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Alcohol-Based Rooting Hormones: Do They Burn Cuttings?

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INTRODUCTION

Auxins have been used for cutting propagation since the mid-1930s, with indole-3-butyric acid (IBA) and 1-naphthaleneacetic acid (NAA) being the most common (Hartmann et al., 2002; Thimann and Koepfli, 1935; Zimmerman and Wilcoxon, 1935). Commercial root-promoting products ("rooting hormones") are available in various formulations: liquid concentrates, water-soluble salts and tablets, powders (talc), and gels (Boyer et al., 2013). Being growth regulators, commercial root-promoting products sold or used in the United States must be registered by the Environmental Protection Agency, falling under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Technical grade IBA and the potassium salt of IBA (K-IBA) are not registered for sale and use as plant growth regulators. Auxin solutions may be applied to stem cuttings by several methods: basal quick-dip, foliar spray, total immersion, extended basal soak extended soak and other less common methods (Blythe et al., 2007).

In the United States of America, four products are currently registered for use in preparing auxin solutions for cutting propagation (Boyer et al., 2013). Dip 'N Grow (Dip 'N Grow Inc., Clackamas, Oregon) and Wood's Rooting Compound (Earth Science Products Corp., Wilsonville, Oregon), which contain IBA and NAA, are alcohol-based, dilutable concentrates. Hortus IBA Water Soluble Salts (Phytotronics Inc., Earth City, Missouri) and Rhizopon AA Water Soluble Tablets (Phytotronics Inc.) are dissolvable, contain IBA, and form K-IBA when dissolved in water. Alcohol is not required for preparing solutions of water-soluble salts but may be used if desired. Along with acting as a co-solvent, alcohol can also act as a surfactant, disinfectant, and/or preservative, and will evaporate if left in an open container.

There have been anecdotal reports that the use of alcohol in auxin solutions can cause "stem burn" on stem cuttings. However, no formal research has been conducted to

adequately establish occurrence of tissue damage on stem cuttings using alcohol-based auxin solutions. Therefore, the objective of our research project was to assess potential phytotoxic effects of alcohol on stem cuttings of several herbaceous and woody plant taxa using methods of applications representative of those used in the nursery industry.

MATERIALS AND METHODS

Cuttings of six herbaceous and woody taxa were obtained from actively growing production and landscape plants at the South Mississippi Branch Expt. Station in Poplarville, Mississippi: *Artemisia afra*, *Ficus benjamina*, *Impatiens* (interspecific) 'Coral', *Pelargonium* ×*hortorum* 'Mary Helen', and *Trachelospermum jasminoides.* Cuttings of *Lantana* 'New Gold', were obtained from plants that were not actively growing due to summer heat but were included as an example of cuttings that were of less than optimal condition for propagation. Cuttings of *Chrysanthemum* Mammoth™ 'Yellow Quill' were supplied by Ball Horticultural Company (Figure 1). Cuttings were freshly prepared to a uniform size appropriate for the species, with basal leaves removed from cuttings of some taxa.

In Expt. 1, cuttings received a 1-sec basal dip to a uniform depth of 0.5 in. in a solution containing Hortus IBA Water Soluble Salts at 0, 1000, or 2000 ppm IBA. In Expt. 2, cuttings received a 5-second immersion in a solution containing Hortus IBA Water Soluble Salts at 0, 100, or 200 ppm IBA and allowed to dry. In both experiments, solutions containing each of the three rates of IBA were prepared with 0%, 25%, or 50% isopropyl alcohol for a total of 9 treatment combinations per experiment.

Treated cuttings were stuck into 50-cell rooting trays containing Fafard 3B mix using a completely randomized design with 33 cuttings per treatment. Cuttings were placed under intermittent mist (10 sec/10 min during daylight hours). Evaluation concluded at 30 days (*Artemisia* and *Chrysanthemum*) or 50–55 days (all other taxa) after sticking. Data collected included mortality, visual evidence of basal stem burn, and visual evidence of leaf burn. The binomial response data were analyzed using generalized linear models.

RESULTS

In Expt. 1, solutions containing up to 50% alcohol were safe for cuttings of *A. afra*, *C.* Mammoth™ 'Yellow Quill', *F. benjamina*, *Impatiens* 'Coral', *P.* ×*hortorum* 'Mary Helen', and *T. jasminoides* using a basal quick-dip application. Limited mortality and stem burn were present on cuttings of *L.* 'New Gold' with treatments containing 25% and 50% alcohol; therefore, when using a solution of IBA for cuttings of *L.* 'New Gold', no alcohol or only a low rate of alcohol should be used in the solution. Cuttings from actively growing and healthy lantana cuttings are preferred for propagation.

In Expt. 2, solutions containing up to 50% alcohol were safe for cuttings of *C.* Mammoth™ 'Yellow Quill', *F. benjamina*, and *I.* 'Coral' using the total immersion method. Stem and leaf burn occurred on cuttings of *A. afra*, *L.* 'New Gold', and *P.* ×*hortorum* 'Mary Helen'; therefore, treatment of cuttings of these three taxa should be limited to solutions with no alcohol. Although alcohol burn did not occur on surviving cuttings of *T. jasminoides*, solutions containing 50% alcohol did increase cutting mortality; therefore, alcohol content should not exceed 25% in solutions used to apply IBA to cuttings of this crop.

Figure 1. Experimental plants: Top row: *Artemisia afra*, *Ficus benjamina*, *Impatiens* (interspecific) 'Coral'; Middle row: *Pelargonium* ×*hortorum* 'Mary Helen', *Trachelospermum jasminoides*, *Lantana* 'New Gold'; Bottom row: *Chrysanthemum* Mammoth™ 'Yellow Quill'.

CONCLUSIONS

When using a basal quick-dip, auxin solutions containing up to 50% alcohol are safe for stem cuttings that are in good condition. Some crops may be sensitive to alcohol-based rooting solutions applied to the entire cutting.

In these cases, test crops for sensitivity to your alcohol solution and be aware that cuttings in suboptimal condition may be more sensitive.

Literature Cited

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