By Erik Runkle

Managing Temperature During Propagation

December through March is peak propagation season for most greenhouse growers in North America. During this time, many growers receive nonrooted and sometimes callused cuttings, sow seeds or both. Successful propagation requires careful water management (and for cuttings, high humidity), moderate light levels and temperatures that promote rapid rooting. Temperature primarily drives the rate of root and shoot development while light provides the energy to promote that growth. When one of these environmental factors is not optimized, rooting is delayed.

In the last decade, growers have become more aware about the importance of light during propagation, especially when rooting cuttings. Research at Michigan State and Purdue Universities has shown the large role that light plays in rooting time and quality. However, sometimes the importance of managing both the root and shoot temperature is overlooked, and if the root zone is too cool, rooting is slowed.

During propagation, measuring and managing root-zone temperature should be given a high priority. Many factors can influence media temperature, including:

- Air temperature
- Temperature and volume of water
- Solar and supplemental lighting
- Evaporative cooling
- Cold glazing temperature
- Root-zone heating, if present

Environmental control in greenhouses is usually based on air temperature. Although air temperature has a significant effect on root zone temperature, the root zone can be significantly (10° F or more) cooler than the air. Many of the factors listed above (cold water, cold glazing and evaporative cooling) can reduce the media temperature to below that of the air temperature. When most floriculture crops are propagated, light levels are low, so the amount of heating from sunlight is minimal.

For these reasons, many young plant growers use a heating system to specifically increase the root zone temperature. A common rooting temperature target is 73 to 77° F. To accomplish this, propagators who grow on the floor use in-floor heating, which is usually installed when the greenhouse is built. This is usually an energy-efficient method to increase the root-zone temperature and secondarily, the air temperature. On very cold days, relying completely on root-zone heating can require a high enough temperature that roots can burn at the bottom of the pot. Therefore, some air heating (e.g., 25 percent of capacity) should be used to supplement the in-floor heating.

When propagating on benches, heating can be delivered under benches or on the surface of benches, just below the pot surface (Figure 1). Regardless of root-zone heating method, ideally a temperature sensor (thermocouple) should be placed into the growing media (neither at the surface nor at the very bottom), and heating should be based on the desired root-zone temperature setpoint. Especially with cuttings, it's often desirable to have a cooler (5 to 10° F) air temperature than root temperature, which allows the roots to grow more quickly than the shoots.

When root-zone heating is not available, increase the air temperature so that the root zone is sufficiently warm. Even when not using bottom heating, it is smart to measure the root-zone temperature so that air temperature can be adjusted to deliver a desired root temperature. The shoots typically grow quicker than desired, but that's usually better than very slow rooting. If you are experiencing slow rooting, root-zone heating could be a smart investment.

Figure 1. *Root-zone heating of benches can be useful during propagation. A common temperature target for the media is 73 to 77° F. (Photos: Roberto Lopez, Purdue University)*

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