GROWERTALKS

Features

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Worrying About Wilt?

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Many factors can contribute to the wilting of unrooted cuttings prior to placing them on the propagation bench. Some of the more common problems result from an extended shipping or storage duration, cutting boxes that aren't full, slow or improper handling of cuttings on the sticking line, delays in transporting the cuttings to the propagation bench and dry, sunny and windy environments. Water stress at this critical point in the life of the cutting can cause damage or delays in rooting.

A plant's primary defense against water loss is a waxy surface—called the cuticle—however, this waxy cuticle also reduces the absorption of water that's sprayed onto the foliage. Water applied in a water tunnel or from an irrigation boom tends to bead up on the leaf's surface and run off, rather than get absorbed by the leaf. Thus, misting the cuttings is an inefficient means of rehydrating the leaves. Foliar-applied water primarily serves to reduce the rate of water loss (transpiration), preventing further dehydration, but it's not very effective at rehydrating a wilted leaf.

In response to this problem, spray adjuvants, which are sometimes referred to as surfactants or wetting agents, have long been an integral part of improving water contact on leaves during propagation. Immediately after sticking, cuttings may be sprayed with an adjuvant, which works to decrease the water's surface tension. This allows the water to evenly spread across the leaf, rather than to bead up.

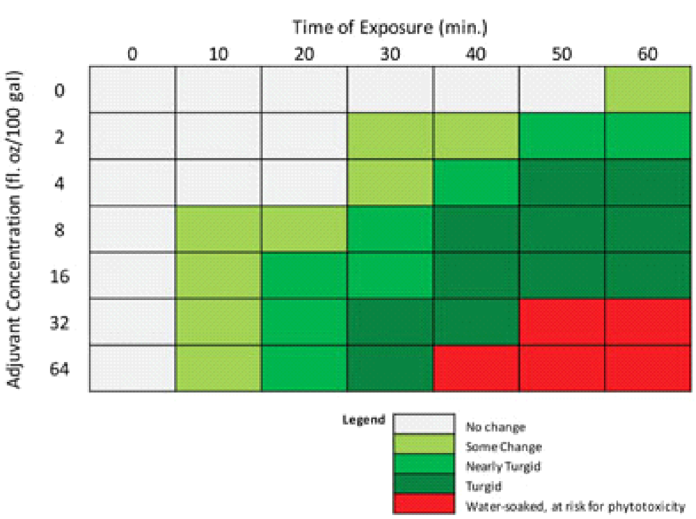

Figure 1. The effect of time of exposure and adjuvant (CapSil) concentration on the rehydration of wilted poinsettia cuttings. This table shouldn't be taken as a recommendation since rehydration rate and phytotoxicity potential will vary with species, adjuvant and the degree of wilting prior to the treatment.

One potential solution to rescuing wilted cuttings is to submerge them in an adjuvant solution prior to sticking. The benefits of restoring a cutting's turgidity before sticking are that turgid cuttings are easier to stick into the growing media and the stress of wilting is limited, improving the cutting's chance of survival. The potential downside to soaking cuttings in an adjuvant solution is the potential for phytotoxicity resulting from excessive water penetrating the plant cells. Also, from a sanitation perspective one needs to also be aware of the potential for spreading disease organisms when plants share a common solution.

Soaking study

We conducted a series of experiments to identify the ideal duration for soaking cuttings in an adjuvant solution and the proper adjuvant concentration for rapid rehydration while avoiding phytotoxicity. Freshly harvested poinsettia cuttings were placed on a greenhouse bench until approximately 10% of their total mass was lost. This results in significant wilting without causing permanent tissue damage.

The cuttings were then submerged in a range of concentrations of a common adjuvant (CapSil; 0, 2, 4, 8, 16, 32 or 64 fl. oz./100 gal.) and then removed from the solution at 10-minute intervals (10, 20, 30, 40, 50 or 60 minutes). Cutting mass was recorded as they rehydrated. The cuttings were then stuck in a foam propagation medium (Oasis Wedge) and observed over several weeks for phytotoxicity and rooting.

Figure 1 demonstrates the results observed. Cuttings dipped into water without adjuvant required one hour before any noticeable rehydration had occurred. Cuttings needed to be exposed to the lower concentrations of adjuvant (2 and 4 fl. oz./100 gal.) for 30 to 60 minutes in order to regain turgidity. The intermediate adjuvant concentrations (8 and 16 fl. oz./100 gal.) demonstrated a benefit in rehydration in as little as 10 minutes and complete rehydration occurring at 40 minutes.

The highest adjuvant concentrations (32 and 64 fl. oz./100 gal.) also resulted in rapid rehydration; however, phytotoxicity occurred with exposures greater than 30 minutes. The initial damage observed was water-soaked leaf tissue that developed into necrotic tissue during the first few days in propagation. No effect on rooting was observed for any of the adjuvant
treatments.

Cuttings stay wet for a period of time following their removal from the adjuvant solution, which affects the duration of exposure of the cuttings to the adjuvant and thus increases the potential for phytotoxicity. So we found that rinsing cuttings with clear water immediately after removing the cuttings from the soaking treatment reduced phytotoxicity.

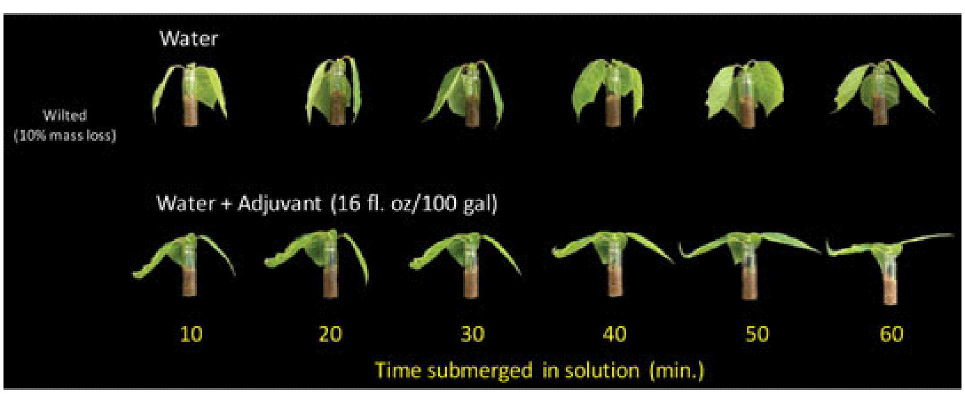

Figure 2. Change in turgidity of wilted poinsettia cuttings after being submerged in water and an adjuvant (CapSil at a rate of 16 fl. oz./100 gal.).

Figure 2 demonstrates the rate at which water penetrates a poinsettia cutting, resulting in increased turgor pressure and reduced wilting. Submerging cuttings in water has little effect on rehydration since water doesn't readily penetrate the waxy leaf cuticle. Figure 3 (left) shows the appearance of a leaf submerged in water. The waxy leaf cuticle causes a layer of air to form between the leaf and the water resulting in a silvery appearance that's not seen when leaves are submerged in an adjuvant solution (right). Adjuvants reduce the surface tension of the water, allowing it to come in direct contact with the leaf. This results in a different perception of the leaf color in the solution and rapid water penetration across the cuticle and into the leaf tissue.

Figure 3. Comparison of a poinsettia leaf submerged in water (left) or an adjuvant (right). The waxy leaf cuticle causes a layer of air to form between the leaf and the water resulting in a silvery appearance that's not seen when leaves are submerged in an adjuvant solution.

Results will vary with different plant species, different adjuvants and different initial degrees of wilting. Thus, growers will need to conduct their own trials to determine the best practices for their own facilities and crops. Based on our results with poinsettia cuttings, we suggest starting with CapSil at the rate of 8 to 16 fl. oz./100 gal. The person in charge of this rehydration process must check the cuttings for improved turgidity every five minutes until the cuttings reach the desired water content. One cannot simply submerge the cuttings and then walk away for 30 minutes. The potential for phytotoxicity is too great to not closely supervise this procedure. Finally, rinsing the adjuvant from the cuttings is recommended to avoid excessive exposure time.

Properly supervised, dipping cuttings into adjuvant solutions is a viable method to revive water-stressed cuttings. As a final note of caution, dipping solutions should be frequently changed to prevent the possibility of spreading pathogens and growers may want to experiment with adding a disinfectant to the solution to reduce this possibility. **GT**

Mary-Frances Behnke recently graduated from high school and will begin her studies at Clemson University in the fall. Kelly Lewis is a research specialist and James Faust is an associate professor at Clemson.