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Increasing the Rooting Success of Challenging Vegetative Cutting Species

Greenhouse growers need to consider the environmental conditions, timing, media porosity, and rooting hormones when sticking vegetative cuttings. Then, growers need to manage their light intensity and humidity in the propogation environment.

Greenhouse growers are now receiving unrooted cuttings from suppliers as the spring season begins to ramp up. We are also beginning to hear reports of challenges during the propagation of some vegetative cuttings species. Specifically, growers are struggling to root and propagate some herbs, such as rosemary and lavender (Fig. 1). Some other floriculture species that can be difficult to root and can benefit from priority sticking and rooting hormones include: bracteantha, bougainvillea, calibrachoa, crossandra, dahlia, gazania, heliotrope, hibiscus, lobelia, mandevilla, salvia, and thunbergia. The reason these species can be challenging range from their sensitivity to ethylene during shipping, moisture during propagation, and/or leaf size.

Now is a good time to review the most effective cultural and environmental conditions for rooting vegetative cuttings and especially

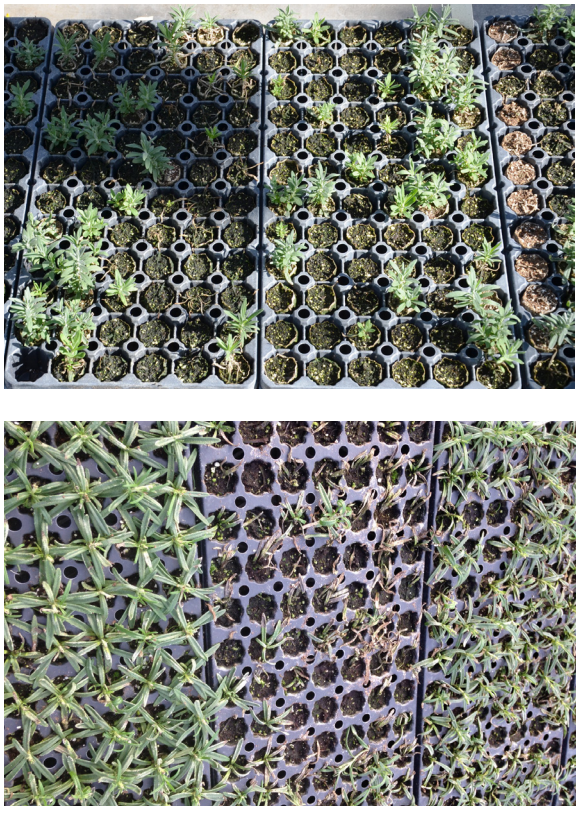

Figure 1. Poor rooting of lavendar and rosemary

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those can pose challenges. First, choose a media for rooting that is porous especially with rosemary or other hard-to-root cuttings. Remember that the rooting media should be firm and dense enough to support the cutting upright and without movement during rooting. It should also retain adequate moisture to keep the cutting turgid, and provide drainage and oxygen for rooting. Therefore, for species that are sensitive to moisture we recommend a media that that is composed of 50% or greater perlite to allow for adequate oxygen (25 to 35% porosity). The propagation medium should never be compacted or dense as this reduces the supply of oxygen to the base of the cutting and inhibits root development. Also, in water-logged media, fungus gnat larva populations may begin to increase and feed on the roots of the plants, which can cause wilting, spread of pathogens, and plant death.

Figure 2. Growers should immediately open boxes of incoming cuttings to inspect their temperature and quality.

Upon arrival of cuttings, boxes should be opened immediately, inspected for wilting, quality (e.g., appropriate length, caliper, leaf number, and size), proper labeling and quantity, noticeable signs of damage, stress, disease or death, and the cutting-tissue temperature should be determined

with an infrared thermometer (Fig. 2). Cuttings should be removed from the box to cool as quickly as possible, especially if the temperature of the cuttings is greater than 68°F (20°C) or if the box has been in transit for more than 2 days. Species are generally categorized high, moderate, or low based on their sticking priority. This categorization is based primarily on their sensitivity to ethylene or temperature extremes during shipping, difficulty for root initiation, or susceptibility to desiccation. The condition and tissue temperature of the cuttings upon arrival and the species sticking priority will affect the potential storage longevity as well as their performance in propagation. Growers should use this information along with the availability of labor, propagation, and cooler space to determine which of the three established handling protocols are followed.

High-priority species are immediately stuck into the rooting media within 4 hours of arrival. These species include: agastache, bacopa, coleus, crossandra, dahlia, geranium, heliotrope, hybrid euphorbia, lantana, lavender, portulaca, sweet potato, thunbergia, and wallflower. Moderate-priority species should be stuck within 24 hours of arrival. These include: fuchsia, licorice plant, impatiens, lithodora, mandevilla, garden phlox, poinsettia, strawflower, and yarrow. Lower-priority species should be propagated within 48 hours of arrival.

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When cuttings are not or cannot be stuck upon arrival, they should be unboxed and placed on shelves in a cooler at a high relative humidity, e.g., 80 to 95%. For cold-tolerant species, such as geranium and petunia, the temperature set point in the cooler should be between 41 to 50˚F (5 to 10 ˚C). Chilling-sensitive species, such as impatiens and poinsettia, should be placed at 50 to 59˚F (10 to 15˚C).

Rooting hormones are not required for the majority of unrooted cuttings, although difficult- or slow-to-root species and cultivars are often treated with stem or foliar rooting hormones to improve the uniformity of root initiation or to improve the rooting percentage (Fig. 3). Rooting hormones consisting of synthetic auxin compounds such as indole-3-acetic acid (IAA) are commonly used. The recommended concentration for stem and foliar application will vary by species. The general recommendations are:

- *500 to 2,000 ppm Indole-3-butyric acid (IBA) for stem applications*
- *50 to 500 ppm IBA for foliar applications*

Figure 3. Rooting hormone is often used when sticking dahlia cuttings.

Growers should always read the label of the compound that they are applying prior to application.

Most species develop callus and initiate roots most rapidly and uniformly when exposed to media temperatures of between 70 and 77 ºF (21 to 25˚C). This is often achieved by using root-zone or under bench heating. The air temperature is also important as it affects growth and should be maintained between 65 to 73˚F (18 to 23˚C). Light should be indirect or diffuse with the use of shade curtains resulting in levels between 120 to 200 $\mu mol \cdot m^{-2} \cdot s^{-1}$ or a daily light integral (DLI) of 3 to 5 $mol \cdot m^{-2} \cdot d^{-1}$Additionally, a low vapor pressure deficit of 0.3 kPa (relative humidity of approximately 85 to 90%, depending on temperature) should be maintained to keep cuttings hydrated and to prevent water stress.

Some growers maintain these environmental conditions by tenting young plants in plastic (Fig. 4), while others have misting or fogging systems (Fig. 5). The intermittent mist or fog system should be on to reduce cutting stress by maintaining humidity around the leaves to minimize transpiration and

Figures 4 and 5. Growers maintain high humidity when rooting vegetative cuttings by tenting plants or utilizing misting or fogging systems.

help reestablish turgor. The frequency of the mist or fog will vary widely and is dependent on the species, humidity, air movement, and greenhouse conditions. The ideal frequency should provide a continual film of water on the leaves, maintain humidity, and supply little to no water to the propagation media. Some greenhouse growers utilize a single application of a spreader-sticker or adjuvant (ex. CapSil). This prevents the water from beading and allows the mist to be more uniform on the cuttings.

After 7 days, growers should begin to apply 50 to 75 ppm nitrogen. This relatively light fertilization will encourage new root and shoot growth. With respect to light, according to previous research performed at Michigan State University, during stage 1 (from cutting stick to callus formation), limit light levels to 200 to 400 $\mu mol \cdot m^{-2} \cdot s^{-1}$ to achieve a DLI of 5 to 10 $mol \cdot m^{-2} \cdot d^{-1}$.

Greenhouse growers should follow these recommendations in order to ensure uniform and rapid rooting of unrooted cuttings (Fig. 6).

Figure 6. Greenhouse growers should consider media porosity, humidity, rooting hormones, adjuvants, minimal fertigation and light intensity to encourage fast and uniform rooting of challenging vegetative cutting species.