Effects of Cellulosic Water and Media Surfactant on Time to Wilt for Potted Spathiphylum

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Additional index words. display life, interiorscapes, flowering, indoor house plants, watering, wetting agent, available water

Watering of indoor house plants can be time consuming and problematic when people are away for periods of time. Increasing the potting medium water-holding capacity without sacrificing aeration and utilizing slow-release water sources are two potential ways to extend the intervals between waterings without the use of specialized planters. This experiment was conducted to determine if a medium surfactant drench (S) and cellulosic water (CW), respectively, could provide those benefits. Uniform, finished Spathiphyllum 'Patrice' plants grown in 6-inch pots were used. Thepeat-pine bark-perlite growing medium was left untreated (control), drenched with a S (Aqua-Gro® L) at 600 ppm, inserted with three 50-mL spikes filled with CW (SolidWater™) or treated with both S and CW. Pots were then brought to container capacity, weighed, and held under simulated home/office conditions. Plants were weighed daily and checked visually for wilt. When the wilt threshold was met, the plants were re-watered, re-weighed, and monitored for the next wilt event. Each plant was allowed to wilt three times. The S-alone treatment did not increase average days to wilt (DTW) compared to the control even though medium rewetting was highest for both treatments that included S. CW treatment increased average DTW (10.4 d with surfactant, 9.6 d alone) compared to the control (8.7 d) treatment. Initial and final weights of the spikes showed that, on average, only 29% of the CW had been released after 33 d. This slow release could be due to the populations of microorganisms in the growing medium, amount of contact area between the CW and the medium, and/or the cellulose content/viscosity of the CW.

Materials and Methods

This experiment was conducted in a 10 ft × 10 ft acclimatization room at the University of Florida’s Mid-Florida Research and Education Center (Apopka, FL) set up to simulate a home/office environment. Room conditions were maintained at 73 ± 3 °F and 57% ± 15% relative humidity (RH) with 12 h of light per day at 16.3 µmol·m²·s⁻¹ provided by cool-white fluorescent lamps (F34T 12/CW/RS/EW Alto; Philips Lighting, Somerset, NJ).

Uniform finished Spathiphyllum 'Patrice' plants in 6-inch standard pots (STD. T.W., Dillen Products, Middlefield, OH) were used. The plants had been produced using a Canadian sphagnum peat : pine bark : perlite (35% : 55% : 10%) growing medium (Florida Potting Soils, Orlando, FL). The four treatments included untreated controls, growing medium drench with 600 ppm surfactant (S)(Aqua-Gro® L, Aquatrols, Paulsboro, NJ), 150 mL of cellulosic water (CW) supplied using three 50-mL spikes per pot (Solidwater; Amerisupply, Sanford, FL) or a combination of the S and CW treatments.

All pots were brought to container water-holding capacity before the start of the experiment. The pots getting the surfactant treatments were treated the day before the experiment started and the CW-treated pots had the spikes inserted into the growing medium surface (Fig. 1) the day the experiment started. Pots were weighed and evaluated for wilt daily. When a plant reached the wilt threshold it was re-watered by slowly pouring 800 mL of
water evenly over the growing medium surface and letting the pot stand for 1½ h in its saucer in the excess water. The residual water remaining in the saucer was measured to allow determination of the amount of water added back into the growing medium. In addition, the pots were reweighed. Each plant was followed through three wilt cycles. Once all plants had wilted three times, the leaf surface area of each plant was determined using an area meter (3100, LI-COR, Lincoln, NE). Periodic counts were also made of all emerging and open inflorescences.

The experimental design was a randomized complete block with six replications. Individual pots were the experimental units. Data were subjected to analysis of variance, regression analysis, and Duncan’s new multiple range test at P ≤ 0.05 for means separations (GLM, SAS version 9.2; SAS Institute, Cary, NC).

**Results and Discussion**

**Days to wilt.** CW alone and the combination S plus CW treatments increased the days to wilt (DTW) compared to the control (Fig. 2, P ≤ 0.05, Duncan’s new multiple range test). The surfactant alone treatment did not increase DTW compared to the control despite increased water retention upon rewetting in the surfactant treatments (see “Rewetting efficacy” and Fig. 3).

**Leaf surface area.** There were no differences among leaf surface areas for plants from the four treatments (F_{1,20} = 2.17, P = 0.124; data not shown) and overall regression analysis indicated no relationship between plant leaf surface areas and DTW (F_{1,22} = 0.01, P = 0.906; data not shown).

**Rewetting efficacy.** Surfactant drench treatments had no significant effect on initial container capacities (F_{1,22} = 2.94, P = 0.10; data not shown) but did increase the amount of water retained during rewetting (Fig. 3). This result is consistent with previous work (Blodgett et al., 1993; Urrestarazu et al., 2008). However, this increased water retention did not lead to increased DTW for the surfactant-only treatment. This may indicate that less of the retained water is readily available to the plants. Bilderback (1994) found that a wetting agent increased the amount of available water in a bark medium but decreased it in a bark:sand (4:1) medium. In another study on the effects of a wetting agent applied to new and used coconut fiber, it was found that plant water uptake was significantly decreased by the surfactant (Guillen et al., 2005). The CW treatment also increased rewetting water retention, albeit less so than S. The benefit was possibly due to maintaining slightly higher medium moisture levels.

**Weight loss at wilting.** Weight losses at the wilting point, an indicator of water loss, varied depending on treatment (Fig. 4). Pots treated with surfactants lost less weight before plants wilted than their corresponding treatments—surfactant vs. control and surfactant + CW vs. only CW. This suggests that the surfactant treatment may have reduced water availability.
Fig. 4. The volume of water extracted from the growing medium before the Spathiphyllum plants wilted was less in the treatments that included the surfactant drench than in their corresponding treatments, S alone vs. untreated and S + CW vs. CW alone. Different letters accompanying mean values in the bar graph represent means with significant differences ($P \leq 0.05$, Duncan’s new multiple range test; overall $F_{3,68} = 10.38$, $P < 0.0001$).

Cellulosic water release from spikes. The amount of CW released during the 33 d of this study ranged from 23 to 75 mL per pot and averaged 43.5 mL per pot. CW release did not affect average days to wilt ($y = 0.0093x + 10.405$, $R^2 = 0.0713$). However, the release of water may have been enough to facilitate the rewetting process in the case of the CW only treatment and to counter the possible negative effects of the surfactant on water availability.

Inflorescences counts. Treatments had no effect on inflorescences counts at any time during the experiment (data not shown).

In conclusion, this exploratory experiment suggests that cellulosic water can increase the time elapsed before potted spathiphyllums wilt under simulated home and office conditions. However, the amounts of CW released over the 33 d of the experiment averaged only 29% of the CW applied. This limited release could be due to several factors: low populations of microorganisms in the growing medium capable of cellulolysis, limited contact area between the CW and the growing medium, and a high cellulose content/high viscosity form of CW. Additional research is needed using CW with various cellulose contents and with empty spikes as an additional treatment. Research to specifically determine the effects of surfactants on media rewetting and available water content would also be of interest.

Literature Cited


