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Postharvest Effects of Temperature, Dark Storage Duration, and Sleeving on Quality Retention of 'Gutbier V-14 Glory' Poinsettia

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Abstract. Sleeved poinsettia plants (*Euphorbia pulcherrima*, Willd. cv. Gutbier V-14 Glory) had less abscission and damaged bracts and maintained better long-term postharvest quality 30 days after treatment than did nonsleeved plants. Plants had better quality after 30 days in the postharvest environment when the storage temperature was 12.8°C as opposed to 7.2° or 18.3°. The longer storage durations of 6 or 9 days resulted in plants with greater abscission and lower quality for the 30-day postharvest period than the 3-day storage duration.

Some of the new poinsettia cultivars with the ability to retain leaves and bracts for several weeks after harvest have been susceptible to ethylene-induced epinasty (2). Investigation (5, 6, 7, 9) into the epinastic response induced by sleeving and other stress have indicated that this ethylene response differs with cultivar. Newer cultivars have been classified as either epinastic-resistant or -nonresistant. 'Gutbier V-14 Glory' has been reported to be resistant to epinasty (1). Higher levels of natural illumination, along with higher temperature during production, adversely affected postharvest characteristics of 'Annette Hegg Dark Red' (10). The short-term postharvest effects of different plant sleeves and storage temperatures on 2 Hegg cultivars showed that plants could be stored for a minimal time in paper sleeves at 10°C (11). However, the long-term effects of storage temperatures and sleeving on the postharvest life have not been determined. The objective of this research was to determine

the long-term, postharvest effects of temperature and dark storage duration of sleeved and nonsleeved plants.

A 3 × 3 × 2 factorial experiment in a completely randomized design was established on August 28, 1980, with 3 temperature regimes, 3 storage durations, and 2 sleeving treatments. There were 5 replications per treatment combination with 1 plant/12.5-cm pot as an experimental unit. Uni-

form rooted cuttings of 'Gutbier V-14 Glory' were potted in a growing medium of 1 soil : 1 sphagnum peat : 1 perlite (by volume) amended with 3.6 kg/m³ dolomitic limestone and 74.2 g/m³ fritted trace elements. Plants were grown in a greenhouse with temperatures of 17°C minimum and 23° maximum and watered 3 times per week. All plants were pinched 2 weeks after potting, leaving an average of 6 leaves per plant. Photoperiod induction was under natural days. Fertilizer was applied weekly as 600 ppm N and 200 ppm K from a 25N-4.3P-8.3K soluble fertilizer until November 1 and then fertilizer was applied on alternate weeks. Fertilizer was terminated 2 weeks prior to initiation of dark storage treatments. All plants were watered thoroughly prior to storage treatments.

Postharvest treatments were initiated on December 10. Treatments consisted of plants being sleeved in paper sleeves or being left unsleeved. The sleeve which remained open at the top, was Kraft water-repellent paper with a wet strength of 20.4 kg. Plants were then subjected to 7.2°, 12.8°, or 18.3°C for 3, 6, or 9 days of dark storage. Dark storage treatments were achieved by placing plants in temperature-controlled rooms for the appropriate storage duration with a relative humidity of 60 ± 10%. Following dark storage treatments, plants were held in a light- and temperature-controlled room for the 30-day postharvest observation period. Plants were provided with 15 μE s⁻¹m⁻², measured at the top of the bract canopy, from Cool-White fluorescent tubes. Temperature was maintained at 20 ± 1° with a relative humidity

Table 1. Postharvest effects of sleeving, temperature, and duration of dark storage on abscission, fresh weight, and quality of 'Gutbier V-14 Glory' after 30 days indoors.

Treatment main effects	Leaf drop (%/plant)	Bract drop (%/plant)	Cyathium drop (%/plant)	Damaged bracts (%/plant)	Fresh wt (g)	Plant quality grade ^z
<i>Sleeving</i>						
Sleeved	20	6	76	10	81	3.4
Nonsleeved	27	11	84	18	73	2.8
<i>Temp</i>						
7.2°C	31	14	82	14	68	2.4
12.8°	16	4	75	0	83	3.6
18.3°	23	7	82	0	77	3.2
<i>Storage</i>						
3 days	16	5	65	1	87	3.5
6 days	22	8	85	5	74	3.1
9 days	31	11	90	7	68	2.7
<i>Significance^y</i>						
Sleeving	*	*	*	*	*	*
Temp	q**	l*q**	q**	NS	l*q**	q*
Storage	l**	l*	l**	l*	l**	l**

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^z1 = poor, not acceptable; 3 = good, acceptable; and 5 = excellent quality.

^yLinear (l); quadratic (q); no significance (NS); 5% level (*); 1% level (**). Interactions of sleeving × temp, sleeving × storage, and temp × storage were nonsignificant.

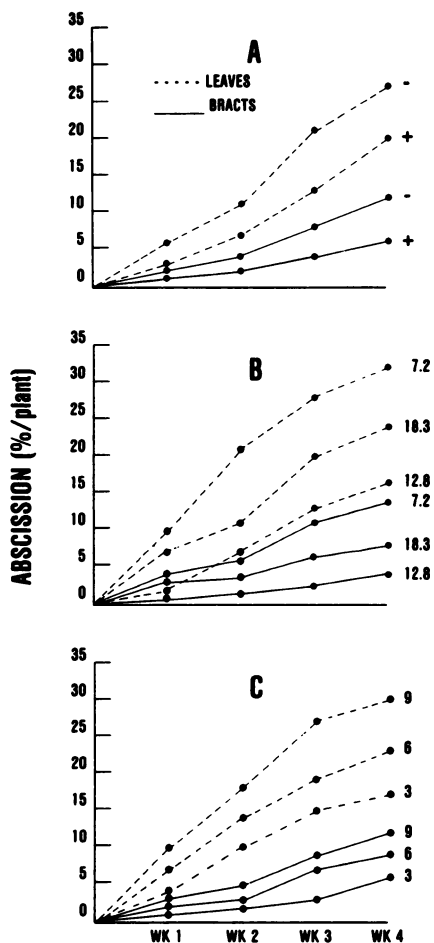


Fig. 1. Postharvest abscission of leaves and bracts over time of 'Gutbier V-14 Glory' as affected by: (A) sleeving (+) or nonsleeving (-); (B) temperature ($^{\circ}\text{C}$); and (C) duration of storage (days).

of $60 \pm 10\%$, and plants were watered once per week.

Data collected weekly during the 30-day observation period were leaf drop, bract drop, and cyathium drop. Number of damaged bracts (chilling damage exhibited by white lesions on bracts), fresh weight (plant severed at soil line), and plant quality (1 = poor, not acceptable; 3 = good, acceptable; 5 = excellent quality) were determined at the end of

the 30-day postharvest period.

Postharvest results after 30 days indoors showed that sleeved plants had less leaf, bract, and cyathium drop with fewer damaged bracts than nonsleeved plants (Table 1). Leaf abscission of nonsleeved plants resulted in the net effects of less fresh weight and lower plant quality.

Results for temperature treatments indicated a highly significant quadratic response for leaf, bract, and cyathium drop. Damaged bracts only occurred at 7.2°C . A negative quadratic response occurred for fresh weight and plant quality. Quality retention was better for plants held at 12.8° because abscission was less.

As storage duration increased, abscission of leaves, bracts, and cyathia and number of damaged bracts increased linearly. Fresh weight and plant quality decreased as storage duration increased.

Nonsleeved plants consistently maintained a higher level of leaf and bract abscission than sleeved plants as time after storage increased up to 4 weeks (Fig. 1). The intermediate temperature of 12.8°C maintained the lowest leaf and bract abscission over the 4-week time period. Leaf and bract abscission consistently were lower for 3 days of dark storage than for 6 or 9 days as weeks after storage increased. For all treatments, the greatest abscission occurred between weeks 3 and 4, with leaves abscising at a faster rate than bracts for weeks 1 through 4.

These results further substantiate previous findings (1) that 'Gutbier V-14 Glory' can tolerate the stress imposed by sleeving and, in addition, that no epinastic response occurred. Sleeved plants retained better quality as reflected by greater leaf, bract, and cyathium retention. Sleeved plants also had less damaged bracts, because of less white lesions, than did nonsleeved plants. This probably was because of a reduction in heat transfer, as suggested by Staby et al. (11). Plants exposed to 7.2°C were the only ones showing bract damage. Chilling damage of tropical plants has been reported to occur at low but nonfreezing temperatures below 12° (3), and white lesions have been among the symptoms described (4). However, others (8,

11) have reported that storage at 10° did not lower poinsettia plant quality. Plants held at 12.8° had less abscission and better quality than those held at 18.3° , possibly due to a reduction in the rate of senescence. The storage temperature of 18.3° was very similar to the finishing production temperature and the postharvest holding temperature resulting in plants with a steady-state decline toward senescence. We recommend that sleeving during storage and storage at a temperature of 12.8°C (up to a maximum of 6 days) will enhance postharvest keeping quality of 'Gutbier V-14 Glory' poinsettia.

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