ofa Grower

OFA Fact Sheet: Cutting Propagation

by Roberto G. Lopez

In an ideal propagation greenhouse, a grower is able to provide adequate moisture, minimize environmental stresses, prevent diseases and insects, and rapidly root cuttings in well-drained media. If appropriate cultural and environmental factors are maintained, most annual and perennial unrooted cuttings (URCs) can become fully rooted liners within two to four weeks. The critical environmental factors to manage during rooting are:

- Light intensity
- Air and media temperatures
- Misting and relative humidity
- Air flow around leaves

These five factors are all essential for preventing cuttings from drying out, rapidly elongating, and promoting rapid, uniform, and complete rooting into the liner cells. Growers often find that it is difficult to keep these conditions in balance because of extreme external environmental factors or inadequate propagation facilities or controls. For example, on very cold and cloudy days growers may opt to use their shade or energy curtains during the day to help maintain warm air and media temperatures leading to excessively low light levels in their propagation houses. The following information will help you manage and keep environmental parameters in balance to ensure rooting success.

Light Management

Vegetative cuttings require a minimum quantity of light to provide the energy for root initiation and development. Light intensities below this minimum result in arrested root development, leading to a delayed crop or rooting failure. Conversely, too much light can reduce root formation due to excessive stress on the cuttings, and lead to bleached or scorched leaves.

Photoperiod

Photoperiod is often not controlled during the propagation of vegetative annual or perennial URCs. In certain annual plants, flowering is promoted by certain photoperiods (i.e. long days for petunia and *Argyranthemum*), and should be managed to prevent premature flower induction during propagation or finishing. A photoperiod of 12 to 13 hours is recommended for the propagation of most annuals, especially for long-day plants such as petunia.

Light Intensity

Desirable levels of light vary, depending primarily on the stage of root development. The following is a guideline to manage light intensity for most herbaceous crops during propagation.

Stage 1: Stick to callus formation. During the early stages of propagation (from stick to callus formation), maximum recommended light intensity is between 100 to 200 $\grave{I}mol \cdot m^{-2} \cdot s^{-1}$ (500 to 1,000 footcandles) to provide enough energy for callus formation and root initiation without causing desiccation. In addition, light transmission through the propagation house should be indirect or diffuse. White wash or exterior shade in combination with retractable shade curtains can provide a good system for light modulation, especially in the spring and summer. Automatic or manually operated retractable shade curtains alone can be an effective way to modulate light transmission, as they can remain open on cloudy days or in the morning and late afternoon on sunny days. Curtains should be closed during the brightest hours of the day to prevent excessively high light levels.

Stage 2: After root initiation. Once roots have initiated and are visible (generally 5 to 12 days after stick), maximum light intensity can be increased to 200 to 400 $\grave{I}mol \cdot m^{-2} \cdot s^{-1}$ (1,000 to 2,000 footcandles). Again, the light should be diffuse.

Stage 3: After roots fill half the plug. Once roots fill about half of the plug cell (generally 10 to 16 days after stick), maximum light levels can be increased to 500 to 800 $\grave{I}mol \cdot m^{-2} \cdot s^{-1}$ (2,500 to 4,000 footcandles). This higher intensity helps acclimate plants to the post-propagation environment.

Temperature Management

Air temperature and especially medium temperature are important for callus and root development. A desirable medium temperature for most species during Stage 1 is 73 to 77°F (23 to 25°C), which usually requires bench heating. Air temperature should be maintained between 68 to 73°F (20 to 23°C) when bottom heat is utilized. However, if bottom heat is not available, air temperature should be increased to 77 to 80°F (25 to 27°C) so that medium temperature is adequate. Maintaining air temperature lower than medium temperature retards shoot growth and promotes root development. During Stage 2 and 3, temperatures can be slightly lowered: air temperatures of 66 to 70°F (19 to 21°C) and media temperatures of 72 to 75°F (22 to 24°C).

Mist, Humidity, and Airflow Management

The most common watering system used in propagating URCs is intermittent mist. Efforts should be made to root cuttings with the least amount of mist possible to minimize disease pressure, leaching of nutrients, and water-logged media. The following is a good rule of thumb to follow: mist should be applied often

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enough to prevent URCs from wilting and long enough so water evenly coats the leaf surface but does not drip off.

Maintain relative humidity in a propagation house according to your air temperature set point as follows:

- >70% relative humidity at 68°F (20°C)
- >75% relative humidity at 73°F (23°C)
- >80% relative humidity at 78°F (26°C)

This can be done with steam or fog delivered by either high pressure or a fan-driven water atomizer. If environmental conditions are ideal (i.e. warm medium temperature, humid still air, and adequate light intensity), requirements for misting should be minimal and frequency can be low. Properly managing the electrical conductivity, pH, and hardness of your water is essential when using these systems.

Air movement or air exchanges should be limited during propagation; however air movement is sometimes necessary to balance high light levels, temperature, and moisture in summer months.

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Sustainable...Green...Eco Friendly...Organic... How Do We Fit In?

by Brian Krug

There has been a lot of buzz in our industry around the words "sustainable," "green," "eco friendly," and "organic." If you haven't heard much about them yet, you will. For example, an entire seminar track at this year's "Greenhouse Experience," hosted by Ball Publishing and OFA, was dedicated to organic growing.

What does it mean to you, the grower, to be sustainable, green, or organic? Growing and marketing a crop as *organic* requires certification by a USDA-accredited agency. To be termed organic crops must be grown without the use of conventional pesticides, synthetically produced fertilizers, or bioengineered plants. On the flipside, there is no universal definition or policy that regulates what can be considered *sustainable*, *green*, or *eco friendly*. Wikipedia has this definition: "Sustainable agriculture integrates three main goals: environmental stewardship, farm profitability, and prosperous farming communities. These goals have been defined by a variety of disciplines and may be looked at from the vantage point of the farmer or the consumer." Looking at the goals of sustainability from these different vantage points gives you a variety of views. The recent movement toward sustainability in the greenhouse industry offers us the advantage of shaping what sustainability means to our industry.

To investigate the sustainability certification process I had the privilege of being included in a meeting hosted by Doug Cole, of D.S. Cole Growers in Loudon, New Hampshire to learn about a European grower certification program. Other attendees included Noah Schwartz of Matterhorn Nursery in Spring Valley, New York, Henry Huntington of Pleasant View Gardens in Loudon, New Hampshire, and Chris Schlegel, also of D.S. Cole Growers.

Theo de Groot, director of MPS (Milieu Project Sierteelt), gave us a little background on the Dutch certification program. MPS is translated into English as Environmental Program Floriculture. It was established in conjunction by the Dutch flower auctions and the Dutch growers' associations in 1994 and one year later was officially founded. It was accredited by the Dutch Accreditation Council in 1999. As a not-for-profit organization, MPS has a worldwide network with 11 foreign offices and over 4,000 growers under their certification. This proliferation has enabled MPS to develop the world's largest database for floriculture production information. The goal of MPS is to use registration, certification, innovations, and marketing to strengthen the position of growers, packers, retailers, etc. as responsible and reliable companies.

MPS has over 10 certificates available depending on the needs of your company. Theo explained four certifications in detail: MPS-ABC, MPS-GAP, MPS-SQ, and MPS-Quality. The first, MPS-ABC, is an environmental score card for your company. It issues you a rating of either A, B, or C depending on your inputs. MPS-GAP (Good Agricultural Practices) looks at the performance of your company, specifically related to workplace safety, hygiene, and worker training. MPS-ABC and MPS-GAP together make the