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Successfully propagating cuttings takes planning

More than 1 billion stem cuttings of bedding plants, perennials and potted plants are propagated in the United States each year. Whether they are purchased from suppliers or harvested from stock plants, successful cropping requires rapid and uniform rooting of cuttings. Delayed rooting can increase problems with insects, diseases and nutrition; increase crop timing; and increase variability of starting and finished material.

Successful propagation requires starting with high-quality, uniform cuttings that are vegetative, not excessively long and free of insects, diseases and viruses. Cuttings not of high quality can lead to delayed and non-uniform rooting. Starting with variable rooted transplants often produces variable finished plants.

Some tips for good crops

- **Use good sanitation.** Successful propagation requires prevention of diseases and viruses. To accomplish this, employees harvesting cuttings should disinfest their hands and wear latex gloves before handling stock plants. Cutting tools used on stock plants should be regularly sanitized using a disinfestant (such as trisodium phosphate) or passed through a flame.

When possible, use new plug trays so that there is no chance for pathogens to be resident on the plastic containers. Rooting media should be free of insects, diseases and weed seeds. Solid benches and floors where flats are placed should be sanitized between crops when possible. Good sanitation protocols can prevent crop problems during propagation.

- **Use a porous medium.** Propagation requires frequent misting, especially during the first seven to 10 days after cuttings are stuck. Use of a highly porous rooting medium during propagation, such as one that contains at least 50 percent perlite, can prevent the medium from becoming saturated with water. A fine, heavy medium dries out slowly, which can prevent oxygenation of the root zone. Use of a porous medium can also reduce problems with fungus gnats and shore flies. Plants with succulent or pubescent stems respond especially well to a light medium during propagation.

- **Maintain high humidity.** If humidity in the propagation area is maintained at 90-95 percent, cuttings require less misting. The humidity can be raised using steam or fog delivered by either high-pressure or a fan-driven water atomizer. In addition, air movement should be minimized during propagation so that leaf surfaces don't dry too quickly.

- **Regulate misting.** Stem cuttings have no roots. so frequent misting is needed to prevent leaves from drying out. Develop a misting program based on time, humidity and light levels.

Generally, the brighter the light environment, the more rapidly plants dry out. Therefore, cuttings require more frequent misting when exposed to bright light compared to at night.

In addition, rootless cuttings dry more slowly when the relative humidity is high. Once cuttings begin to root, misting frequency can be decreased over time. Therefore, misting should be more frequent during the first week of propagation and when light levels are highest. Once roots have initiated, misting at night can be stopped for most species.

Mist with a fine droplet size should be applied once the leaf surfaces begin to dry. At each misting event, apply enough mist to nearly cover the leaf but not so much that water drips off the foliage. Excessive misting leaches nutrients from the medium more rapidly and can lead to early nutritional deficiencies.

- **Apply fertilizer.** Frequent misting can rapidly leach out the pre-plant nutrients in most soilless media. Without fertilizer, cuttings can become chlorotic and root development can be delayed. One way to deliver nutrients to cuttings is to incorporate a light rate of fertilizer (such as 40-50 parts per million nitrogen) into the water used for misting. This allows plants to continue to receive a constant supply of nutrients and prevents nutritional deficiencies. Another strategy is to drench cuttings with a fertilizer (200-300 ppm) once roots have developed (for example, 10 days after sticking cuttings for many crops).

- **Manage medium and air temperature.** Temperature influences the rates of callus formation and root and shoot development. Ideally, the temperature of the medium should be maintained slightly higher (5°F-8°F) than the air so that callus and root growth occur faster than shoot growth.

To accomplish this, bottom heating is required. Desirable propagation temperatures are 73°F-77°F for the medium and 68°F-73°F for the air. If bottom heat is not available, the air temperature should be increased to 77°F-80°F so that medium temperature is adequately high.

A high medium temperature can be difficult to maintain when cold water is used for misting. To overcome this, increase bottom heating. However, excessive bottom heating can create root pruning, in which the temperature at the base of the plug becomes too high for root growth. Alternatively, misting water can be heated or mixed with hot water to raise its temperature and thus have less of a cooling effect on the medium temperature.

- **Watch light intensity and photoperiod control.** Plants that are photoperiodic should be maintained under noninductive conditions during propagation so that they are not induced to flower.

For example, cuttings of long-day plants should be grown under a photoperiod of 12 hours or less. Cuttings of poinsettia and other short-day plants need exposure to long days (night length less than 11 hours) to prevent early flowering.

Cuttings that contain or develop flower buds during propagation expend some of their energy on the flowers at the expense of root development.

Research has shown that the daily light integral (DLI) influences propagation time and root development. Under a low average daily light integral (less than 3 moles per square meter per day), many cuttings root slowly because they do not receive sufficient light energy.

During the initial stages of propagation, a high propagation daily light integral (above 6 mol·m^{-2}·d^{-1}) can also delay rooting. Therefore, a daily light integral of 3 to 6 mol·m^{-2}·d^{-1} is recommended until roots have formed. Once roots have reached the sides of the plug, 5 to 8 mol·m^{-2}·d^{-1} of light is suggested.

• **Establish propagation stages.** During propagation, cuttings transition from a completely rootless stem to an actively growing plant. Similar to seedling plugs, cuttings should be managed differently as root development progresses.

As cuttings develop roots, they need to be weaned off conditions for lush growth. Misting frequency should be reduced and light levels can be increased. Once roots have filled up half of the plug cell, the humidity can be reduced, misting can be terminated and fertility levels can increase.

During the last several days of propagation, plants that are hardened off will perform better after transplant. Providing different conditions during the propagation phases can shorten total propagation time and produce high quality, rooted transplants.

• **Other considerations.** Other propagation considerations include application of a rooting hormone to the base of stem cuttings. Bacteria, fungi and insects need to be controlled during propagation.

High humidity, abundant moisture and high temperatures can be conducive to rapid pathogen and insect development and should be actively managed for rapid, uniform rooting without plant loss. GMPRO