemicals	Freshness of florets (days)			Fifty per cent flower wilting (days)		
	Pre- cooling					
	P1	P2	Mean	P1	P2	Mean
T1	3.00	2.00	2.67	5.66	3.67	4.67
T2	3.00	3.00	3.00	6.00	4.33	5.17
T3	4.67	3.67	4.17	7.00	6.00	6.50
T4	5.33	4.68	5.00	7.67	6.33	7.00
T5	2.67	2.00	2.34	4.00	3.34	3.66
Mean	3.73	3.13		6.07	4.75	
	P	T	PXT	P	T	PXT
S. Em ±	0.21	0.34	0.48	0.11	0.18	0.25
CD @ 5%	NS	1.007	NS	0.34	0.53	NS

NS- Non Significant
P1 – Buds pre-cooled at 4°C P2 – Without pre-cooling
T1 - 2 % Sucrose T2 – 4% Sucrose
T3 – 2% Boric acid T4 – 4% Boric acid
T5 – Without soaking

Results and Discussion

Precooling

The results obtained indicated that the pre-cooled tuberose flower buds remained fresh (Table 1) for maximum number of days (3.73) and recorded maximum number of days (6.07) for fifty per cent flower wilting (Table 1), had the maximum colour retention score of 8.26, 6.33 and 4.34 after second, fourth and sixth day storage respectively (Table 2) and minimum physiological loss in weight (0.19, 0.30 and 0.39 g after second, fourth and sixth day storage respectively). The flower buds which were not pre-cooled recorded minimum number of days for fifty per cent flower wilting (4.67), minimum colour retention score (7.13, 5.80 and 3.73) after second, fourth and sixth day respectively and maximum physiological loss in weight (0.37, 0.42 and 0.52 g) after second, fourth and sixth day respectively (Table 3). This may be attributed to the fact that the pre-cooling has the added advantage of reducing the production and sensitivity to ethylene that accelerates the senescence of the florets and also it slows down the rate of respiration and deterioration which reduces wilting since transpiration and evaporation occurs more slowly at low temperatures (Brosnan and Sun, 2001).

Chemical treatment

The flower buds treated with 4% boric acid remained fresh (Table 1) for the maximum number of days (5.00. Nagajjanavar *et al.*, (2012), Jawaharlal *et al.*, (2013) and Thamiraiselvi *et al.*, (2010) also obtained similar results with jasmine under refrigerated storage condition and attributed it to minimum amount of ethylene evolution from florets treated with boric acid. The results were also in accordance with Sudhagar *et al.*, (2010) and Kumar *et al.*, (2006) in tuberose cut flowers. The maximum number of days taken for fifty per cent flower wilting (6.07) was also observed with the 4 % boric acid treatment. The longevity of the florets with boric acid treatment may be attributed to its action on retention and translocation of the sugars to the corolla and most

Table 2: Effect of pre-cooling and preservative chemicals on colour retention (score) of tuberose florets.

Preservative Chemicals	2 nd day			4 th day			6 th day		
	Pre- cooling								
	P1	P2	Mean	P1	P2	Mean	P1	P2	Mean
T1	8.00	6.66	7.33	5.66	4.67	5.16	3.34	2.00	2.66
T2	8.34	7.00	7.66	7.00	6.00	6.50	3.67	4.00	3.83
T3	8.66	7.67	8.16	7.33	6.34	6.83	6.00	4.66	5.34
T4	9.00	8.00	8.50	8.00	7.00	7.50	7.00	6.34	6.67
T5	7.33	6.33	6.83	5.00	3.66	4.33	1.67	1.66	1.66
Mean	8.26	7.13		6.33	5.80		4.34	3.73	
	P	T	PXT	P	T	PXT	P	T	PXT
S. Em ±	0.11	0.18	0.25	0.10	0.16	0.23	0.27	0.42	0.60
CD @ 5%	0.34	0.53	NS	0.31	0.49	0.69	NS	1.26	NS

NS- Non Significant

P1 – Buds pre-cooled at 4o C P2 – Without pre-cooling

T1 - 2 % Sucrose T2 – 4% Sucrose

T3 – 2% Boric acid T4 – 4% Boric acid T5 – Without soaking

Table 3: Effect of pre-cooling and preservative chemicals on physiological loss in weight (g) of tuberose florets.

Preservative Chemicals	2 nd day			4 th day			Senescence		
	Pre- cooling								
	P1	P2	Mean	P1	P2	Mean	P1	P2	Mean
T1	0.27	0.47	0.37	0.38	0.51	0.44	1.84	2.44	0.54
T2	0.22	0.43	0.33	0.33	0.48	0.40	1.60	2.24	0.48
T3	0.11	0.24	0.17	0.20	0.30	0.25	1.12	1.65	0.34
T4	0.09	0.21	0.15	0.16	0.29	0.23	0.92	1.48	0.30
T5	0.28	0.49	0.38	0.45	0.54	0.50	2.40	2.63	0.63
Mean	0.19	0.37		0.30	0.42		0.39	0.52	
	P	T	PXT	P	T	PXT	P	T	PXT
S. Em ±	0.010	0.016	0.02	0.0039	0.0048	0.0061	0.003	0.005	0.007
CD @ 5%	0.03	0.049	NS	0.0091	0.014	0.020	0.009	0.015	0.021

NS- Non Significant

P1 – Buds pre-cooled at 4o C P2 – Without pre-cooling

T1 - 2 % Sucrose T2 – 4% Sucrose T3 – 2% Boric acid

T4 – 4% Boric acid T5 – Without soaking

probably due to anti ethylene activity of the boric acid which retards the early senescence (De and Barman 1998). Boric acid resulted in almost complete inhibition of the climacteric ethylene production in carnation florets (Serranno *et al*., 2006). It has also recorded the maximum colour retention score (8.26, 6.33 and 4.34) after the second, fourth and sixth day storage respectively (Table 2). This might be due to effectiveness of boric acid in increasing anti-oxidant activity besides an anti- ethylene activity and had reduced per cent of solute leakage from the florets indicating increased membrane integrity of florets due to which the good colour retention is observed. The potential of the boric acid has been reported earlier by Bhattacharjee 2002 in crossandra. Flower buds treated with 4 % Boric acid also recorded the minimum physiological loss in weight (0.19, 0.30 and 0.39 g) after second, fourth and sixth day storage respectively (Table 3). This might be due to the reason that boric acid could increase the osmotic concentration and pressure potential of the petal cells thus improving the water balance and longevity (Halevy 1976) in tuberose.

Conclusion

From this study it can be concluded that pre-cooling of tuberose flower buds was found to improve the longevity (shelf life) of flower buds. Soaking of florets in 4 % Boric acid solution for two hours and air drying them before packing increased the shelf life up to six days. This can be easily practised at the growers' level to improve the quality and to prolong the freshness and maintain the colour of florets.

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