

Rehydrating Unrooted Cuttings: A Systems Approach to Uniform Liners



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Rehydrating unrooted cuttings is not a single action but a coordinated system that integrates receiving practices, holding environments, sticking workflows, humidity management, and vapor pressure control throughout the rooting process.

One of the most critical, and often underestimated, drivers of rooting success is the hydration status of unrooted cuttings (URCs) from the moment they arrive at your facility through callus formation and early root development (Fig. 1). Cuttings that are inadequately hydrated, even briefly, frequently exhibit delayed rooting, leading to non-uniform liners and increased disease susceptibility, all of which compromise crop scheduling and profitability (Fig. 2).

Despite careful harvest, packing, and shipping by suppliers, URCs arrive physiologically stressed because they inevitably lose water during transit and handling (Figs. 3 and 4). Research and commercial experience have shown that many cuttings arrive at greenhouses already significantly dehydrated by up to ≈20% relative to their optimal internal water status. Without intervention, dehydration often worsens during unpacking, staging, and sticking, particularly in dry work areas. Therefore, rehydration should be viewed not as a corrective measure for poor-quality cuttings, but as a foundational propagation practice that restores water balance and sets the stage for consistent rooting.



Figure 1. Upon arrival at your facility, unpack the boxes of unrooted cuttings, inspect them, and immediately sort and stage them by priority to prevent further dehydration.

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Understanding Dehydration Stress in Cuttings

Water loss in URCs has immediate consequences. Because cuttings lack roots, they rely almost entirely on stored water and limited foliar uptake to maintain turgor. When dehydration occurs, leaf tissues lose turgidity, stomatal function becomes erratic, and processes associated with wound healing and callus formation slow dramatically. In extreme cases, cuttings may be nearly desiccated (Fig. 5). Even when cuttings recover visually after misting, internal water deficits may persist, resulting in weaker callus tissue and reduced root initiation.

The effects of dehydration are not uniform across species, cultivars, or even shipments. Thin-leaved crops with high transpiration rates lose water more rapidly than thick-leaved or woody species. Inconsistent hydration before sticking is one of the most common causes of uneven rooting within a tray, resulting in variable liner size and additional labor later in the crop cycle.

Assessing Cutting Hydration at Arrival

Effective rehydration begins with assessment. Upon arrival, cuttings should be inspected immediately rather than left sealed in shipping boxes or bags. Visual indicators such as wilted leaves, limp stems, or brittle tissue suggest water loss, but tactile assessment is equally important. Hydrated cuttings maintain firmness and resist bending, while dehydrated cuttings collapse easily under light pressure. Infrared thermometers can also be useful, as elevated tissue temperatures often indicate stress and excessive transpiration.

Temperature management during shipping and holding is closely tied to hydration. While coolers reduce metabolic demand (respiration), they also create low-humidity environments that accelerate moisture loss unless humidity is actively managed. For this reason, refrigeration alone is not a hydration strategy. The ideal temperature to store the vast majority of URCs is between 50 to 55 °F. Geraniums and chrysanthemums can be stored at 40 °F. Maintaining high humidity within coolers is essential to prevent further dehydration before rehydration protocols can be applied.

Rehydration Tips: From Basics to Best Practices

Rehydration strategies vary widely among commercial operations, but they can be broadly categorized by their effectiveness and level of



Figure 2. Cuttings that are stuck and dehydrated are more prone to disease and can root non-uniformly.



Figure 3. Calibrachoa cuttings are very susceptible to dehydration. Prior to sticking the URCs, place open bags in a cooler with fog; this will make sticking easier and improve rooting success. Through callus, keep the vapor pressure deficit low (Photo: Rick Ouding).



Figure 4. Geranium cuttings are moderately susceptible to dehydration and generally tolerate dehydration better than thin-leaf crops, but still benefit from structured hydration programs.

environmental control. Traditional misting after sticking is the most basic approach and remains common due to its simplicity and low initial cost (Fig. 6). However, mist systems typically produce relatively large droplets that fall quickly, wetting the substrate more than the URC. While mist can temporarily improve leaf turgor, it often fails to restore internal water balance and can increase disease risk if overused.

Dipping cuttings in water before sticking provides more immediate surface hydration and is more effective than mist alone (Fig. 7). This approach can improve the hydration status of cuttings when properly managed, but it is labor-intensive and carries risks of pathogen spread if sanitation is inadequate. Additionally, moisture gained through dipping can be lost quickly if cuttings are exposed to dry air before sticking.

Fogging systems represent the most effective and consistent method for rehydrating unrooted cuttings (Fig. 8). Fog produces extremely fine droplets that remain suspended in the air, maximizing leaf-surface contact and promoting gradual foliar water uptake without saturating the propagation media. Fogging can be used in dedicated hydration rooms, coolers, or holding areas and is particularly effective when cuttings are removed from shipping bags prior to treatment. Extended fogging periods, ranging from several hours to overnight, have been shown to restore turgidity and improve rooting uniformity across a wide range of crops.

Regardless of the method used, the critical principle is continuity. Hydration gained through fogging or dipping can be lost rapidly if cuttings are exposed to dry conditions during staging or sticking (Fig. 9). Propagation workflows should be designed to minimize the gap between rehydration and sticking, and humidity control should extend to sticking lines whenever possible (Fig. 10).

Integrating Rehydration into the Propagation Workflow

The propagation process should be viewed as a continuous moisture-management system rather than a series of isolated steps. Rehydration begins at receiving, continues through holding and sticking, and transitions into humidity and irrigation management after sticking. One of the most common points of failure is the sticking area itself, which is often warm, dry, and well-ventilated for worker comfort. Under these conditions, unrooted

cuttings can lose a substantial portion of their water content in less than two hours.

Maintaining localized humidity near sticking lines, reducing air movement, and organizing labor so that cuttings are stuck promptly after removal from hydration environments all contribute to improved outcomes. Training staff to recognize the importance of minimizing exposure to dry air is just as important as investing in equipment.

Managing Vapor Pressure Deficit During Root Development

While relative humidity has traditionally been used to guide propagation environments, vapor pressure deficit, or VPD, provides a more accurate measure of the transpiration demand placed on cuttings. VPD integrates air temperature and moisture content into a single value that reflects how strongly water is pulled from plant tissue into the surrounding air. For URCs, controlling VPD is one of the most effective ways to manage hydration without relying on excessive misting.

During arrival, rehydration, and pre-stick holding, cuttings are most vulnerable. At this stage, there are no roots and little capacity to replace water lost through transpiration. VPD should be maintained at very low levels, generally between 0.1 and 0.3 kilopascals (kPa), to minimize water loss and allow foliar uptake during fogging or high-humidity holding. If VPD rises above approximately 0.4 kilopascals during this stage, particularly under warm conditions, cuttings will continue to dehydrate despite surface moisture.

Immediately after sticking, during the early callus formation stage, VPD targets should remain low but slightly higher than during holding. A range of approximately 0.2 to 0.4 kPa supports wound healing and callus development while still limiting transpiration. Maintaining extremely low VPDs for extended periods can slow metabolism and increase disease pressure, so stability and uniformity are more important than pushing humidity to extremes.

As callus tissue develops and root initials form, VPD can be gradually increased to promote root initiation. During this phase, typically occurring three to ten days after sticking, depending on species and temperature, VPD targets of approximately 0.4 to 0.6 kPa are appropriate. This moderate increase stimulates root development while avoiding visible wilt. Mist frequency should decrease during this stage, and brief dry-downs

between mist events can improve oxygen availability in the substrate.

Once functional roots are present and the root system begins to expand, cuttings transition from survival mode to active growth. During this root development stage, VPD can be further increased, typically to 0.6 to 0.9 kPa. These conditions promote stronger root systems, increased branching, and better acclimation to finishing environments. Mist should be discontinued once cuttings maintain turgor independently, and irrigation should focus on managing substrate moisture rather than leaf wetness.

In the final hardening phase prior to transplant, VPD levels between approximately 0.8 and 1.2 kPa help prepare liners for transplant shock by strengthening cuticles and improving stomatal function. As with earlier stages, changes in VPD should be gradual to avoid stress on developing root systems.

Species Differences in Susceptibility to Dehydration

Species selection plays a significant role in determining how aggressively rehydration and VPD control must be managed. Some crops lose water rapidly and show stress quickly when hydration is inadequate, while others tolerate short periods of dryness with little impact on rooting.

Highly susceptible species include New Guinea impatiens, coleus, calibrachoa, petunia, bacopa, verbena, osteospermum, and nemesia. These plants typically have thin leaves, high stomatal density, and limited cuticular development, resulting in rapid moisture loss during shipping and handling. For these crops, extended pre-stick fogging and strict low-VPD control through callus formation are critical. Even brief exposure to dry air during sticking can result in uneven rooting and reduced liner quality.

Moderately susceptible species, including geranium, chrysanthemum, poinsettia, fuchsia, dahlia, and diascia, can tolerate dehydration better than thin-leaf crops but still benefit from structured hydration programs. These species respond well to short fog treatments or dipping prior to sticking and can tolerate slightly higher VPD earlier in propagation. In many cases, excessive misting is more detrimental than mild dehydration, as overly wet conditions slow root development and increase disease risk.



Figure 5. New Guinea impatiens are highly susceptible to dehydration. These cuttings are severely desiccated as leaves have become necrotic (Photo: Rose Oberholtzer).



Figure 6. Traditional misting can be used to improve cutting turgor. However, the large water droplets also saturate and waterlog the substrate, increasing disease risk if overused.



Figure 7. Dipping cuttings into water to rehydrate them before sticking provides more immediate surface hydration and is more effective than mist alone. This approach is labor-intensive and carries risks of pathogen spread if sanitation is inadequate.

Low-susceptibility species include pubescent-leaved plants such as lavender, rosemary, sage, and thyme, as well as succulents and many woody ornamentals. These plants possess thick cuticles, waxy leaves, or other adaptations that limit water loss. While they are less prone to dehydration during shipping and handling, they are particularly sensitive to over-hydration during propagation. For these crops, minimal fogging and higher VPD levels early in rooting often produce better results than traditional high-humidity approaches.

Bringing It All Together

Rehydrating URCs is not a single action but a coordinated system that integrates receiving practices, holding environments, sticking workflows, humidity management, and VPD control throughout the rooting process. The most successful propagation programs focus less on adding water and more on controlling water loss, using environmental tools such as fogging and VPD monitoring to create stable, species-appropriate conditions.

By tailoring rehydration strategies to crop susceptibility and adjusting VPD intentionally as cuttings progress from arrival through root development, growers can significantly improve rooting uniformity, reduce losses, and produce stronger, more consistent liners. In an increasingly tight labor and margin environment, these gains translate directly into more predictable schedules, lower input costs, and higher overall crop quality.

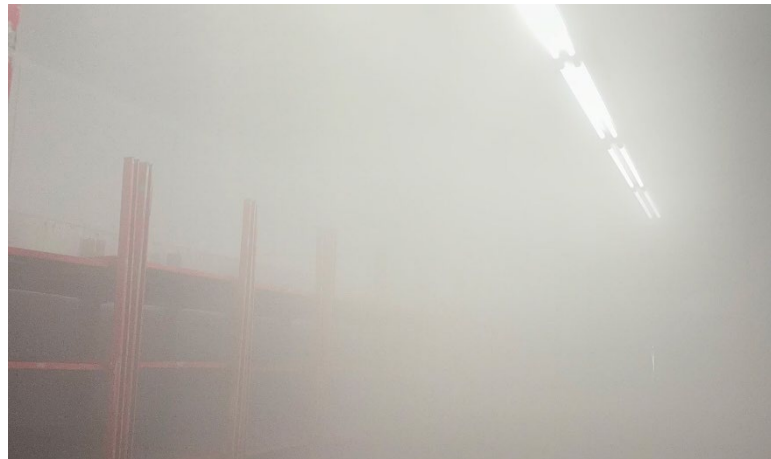


Figure 8. Utilizing a fogging system in a cooler is the most effective and consistent method for rehydrating unrooted cuttings (Photo: Rose Oberholtzer).



Figure 9. Any hydration gained through fogging or dipping can be lost rapidly if cuttings are exposed to dry and warm sticking environments.

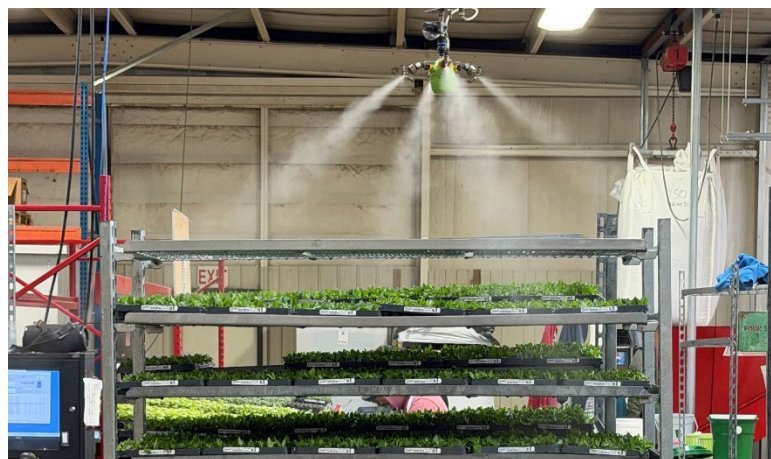


Figure 10. This greenhouse is using fog in the sticking line to ensure cuttings stay hydrated.

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