SYRINGING TO REDUCE STRESS: IS IT EFFECTIVE?

GARY S. COBB

Cottage Hill Nursery, Inc.
9960 Padgett Switch Road
Irvington, Alabama 36544

Obviously it can be. The use of water in the propagation of cuttings is a prime example. For propagation, a portion of the shoot is removed from the stock plant and placed in a favorable environment to encourage the development of roots. Until rooted, the cutting is subjected to various stresses, including water loss. As propagators we manipulate environmental and cultural conditions to minimize these stresses and promote rooting. One tool we use is water. We arrange the frequency and duration of its application to insure high humidity around the cutting while maintaining a film of water on the exposed plant tissue. We attempt to apply sufficient water to keep the foliage wet and the humidity high without actually irrigating or waterlogging the growth medium. How frequently and how much water we apply varies dramatically depending on the crop, location, time of year, propagation medium, and the water delivery system and its controls.

At Cottage Hill Nursery most cuttings are started out on a 10- to 15-minute misting frequency with a 10- to 12-second duration. We lengthen the frequency interval as rapidly as possible. We use a very coarse mist delivered by conventional impact-type sprinklers that are run in reverse. This system puts out a lot of water, which we are able to deal with because of the well-drained media that we use. The system works well under our conditions and allows us to propagate our plants in the same location and with the same irrigation system that we use during the production phase.

Regardless of specific details and variations, mist propagation is a very successful use of syringing to reduce stress. There are others.

Transplanting stress can be drastically reduced by intermittent syringing. With seedlings we typically use a 20- to 60-minute syringing frequency for the first few days after transplanting. Duration should be sufficient to wet the foliage without actually irrigating the medium. This cools the leaves and minimizes water loss until the seedlings can become established. The same program works well in any transplanting situation—rooted cuttings, bareroot liners and field dug plants, for example.

The benefits of syringing are greatly reduced once a plant becomes established. Established plants have sufficient roots for sustenance and growth, and water stress is dealt with by adequate irrigation; however, other stresses become significant, and appropriate water use can be very helpful.

High summer temperatures, particularly in the South, result in significant stress on container plants. At moderately high temperatures, plant metabolism particularly respiration, is elevated. More energy is expended than produced, which reduces growth. At higher temperatures some tissues, such as roots, cannot survive. Since root ball temperatures in containers may reach 120°F or higher, growth is frequently inhibited and roots are killed. Healthy, active roots are the key to successful container production; thus, reducing excessively high root-ball temperatures is beneficial.

The appropriate use of water is one means of reducing root-ball temperatures. Comparison of syringing and irrigation timing has demonstrated very little benefit from midsummer syringing of established container nursery stock. Hourly syringing reduced canopy temperatures, but not root-ball temperatures, and resulted in no growth difference; however, the time of day that the plants are irrigated is important. Irrigation during the heat of the day reduces root ball temperatures 7° to 13°F and increases plant growth.

On most nurseries irrigation demands require application throughout the day, which means optimum timing is impossible. However, midday irrigation of problem crops or crops that are being "pushed" can contribute to increased growth.

Avoiding cold injury is another place where water application can be utilized as a tool. One technique involves the "icing over" of a crop to protect it during severe cold. Some nurseries have coated their plants with a sheet of ice to insulate them. Unfortunately, ice is a very poor insulator and this practice usually results in increased damage due to low temperatures and tissue desiccation.

If plants are to "ice-over" successfully, water must be applied continuously. This results in sustained ice buildup with heat being released by the freezing water and insures a moist environment to prevent desiccation. Temperatures under the ice remain just above freezing. Using this method we have successfully overwintered indica azaleas, pittosporum, holly, boxwood, and other species when ambient temperature went to 3°F, with a wind chill well below zero.

Icing over is another situation where the method cannot be used for protection of an entire nursery, but it may be successfully employed over a limited area. One should be aware that although continuous icing is effective, damage can develop very rapidly if you lose the ability to apply water.

At the liner division of Cottage Hill Nursery we use water as the sole heating source in our greenhouses. We grow a wide range of woody-ornamental liners in quonset-style, single or double poly-covered structures. On cold nights we keep these houses above freezing by intermittent syringing.

We use cyclic timers or electronic controllers, typically set to syringe each house for 45 seconds every 10 minutes. Water tempera-

ture is about 65°F and we apply up to 1 in. of water per hour of "on" time, depending on sprinkler type and spacing. This means that from the water we apply intermittently we can obtain 50,000 BTU's of heat per hour as the water cools from 65°F to 32°F. If this amount of heat is insufficient to prevent subfreezing temperature, ice begins to form on the plastic film of the greenhouse interior walls. Freezing water releases considerable heat (80 calories/gram). So freezing continues until enough heat is released to raise the temperature to just above 32°F. We apply enough water each hour to provide a reserve in excess of 200,000 BTU's if all of it were to freeze.

For this system to work dependably we must have a reliable water source, be able to deliver the water with the necessary frequency and duration, and have backup capability both for power supply and pumps.

We use strategically placed temperature sensors to monitor the operation. These are located in the northwest corner of our most exposed houses between the outside row of plants and the inside greenhouse wall. We follow weather conditions closely, but as an extra precaution we employ a thermal alarm system which will alert personnel at home when conditions warrant attention.

This program has worked effectively for several years even when we have experienced low, single digit temperatures. A wide range of species including cold-sensitive crops and plants in active growth have been protected and protected economically using only intermittent syringing. With our well-drained growth medium and our relatively infrequent need to use the system, we have experienced no root deterioration or disease problems.

However we use water, we must be sure that we accomplish what we attempt to do. Indiscriminate or impractical utilization will result in problems. We must understand the limitations and capabilities of our water usage and dedicate sufficient attention to its management if we are to use it effectively.