Ice cube irrigation of potted *Phalaenopsis* orchids does not decrease display life

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Abstract

Historically, orchids have been associated with the wealthy and orchid enthusiasts, but today *Phalaenopsis* orchids are readily available to all consumers due to the advancements in production, breeding, and propagation. Proper irrigation is a challenge faced by consumers, but plant care instructions can alleviate the problems of over- or under- watering. Ice cube irrigation is a method promoted to give structured, straight forward instructions for irrigating orchids. Chilling or freezing damage caused by the ice is a concern because *Phalaenopsis* orchids are native to tropical regions. The objective of this study was to evaluate the health and display life of *Phalaenopsis* orchids irrigated with ice or room temperature water. The experiment was conducted at The Ohio State University (Wooster, OH) and University of Georgia (Athens, GA). At each location, 24 orchids (6 plants of 4 different cultivars) were irrigated with three ice cubes and 24 orchids were irrigated with the equivalent volume of room temperature water every week. The longevity of an individual flower and the overall display life of the whole plant were determined. Plants were maintained in an interior evaluation room for 4 to 6 months, until the last flower on the plant senesced. Leachate volumes were measured to determine how much water was used by the plant or held by the bark growing media. The chlorophyll content of the leaves, quantum yield of photosystem II of the leaves and roots, and final dry weights of the leaves and roots were used to monitor the effect of ice irrigation on the health of the plants. The temperature in the media was also monitored during irrigation events. Flower longevity and display life were the same in ice- and water- irrigated plants of all cultivars. The efficiency of photosystem II and chlorophyll content also showed no treatment effect. The leachate volume after ice irrigation was equivalent or lower than the leachate volume after water irrigation. Leaf and root dry weights showed similar results between the two irrigation methods. The temperature of the bark after ice irrigation reached a low of 11˚C. Ice irrigation did not cause early flower loss or damage the plant's photosynthetic health, while providing a sufficient amount of water to the orchid. A consumer's success with their potted plants is an important aspect of the industry, and irrigating with ice should be considered a viable irrigation option for *Phalaenopsis* orchids in bark media.

Introduction

- Orchids are now the top selling potted flowering plant in the United States, with a wholesale value of $288 million (USDA, 2016).
- *Phalaenopsis* orchids do well as house plants because of their long flower life under the temperature and low light conditions of the home (Banks, 2005).
- Ice cube irrigation has been promoted to give straight forward instructions for irrigating orchids, which reduce the chances of over- or under-watering (Onofrey, 2009).

Objective

Evaluate the health and display life of *Phalaenopsis* orchids irrigated with ice cubes or room temperature water.

Materials and Methods

Two Locations

- The Ohio State University, Ohio Agricultural Research and Development Center in Wooster, OH.
- University of Georgia in Athens, GA.

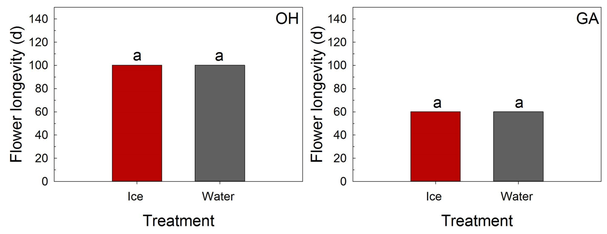
Materials and Methods cont.

Experimental Design

- 48 *Phalaenopsis* orchids per location.
- 4 cultivars.
- Split plot, randomized complete block design.
- 2 irrigation treatments: ice cube & room temperature water.
- Statistical analysis: F-test considered significant at α=0.05.

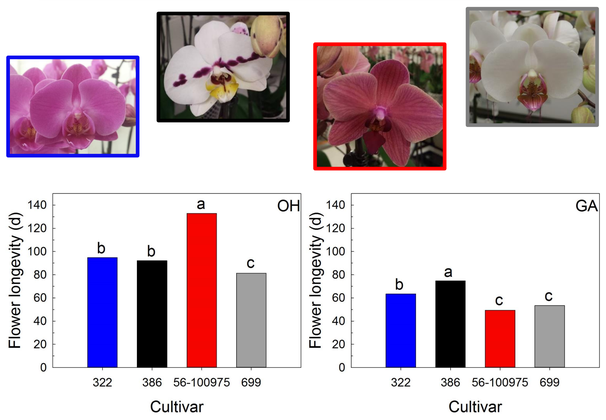
Results

Figure 1: Flower Longevity Under Different Irrigation Treatments



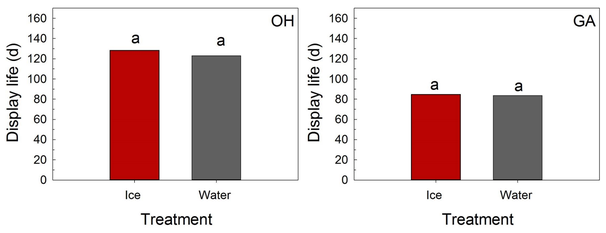
- Flower longevity was determined by monitoring a single flower per spike from day of opening to day of wilting.
- In OH and GA, the flower longevity was unaffected by irrigation treatment.

Figure 2: Flower Longevity of Different Cultivars



- Cultivars showed differences in flower longevity, regardless of irrigation treatment.

Figure 3: Display Life Under Different Irrigation Treatments



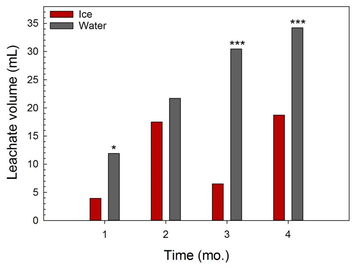
- Display life is the number of days from orchid arrival to the day the last flower wilted.
- Irrigation treatment had no effect on display life in OH or GA.
- Significant differences were found between cultivars, regardless of irrigation treatment (data not shown).

Figure 4: Visual Comparison of Display Life

- Comparison between the ice cube and water irrigated orchids for cultivar 56-100975 in the fourth measurement month.

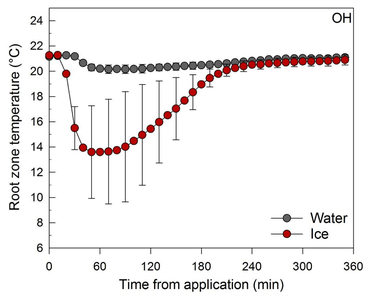
Results cont.

Figure 5: Leachate Volume



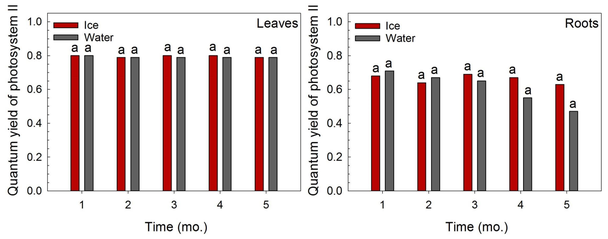
- Leachate was collected 24 h after irrigation once a month.
- Ice cube irrigation resulted in a lower leachate volume than water irrigation in 3 of the 4 months at the GA location.
- Generally, leachate volumes were either the same between treatments or lower in ice cube irrigated orchids in OH (data not shown).

Figure 6: Media Temperature



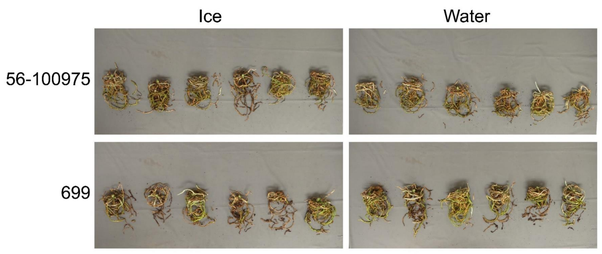
- Media (95% bark) temperature was monitored with EM50 probes (Decagon) following irrigation events.
- Media temperature changes during a representative irrigation event (27 June 2016, OH, cv 699).
- The average media temperature after the water irrigation treatment was between 20.2 and 21.3 °C.
- Ice cube irrigation resulted in a low media temperature of 13.6 °C.
- Media temperature returned to pre-treatment temperatures ~ 5 h after ice cube application.

Figure: 7: Quantum Yield of Photosystem II



- A chlorophyll fluorometer (Photon Systems Instruments) was used to measure the quantum yield of photosystem II of the leaves and roots once a month (OH location only).
- Quantum yield of *Phalaenopsis* leaves and roots were not affected by the irrigation treatment.

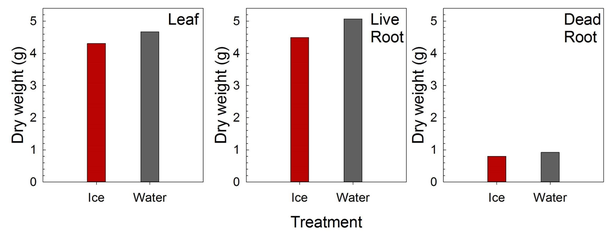
Figure 8: Visual Comparison of Roots



- At final harvest, leaves were separated from the roots and visually evaluated for signs of damage.
- Root systems were visually similar between treatments.

Results cont.

Figure 9: Final Harvest Dry Weights



- At the end of the experiment, the dry weights of leaves, healthy roots, and dead roots were measured.
- At the GA location, no significant difference was found between the dry weights.
- At the OH location, differences were found between cultivars (data not shown).

Discussion

- Consumer success with orchids will determine repeat purchases, and it is therefore important for orchid producers to provide recommendations that can insure their success.
- The method of irrigating *Phalaenopsis* orchids with ice cubes has been suggested as a way to prevent over- or under-watering, but concern has been raised about low temperature damage to the plants and flowers.

- The flower longevity, display life, and root and shoot health of the *Phalaenopsis* orchids irrigated with ice cubes was not different than those irrigated with water.

- Overall leachate volume was reduced when plants were irrigated with ice cubes. This slow release of water can allow for greater uptake by the plants and retention by the media.
- The media temperatures were not reduced low enough or long enough to induce low temperature damage in the roots.

Conclusion

Phalaenopsis orchids grown in bark potting media showed no damage from the ice cube irrigation treatment. Ice cube irrigation is a viable method for homeowners.

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