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Short communication

Effect of pre-storage GA_3 pulsing on keeping quality of gladiolus spikes

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ABSTRACT

Pre-storage pulsing of gladiolus spikes with a solution containing 20% sucrose and 400 mg/l aluminium sulphate [$Al_2(SO_4)_3.16H_2O$] significantly improved vase life, floret size and per cent opening of florets. The effect was significantly enhanced with addition of GA_3 @ 100 mg/l. Spikes pulse-treated with GA_3 could be stored for 14 days with an acceptable vase life of 5.44 days. These spikes also exhibited 49.65 per cent opening of florets even at 21 days from onset of storage. On the other hand, spikes pulse-treated with a solution containing 20% sucrose and aluminium sulphate [$Al_2(SO_4)_3.16H_2O$] @ 400 mg/l or water (Control) showed no opening of florets after 21 days of storage.

Key words: Pulsing, gladiolus, spikes, vase life

Dry storage of flowers in water-retentive plastic sleeves has been considered useful for long term storage (Goszczynska and Rudnicki, 1988; Singh *et al,* 2001a). During dry storage, metabolic activity of the stem remains low which subsequently results in a long vase life in storage (Gosczcynska and Rudnicki, 1988). Among various polymeric film sleeves evaluated for dry storage of gladiolus spikes, polypropylene (PP) sleeve (25 µ thick) was found to be the most suitable, as it retained optimally high CO_2 and low O_2 levels inside the package (Grover *et al,* 2006). Singh *et al* (2000) earlier reported aluminium sulphate solution to effectively suppress sucrose-induced bacterial growth in vase water of the gladiolus spikes. Studies have also revealed that sucrose promotes opening of immature florets of gladiolus (Nowak and Rudnicki, 1990; Singh *et al,* 2001b). Due to lack of organized marketing system for flowers in our country, there is a need to develop efficient storage systems to overcome glut, especially, in periods of over production and lean demand. Studies were, therefore, made on the effect of pre-storage pulsing of gladiolus spikes with GA_3, in combination with sucrose and aluminium sulphate, on keeping quality.

Spikes of gladiolus cv. White Prosperity (90 cm long) were harvested at the tight bud stage, i.e., when the colour was visible in the basal 1-2 florets, and were pulse-treated with 20% sucrose + aluminium sulphate [$Al_2(SO_4)_3.16H_2O$] @ 400mg/l + gibberellic acid (GA_3) @100 mg/l (T1) and 20% sucrose + $Al_2(SO_4)_3.16H_2O$ @ 400mg/l (T2) for 24h at 23±2^{O}C, 60-70% RH and 16h illumination of 1000lux intensity, provided by 40W white, fluorescent tubes. Control spikes were similarly treated with water (T3). The spikes were then grouped into bundles of 3 each, loosely tied at the base with a rubber band and inserted into polypropylene (PP) sleeves of 25µ thickness. The sleeves were sealed hermetically with an electrical sealing machine and stored vertically under refrigerated conditions in a cold store (3.5-4^{o}C, 85-90% RH) for 7, 14 and 21 days. After storage, 2cm basal ends of the spikes were recut under water to remove surface blockages and the keeping quality was evaluated in an air-conditioned laboratory at 23±2^{o}C, 60-70% RH and 1000lux light intensity (cycle of 16h light and 8h dark).

Observations were recorded for vase life, floret size (size of second floret from the base) and per cent opening of florets in the vase. Vase life of the spikes was evaluated from the day one basal floret was open till there were five open florets left on the spike. Spikes which exhibited opening of less than five florets with wilting of the basal floret, were taken as an index for termination of vase life. The data presented are a mean of three replications each representing, three spikes.

Data presented in Table 1 show that vase life was maximum in spikes treated with 20% sucrose + $Al_2(SO_4)_3.16H_2O$ @ 400mg/l + gibberellic acid @ 100mg/l (6.14 days), followed by pulsing with 20% sucrose + $Al_2(SO_4)_3.16H_2O$ @ 400mg/l (4.59 days), and, was minimum (3.33 days) in Control. Vase life decreased with increase in

Table 1. Effect of pre-storage pulsing treatments with sucrose, $Al_2(SO_4)_3.16H_2O$ and GA_3 on vase life and floret size in gladiolus cv. White Prosperity

Duration storage	Vase life (days)				Floret size (cm)			
of (days)	T1	T2	T3	Mean	T1	T2	T3	Mean
07	6.67	6.22	5.33	6.07	10.32	9.96	9.42	9.90
14	5.44	4.56	2.89	4.30	8.73	7.93	7.37	8.01
21	3.56	0.00	0.00	1.19	7.45	-	-	2.48
Control(0 day)	8.89	7.56	5.11	7.19	10.51	10.17	10.01	10.23
Mean	6.14	4.59	3.33			9.25	7.02	6.70
CD (*P=0.05*)								
Treatment 0.41			Treatment 0.20					
Storage duration 0.47			Storage duration 0.24					
Interaction 0.82			Interaction 0.41					

Table 2. Effect of pre-storage pulsing treatment with sucrose, $Al_2(SO_4)_3.16H_2O$ and GA_3 on per cent opening of florets in gladiolus cv. White Prosperity

Duration storage of	Floret opening (%)			
(days)	T1	T2	T3	Mean
07	63.61(52.88)	54.78(47.73)	43.25(41.07)	53.88(47.23)
14	57.45(49.29)	54.37(47.50)	23.27(28.72)	45.03(41.84)
21	49.65(44.78)	0.00(0.00)	0.00(0.00)	16.55(14.93)
Control (0 day)	73.41(58.94)	61.38(51.60)	47.64(43.62)	60.81(51.39)
Mean	61.03(51.47)	42.63(36.71)	28.54(28.35)	
CD (*P=0.05*) Treatment 2.13, Storage duration 2.46, Interaction 4.26				

* Figures in parentheses are transformed values

duration of storage (Table 1). Decrease in vase life following storage was reported earlier in *Freesia refracta* (Zencirkiran, 2002) and gladiolus (Singh *et al*, 2003; Grover *et al*, 2006). Floret size also decreased with increase in storage duration (Table 1) but was maximum (9.25cm) in spikes pulse-treated with 20% sucrose + 400 mg/l $Al_2(SO_4)_3.16H_2O$, + GA_3, and was minimum in Control (6.70cm). Per cent opening of florets was maximum in freshly-harvested Control spikes (60.81) and continued to decrease with increase in storage duration, and was 53.88, 45.03 and 16.55% after 7, 14 and 21 days of storage, respectively (Table 2). Among the three treatments imposed, spikes pulse-treated with a solution containing sucrose + $Al_2(SO_4)_3.16H_2O$+GA_3 showed maximum opening of florets (61.03%), followed by those treated with 20% sucrose + $Al_2(SO_4)_3.16H_2O$ (42.63 per cent). Per cent opening of florets was, however, minimum in non-pulsed Control flowers. In the present study, GA_3 was seen to synergize the effect of sucrose + $Al_2(SO_4)_3.16H_2O$. The present study also shows that spikes pulse-treated with a combination of sucrose, $Al_2(SO_4)_3.16H_2O$ and GA_3 could be stored for upto 14 days, with an acceptable vase life of 5.44 days. Even after 21 days of storage, pulse-treated spikes showed 49.65 per cent opening of florets. On the other hand, florets in T2 and T3 failed to open after 21 days of storage.

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