GROWERTALKS

Features

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Tips for Rooting Perennial Cuttings

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(To see all of the figures, go to the digital edition.)

Vegetative cuttings of herbaceous perennials are shipped year-round from African, Central or South American stock plant facilities to North American propagators, where they're received and either stuck in propagation trays or placed in coolers to be stuck hours later. Due to space constraints, propagators often place cuttings in the same greenhouse environment to promote callusing (Stage 2), adventitious root formation and development (Stage 3), and toning (Stage 4).

Figure 1. Callus formation on vegetative cuttings of Salvia nemerosa Blue Hill (meadow sage) forms white to tan irregular proliferations at the site of excision.

However, we know that the environmental conditions that minimize stress and losses during callusing aren't favorable for rooting and should be adjusted accordingly. In this first article of a two-part series, we'll be highlighting the ongoing lighting, air and root-zone temperature propagation research at Michigan State University. We'll discuss our methodology and findings to enhance callus induction and adventitious root formation of vegetatively propagated herbaceous perennials.

To produce unrooted cuttings, shoot-tips (meristems) are excised from stock plants and the removal of the shoot (cutting) results in a wounding response. This wound response induces callus and adventitious root formation during Stage 2 of propagation. Callusing is a stage of undifferentiated cell divisions that forms a mass of irregular proliferations at the site of excision or where the cutting was severed from the stock plant (Figure 1). In most, but not all species, callus formation is a precursor of adventitious root formation.

During propagation, environmental conditions such as light, temperature and humidity should be diligently managed to root cuttings as quickly as possible. Controlling and monitoring daily light integral (DLI) in the propagation environment is important for successful callus formation and subsequent adventitious root formation.

On the other hand, temperature influences many developmental, physiological and metabolic processes during cutting propagation. Specifically, root-zone temperature (RZT) is an important factor governing callusing and adventitious root formation of cuttings as it influences root initiation. Therefore, our efforts over the past several years have been focused on optimizing callusing and adventitious root formation of vegetatively propagated herbaceous perennials and ornamental grasses with DLI and RZT.

Callusing experiment

Unrooted herbaceous perennial shoot-tip cuttings of Agastache hybrid Purple Haze (anise hyssop), *Gaillardia aristata* Gallo Yellow (blanketflower), *Achillea millefolium* Apricot Delight (common yarrow), *Heuchera hybrida* Black Beauty and Peppermint Spice (coral bells), *Phlox paniculata* Bright Eyes (garden phlox), *Salvia nemerosa* Blue Hill (meadow sage), *Perovskia atriplicifolia* (Russian sage), *Leucanthemum x superbum* Snowcap (shasta daisy), *Lamium maculatum* Purple Dragon (spotted deadnettle), *Coreopsis rosea* Limerock Ruby (tickseed), and *Gaura lindheimeri* Siskiyou Pink (wand flower) were received from commercial cutting suppliers. Cuttings were stuck in 72-hexagon cell liner trays without rooting hormone. The trays were filled with a commercial soilless substrate amended with 50% coarse perlite. The cuttings were subsequently sprayed to run off with a surfactant to ensure a uniform coverage of moisture on the leaves during propagation.

Trays were then placed in a glass-glazed propagation greenhouse under ≈56% shade on benches equipped with a root-zone heating system that circulated hot water across the benchtop. Each expanded metal bench was insulated with foam board purchased at a hardware store to reduce heat loss.

The heating system and foam boards were covered with galvanized sheet metal that evenly disbursed heat across the benchtop. Each propagation bench was programmed and controlled individually to provide RZTs of 72, 75, 79 or 82F (22, 23, 26 and 27C). Supplemental lighting was provided by high-pressure sodium (HPS) lamps and to maintain a 16-hour photoperiod. Cuttings were callused under a DLI of ≈5.5 mol•m–2•d–1 and air and relative humidity set points of 73F (22C) and 80%, respectively, were maintained.

Beginning at stick to one day after placing the cuttings in the callusing environment, mist consisting of reverse-osmosis water was controlled and applied for four seconds every 10 minutes beginning and ending two hours before and after the photoperiod. At one day, misting frequency was reduced to four seconds every 20 minutes.

Results

At one, three, five, seven and 10 days after sticking, cuttings were visually assessed for callus formation and adventitious root initials. In general, we determined that genera that have thin and tender cuttings produced callus within three to five days after stick, while genera that have thicker cuttings callused much later.

For instance, Coreopsis Limerock Ruby (Figure 2) and Gaura Siskiyou Pink (Figure 3) callused within three days after stick regardless of RZT, and root initials or adventitious root formation occurred by five days. Perovskia callused within five days after sticking and root initials were visible at RZTs of 79 and 82F (26 and 27C) (Figure 4).

For plants that have thicker stems, such as Gaillardia Gallo Yellow, callusing was delayed and occurred between seven and 10 days (Figure 5). From our study, we found time to callus vegetative cuttings to be genera specific and could be categorized as fast (three days), moderate (five days) or slow (eight days) (Figure 6.). Based on our findings with 11 genera and cultivars, we recommend using a RZT of ≈75F (≈23C) and maintaining a DLI of ≈5 mol•m–2•d–1 when callusing vegetative cuttings of herbaceous perennials.

Several breeding companies are now offering a line of annual, perennial and potted flowering crops as callused cuttings that can be directly stuck into the final container. This can greatly reduce shrink for those growers that don’t have the ability to provide ideal callusing conditions for slow callusing or difficult-to-root species, such as argyranthemum, bracteantha, dipladenia (mandevilla), gaillardia, geranium, heliotrope, lantana, osteospermum, poinsettia and scaevola. **GT**

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