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Vapor Gard™ Cold Protection for *Phalaenopsis* Orchid Flowers in Cold Storage

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***Phalaenopsis* species are grown for their attractive flowers. *Phalaenopsis* can stand temperatures of 60 °F (16 °C) but not freezing. All of the known means of protecting the *Phalaenopsis* in shipment and cold storage, such as cold barrier papers and insulated cartons were tried without success. Thus, chemical means were considered as a possibility since previous studies by Miller Chemical & Fertilizer Corporation's Vapor Gard™ had shown that their application in the field provided cold protection. Vapor Gard™ treated *Phalaenopsis* at three percentages—one percent, two percent, and four percent levels of Vapor Gard™ were selected for the trial. The *Phalaenopsis* completely immersed in the three percent levels of Vapor Gard™, with a control of immersing the plant only in water. The immersing of the treated plants was carried out in a 20-gallon plastic container. All of the Vapor Gard™ treatments were allowed to air dry prior to refrigeration. The orchids were placed in cold storage at 42 °F (5 °C) to test the *Phalaenopsis* flowers protection from 42 °F (5 °C) chilling. Evaluations were conducted after 48 hours. The results of the trial significantly showed that Vapor Gard™ at two percent provided excellent protection of the *Phalaenopsis* flowers after 14 days.**

Phalaenopsis spp. are epiphytic orchids grown for their attractive flowers (Fig. 1). *Phalaenopsis* orchids can stand temperatures up to, 60 °F (16 °C) but not freezing. Untill 2007, Kerry's Nursery, Inc., delivered the potted *Phalaenopsis* plants in nonrefrigerated corporate trucks to the outlet stores both in Florida and national without damage. The Box Company requested that the plants be delivered to their Distribution centers from which they would transport the orchids to their Retail Stores. Complaints were lodged to Kerry's Nursery that the *Phalaenopsis* were damaged when transported in their trucks that were also carrying frozen meats and bananas that they claimed were not damaged by the cold temperatures.

All of the known means of protecting the *Phalaenopsis* in shipment, such as sleeves of paper or plastic, cold barrier papers and cartons were tried without success (Staby et al., 1976). Thus, chemical means were a possibility since previous studies of Miller Chemical Companies Vapor Gard™ (unreported data) had shown that their application in the field to protect vegetable crops during cold spells provided protection.

Materials and Methods

The objective of this study was to identify some means to protect the *Phalaenopsis* flowers in shipping and transportation at temperatures below 60 °F (16 °C). The experimental design was a randomized block plan on a 48 x 40 inch pallet with three replicates.

To test the hypothesis that Vapor Gard™-treated *Phalaenopsis* would survive low temperatures, three percentages; 1%, 2%, and 4% levels of Vapor Gard™ were selected for the trial.

The trial was setup by completely immersing the *Phalaenopsis* in a 1%, 2% and 4% levels of Vapor Gard™, with a control of immersing the plant in only water. The immersing of the treated plants was carried out in a 20-gal plastic container. All of the Vapor Gard™ treatments were allowed to air dry prior to refrigeration.

The treated *Phalaenopsis* plants were transported to the cold storage to test the *Phalaenopsis* flowers protection from 42 °F (5 °C) chilling. All of the Vapor Gard™ treatments were allowed to air dry prior to refrigeration. The treated *Phalaenopsis* plants were transported to the cold storage to test the *Phalaenopsis* flowers protection from 42 °F (5 °C) chilling. The treatments and transporting to the cold storage was carried out on 10 Sept 2012.

Evaluations were conducted after 48 h on 12 Sept. 2012 (Fig. 2). Vapor Gard™ treated plants placed on the raised racks in the cold room at 42 °F, 5 °C. The final evaluation was made on September 24, 2012.

Results and Discussion

The results of the trial significantly showed that Vapor Gard™ at two percent provided excellent protection of the *Phalaenopsis* flowers after 14 d (Table 1). The Vapor Gard™-treated plants showing no damage to the 2% treated plants but showing wilting of the controls, 1% treatment damage after 48 h. (Fig. 3). The 4% Vapor Gard™ treatment of the *Phalaenopsis* shows the high sticky dark green gloss on the leaves and damage to the flowers (Fig. 3). Replication 3 showing affect of cold on Vapor Gard™treated *Phalaenopsis* flowers in wilt after 48 h. (Fig 4).

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Fig. 1. *Phalaenopsis* sp. (hybrids).

Fig. 2. Vapor Gard™ treated plants placed in cold room at 42 °F.

Table 1. Effect of dipping of Vapor Gard on *Phalaenopsis* orchids for Cold Protection, 2012.

No. Treatment	Cold Damage[z, y, x]	Toxicity[z, y, x]
1. Control (water dip)	5.0a	0.0b
2. Vapor Gard at 1%	2.0a	0.0b
3. Vapor Gard at 2%	0.0b	0.0b
4. Vapor Gard at 4%	0.0b	5.0a

[z]Cold damage rated from 0–5 with 0 being no damage, 2 being flower wilt, 3 leaves and flower petals showing water soaking, 4 flowers and leaves being brownish in color, and 5 leaves and flowers showing wilting with necrosis.

[y]Plant toxicity rated from 0–5 with 0 being no damage, 2 leaf and flower water soaking, 3 flowers and leaf scorched, 4 necrotic leaves and flowers, and 5 flowers and leaves water soaked with sticky residue.

[x]Mean followed by the same letter within a column are not significantly different ($P = 0.05$) according to Duncan's multiple range test.

Fig. 3 Vapor Gard™-treated (VG) plants showing cold damage after 48 h.

4. Replication 3 showing affect of cold on the control and the 1%, 2% and 4% Vapor Gard™-treated *Phalaenopsis* after 48 h.

The Vapor Gard™ immersion treatment shows promise in protecting the *Phalaenopsis* flowers from temperature of (48 °F, 5 °C) it would be monumental task of treating 8–10 million plants per year but also be a task to capture the run off reaching the soil. There is evidence that protecting the *Phalaenopsis* roots from cold temperatures or a spray drench might be a easier way to protect the plants (McMillan unpublished data).

The shipping environment of refrigerated transport vehicles has never been conducive to maintaining foliage plant quality (Conover 1976). The best shipping temperature for *Phalaenopsis* is in the range of 60 °F (13 °C) to 65 °F (16 °C) with an 85% to 90% relative humidity (Conover and Poole 1983, Staby et al. 1976).

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