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Bud Opening of *Gypsophila paniculata* L. cv. Perfecta with Physan-20[1]

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Abstract. **A 200 ppm solution of Physan-20 [Active ingredients: n-alkyl (60% C_{14}, 30% C_{16}, 5% C_{12}, 5% C_{18}) dimethyl benzyl ammonium chlorides, 10%; n-alkyl (68% C_{12}, 32% C_{14}) dimethyl ethylbenzyl ammonium chlorides, 10%; inert ingredients, 80%.] was as effective in opening buds of 'Perfecta' gypsophila as was a 25 ppm silver nitrate solution when combined with sucrose. Sucrose (10%) was more effective in a short time period than 5% in combination with Physan-20. The minimum time in the solution for producing high quality blooms was 4 days. Physan-20, a quaternary ammonium compound, effectively opened gypsophila buds in tap water moderately high in salts, bicarbonates and nitrates. Physan-20 offers an effective alternate to silver nitrate for opening gypsophila without deionized water.**

Gypsophila flowers respond to floral preservatives when applied after distribution and storage of the blooms (3). Effective flower opening, improved longevity and increased turgidity occurred when 8-hydroxyquinoline citrate (8-HQC) + sucrose was used as a floral preservative during storage and shipment (4). Stems impregnated with silver or continuous exposure to 25 ppm of silver nitrate improved the quality of fresh and dried gypsophila 'Bristol Fairy' when combined with 5 or 10% sucrose in deionized water as a conditioning or bud opening solution (2). A recent report (1) indicates gypsophila treated with 10% sucrose solutions containing either thiobendazole glycolate (TBZ) 300 ppm or solutions containing 8 hydroxyquinoline glycolate (8 HQ) 300 ppm+TBZ 300 ppm, known as TOG preservative, gave consistently larger leaves and flowers than those treated similarly with 8-HQC or silver nitrate. Problems of spoilage of the TBZ solution were reported, and were overcome by adding 8-HQ in the TOG preservative.

A simplified method is described for short term conditioning or bud opening to improve the quality of gypsophila by immersing the cut flower stems in solutions containing Physan-20[3] plus sucrose.

Materials and Methods

'Perfecta' gypsophila was harvested from commercial plantings located at Watsonville, California. Uniform flowers were selected for a given term of development. Bud stage harvest with about 5% of the blooms open or with visible petals were utilized for most experiments (Fig. 1). The flowers were field bunched into 450g bunches and transferred dry by car to UC Davis. The flowers were held at 2°C overnight and the stems were recut prior to treatment the following day. Single bunches were used in expt. 1 and 2 for each test. Two bunches were

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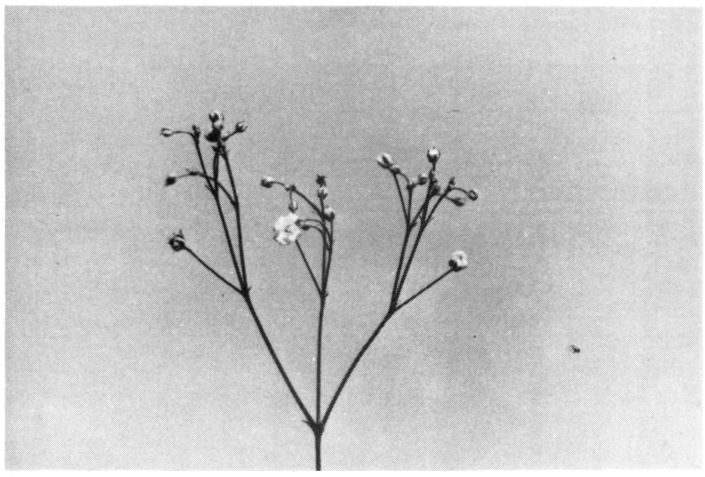

Fig. 1. 'Perfecta' gypsophila inflorescence showing 5% open flower buds. Those buds designated as tight buds were completely closed but with the central bud enlarged.

used for each treatment in expt. 3. Fresh wt were obtained initially and on the 7th day after bud opening in expt. 1 and 2.

Flower stems were placed in plastic buckets with solutions 10 cm deep. A 200 ppm soln of Physan-20 (1 ml/liter) was chosen as a starting point because of favorable experience with carnations. All solutions in expt. 1 and 2 were prepared with deionized water. In expt. 3, a Watsonville nursery well water served as the "tap" water (Table 3) because it restricted water flow in rose stems (Dominic Durkin, personal communication).

The flowers were held during treatment and the vase life observations at 22°C under continuous fluorescent light (ca. 1080 lux). The relative humidity was between 40 and 60%. Flowers were transferred to deionized water 1, 2, 4 or 6 days after treatment (expt. 2). or maintained in the solutions until the best treatments produced the flowers of their highest decorative value.

Results

Expt. 1, Bud opening solutions. Gypsophila was harvested mid Oct. at 2 stages of development (a) as tight buds, without

Table 1. Effect of sugar concn and selected conditioning treatments on bud opening of 'Perfecta' gypsophila havested in tight bud or with 5% open flowers, Fig 1 . Expt. 1.

Degree of flower openness	Bud opening treatment	0% Sucrose			5% Sucrose			10% Sucrose		
		Open blooms (%)	Commercial floral acceptance	Fresh wt gain (%)	Open blooms (%)	Commercial floral acceptance	Fresh wt gain (%)	Open blooms (%)	Commercial floral acceptance	Fresh wt gain (%)
Tight bud	Deionized water	4	poor	−21.3						
	25 ppm silver nitrate	3	poor	− 4.5	50	poor	18.7	50	questionable	58.6
	100 ppm Physan-20				75	good	43.9	60	good	15.3
	200 ppm Physan-20				75	good	22.4	70	good	47.4
	400 ppm Physan-20				60	good	68.6	90	excellent	51.5
5% open	Deionized water	5	poor	−43.4						
	25 ppm silver nitrate	5	poor	− 3.3	70	good	40.5	60	good	19.1
	100 ppm Physan-20				95	excellent	26.7	65	good	45.7
	200 ppm Physan-20				60	questionable	36.1	80	excellent	50.7
	400 ppm Physan-20				75	good	24.5	75	good	33.0

Table 2. Effect of conditioning time in Physan-20-sucrose solutions on bud opening of Gypsophila 'Perfecta'. Buds were cut in the tight stage. Expt. 2.[z]

Days in solution	5% sucrose			10% sucrose		
	Open blooms (%)	Commercial floral acceptance	Fresh wt gain (%)	Open blooms (%)	Commercial floral acceptance	Fresh wt gain[y] (%)
1	45	questionable	−30.2	75	questionable	−20.4
2	60	good	−12.7	80	good	1.1
4	85	excellent	21.7	90	excellent	36.0
6	85	excellent	34.4	95	excellent	58.5

[z]All solutions contained 200 ppm Physan-20. The control stems which were maintained in deionized water produced only 20% flowers and had a fresh wt loss of 55% after 6 days. Commercial floral acceptance was poor.

[y]Measured after 6 days.

Table 3. Bud opening solution of Physan-20 and sucrose prepared with tap and deionized water.[z] Stems were cut with buds open 20%. Expt. 3.

Water source	0% sucrose		5% sucrose		10% sucrose	
	Open blooms (%)	Commercial floral acceptance	Open blooms (%)	Commercial floral acceptance	Open blooms (%)	Commercial floral acceptance
Deionized water	45	questionable	93	excellent	83	excellent
Well water[y] (Watsonville, California)	25	poor	88	excellent	85	excellent

[z]All solutions with sucrose contained 200 ppm Physan-20

[y]pH = 7.3, EC = 1.00 millimohs/cm
CA = 6.1, Mg = 3.1, Na = 1.5 Me/liter
HCO_3 = 4.5, Cl = 1.0 Me/liter
NO_3–N = 27; B = 0.3 ppm

flower color showing and (b) with about 5% of the blooms open or with visible petals (Fig. 1). The flowers opened sufficiently to be commercially acceptable when deionized water containing Physan-20 at 100, 200 or 400 ppm was combined with 5 or 10% sucrose. No phytotoxicity problems with stems or flowers were encountered with Physan-20. Tight buds opened better in Physan-20 solutions than in those containing 25 ppm silver nitrate. Gypsophila treated with silver nitrate performed well if some of the blooms were open on each stem (Table 1). Very little difference in flower response was found between 5 or 10% sucrose concn because all stems remained in the solutions for 6 days until blooms were completely opened. There does not appear to be any direct correlation between the commercial floral acceptance and % weight gain after 6 days.

Only those stems which were placed in deionized water lost fresh wt. This was due mainly to shriveling of the leaves. The stems probably became plugged with organisms since there was no biocide in the water. The water was turbid after 6 days. Very few flowers opened in water with these characteristics. When sucrose with silver nitrate or Physan-20 was added to the water, all stems gained weight and a majority of flowers matured.

Extp. 2, Time required for bud opening. The later experiment was conducted to evaluate the effect of time in Physan-20 + sucrose bud opening solutions. Fresh wt of the flowers placed in 10% sucrose showed positive gain if conditioned 2 days whereas buds opened in 5% sucrose did not show a positive weight gain until the fourth day (Table 2). The data demonstrate that bud opened gypsophila continued to gain fresh wt if left in sucrose until almost completely opened. Under laboratory conditions, 4 days in Physan-20 opening solutions with 5 or 10% sucrose resulted in excellent quality blooms.

Expt. 3, Bud opening in Physan-20 prepared with questionable tap water. Commercial bunches of 'Perfecta' gypsophila were harvested at the 20% open stage in Watsonville in mid-Nov., transferred by car to UC Davis and placed in deionized or tap water containing Physan-20 + sucrose on the same day. High quality flowers developed in Physan-20 + sucrose solutions whether deionized or tap water was used (Table 3). No actual tests were made to evaluate plugging of stems as was observed with roses. The turgidity observed in these tests was only an empirical means of evaluating the probable conductive ability of vascular tissue.

Discussion

California growers have used deionized water-sucrose-silver nitrate solutions to bud open and condition gypsophila for several years based upon previously reported data (2). Contamination becomes a problem as the solutions are reused and the silver nitrate is apparently inactivated. Current tests with Physan-20 + sucrose solutions indicate gypsophila will open well if the solution is prepared with well water with moderately high salts and high nitrates. Thus deionized water may not be necessary to use with Physan-20 as it is when silver nitrate is used. Gypsophila buds opened well in Physan-20 solutions containing 5 or 10% sucrose; however, buds opened in 5% sucrose solutions required longer to open.

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