e-GRO Alert

Olivia J. Liebing[1,2]
liebing.4@osu.edu

W. Garrett Owen[1,3]
owen.367@osu.edu

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Boost Your Roots: Enhance Rooting in Woody Nursery Plants with IBA

Woody nursery crops can be difficult to root from cuttings, especially when grown without rooting hormones, which can cause longer time in propagation and lower the rate of rooting success.

The main goal in propagation is to produce more healthy plants (Fig. 1). Many woody plants species have long life cycles and complicated germination requirements that make starting from seed impractical. Instead, clonal propagules, largely stem cuttings, are grown to speed up production cycles and continue elite stock.

Figure 1. *Taxus* cutting with healthy, well-formed, and evenly distributed adventitious roots.
Photo by: W. Garrett Owen, OSU.

One of the main challenges in growing stem cuttings is caused by what they lack: roots. This leaves stem cuttings vulnerable to water stress, requiring specialized care and environments to prevent drying out. Therefore, new roots needs to be encouraged quickly from non-root tissues through a process called adventitious rooting.

The future root cells in the cutting's basal end go through four key stages that include dedifferentiation, root initiation, root formation, and root elongation. This transformation is driven by the hormone auxin. Growers can apply synthetic auxins, like indole-3-butyric acid (IBA), to cuttings to hasten adventitious rooting.

[1] Dept. of Horticulture and Crop Science
[2] Graduate Research Assistant
[3] Extension Specialist & Assistant Professor

Figure 2. When plants are propagated without supplemental, exogenous rooting hormones, uniform rooting is difficult to achieve. The rooting success and quality of this *Buxus* crop varied greatly even when all cuttings were harvested and placed in propagation on the same day. If a rooting hormone was applied, then rooting would be more synchronized amongst the cuttings. This is useful as growers require all cuttings to root at a similar time and pace. Photo by: Olivia Liebing, OSU.

Impacts on Plant Growth

Indole-3-butyric acid is found naturally within plants in very low amounts while synthetic forms can be applied by growers at much higher rates to induce and promote root growth and development. Once applied, plants convert IBA into indole-3-acetic acid (IAA). These plant hormones not only influence adventitious rooting, but a suite of responses including apical dominance, cambial growth, and phototropism.

The impacts of IBA on cuttings can be substantial and lasting. Cuttings that receive an IBA application often root more uniformly compared to cuttings that are not treated with IBA (Fig. 2). Furthermore, when properly applied, IBA can accelerate adventitious root formation, increase the number of roots formed per cutting, and boost overall root elongation and mass (Figs. 3). As such, proper application is critical to reap IBA's benefits in propagation.

Figure 3. Edible fruiting woody plants, like turkey fig (*Ficus carica*), can also benefit from indole-3-butyric acid application. Indole-3-butyric acid aids growers to continue growing cultivars selected for the best flavors and fruit. Photo by: W. Garrett Owen, OSU.

Application Methods

There are several methods in which IBA can be applied in nursery propagation. The best method often varies with labor and equipment requirements, across crops, and production needs. Efficacy, safety, and cost are common considerations.

Indole-3-butyric acid is commercially available in talc, salt, and liquid formulations. Working with solutions of IBA is often preferred over talc for the application speed and uniform coverage, though talc has a longer shelf life while in a plant ready form.

When creating solutions, potassium salts of IBA, referred to as K-IBA, and liquid formulations can be dissolved in water while acid IBA formulations must first be dissolved in alcohol. The method of IBA application can vary including:

1. Quick-Dips:

As the name implies, a quick-dip consists of inserting the basal end of the cutting into the IBA solution for 3 to 5 seconds (Fig. 4A). Indole-3-butyric acid is nontoxic to plants across a wide range of concentrations and it's common for solutions to range between 500 to 10,000 ppm IBA. Quick-dip solutions are often more concentrated compared to IBA solutions used in other application methods. Quick-dips are often created by mixing IBA with a 50% alcohol solution unless K-IBA or liquid IBA is used. Therefore, short dip duration is important, because overexposure to alcohol can damage plant tissues.

To increase efficiency, cuttings can be dipped in bundles. Dip depth is not a major concern so far as the wounded basal end is submerged in the solution. Afterwards, growers should insert the cuttings into propagation substrate and place in the propagation environment.

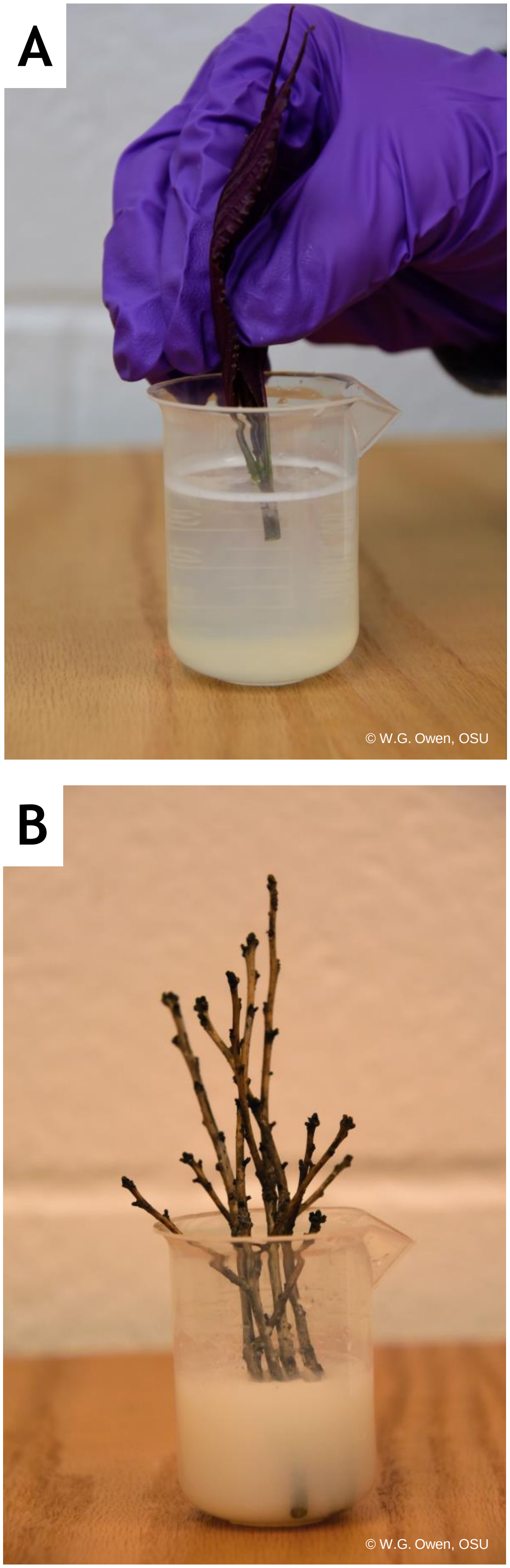

Figure 4. (A) Quick-dip and (B) long soak are two of the methods propagators can utilize to apply liquid formulations of rooting hormone. Photos by: W. Garrett Owen, OSU.

Figure 5. Foliar spray applications of rooting hormone via booms reduces hand labor and creates opportunities for easy repeat applications over time. Photo by: W. Garrett Owen, OSU.

2. Long Soak:

Long soaks are like quick-dips, but unrooted cuttings are exposed to a diluted IBA solution over a longer period (Fig. 4B). Common concentrations used for long soaks range between 20 to 200 ppm IBA.

The duration of the soak is also key. Generally, longer soaks promote more roots but can reduce bud break when overdone. Some cuttings' basal ends can be submerged for up to 24 hours.

While soaking, cuttings should be out of direct sun. This not only reduces stress on the cuttings but maintains the integrity of the light sensitive IBA solution. It is best to hold the plants at 68˚F (20˚C) for similar reasons. After soaking, cuttings should be stuck and placed in the propagation environment.

Long soaks are not a common industry practice due to their time-consuming nature. However, they can still be useful for inducing adventitious roots from more difficult-to-root species.

3. Foliar Sprays:

Interest in foliar sprays has surged in recent years with the releases of Hortus IBA Water Soluble Salts® (salt) and Fine Americas Inc. Advocate® (liquid) product. Foliar sprays reduces labor and employee exposure to IBA when handling cuttings, streamlines propagation, and thus, overall costs. Sprays are often applied after sticking and can be reapplied to hasten root development and uniformity (Fig. 5).

Spray concentrations often range between 200 to 2,000 ppm IBA. Once mixed, the IBA solution should be used within a day. The

Figure 6. Employees demonstrating proper personal protective equipment (PPE) while propagating azalea (*Rhododendron* sp.) cuttings. Workers are wearing long-sleeve shirts, aprons, long pants, closed-toe shoes with socks, and waterproof gloves. The cuttings are being inserted into growing media after a quick dip in indole-3-butyric acid (IBA) rooting hormone solution. Photo by: W. Garrett Owen, OSU.

best time to spray is when light levels are low, mist is off or paused, and cuttings are not stressed, thereby allowing the IBA solution to slowly dry on the plant surface.

Best Practices for IBA Application

Implementing best practices while working with IBA is essential for protecting workers and getting the most out of IBA applications. Growers can create an environment that is safe and efficient, by focusing on:

1. Label: Read and follow the manufacture directions and label rates before using any IBA product.
2. Personal Protective Equipment (PPE): Wear long sleeve shirts, aprons, long pants, close-toed shoes with socks, and waterproof gloves while handling IBA. When spraying or mixing, filtering respirators should be used (Fig. 6). Quick dip and long soak methods do not require respirators.
3. Storage: Indole-3-butyric acid is sensitive to light and temperature. Indole-3-butyric acid solutions should be stored in dark, cool locations. Mishandling or improper storage may reduce efficacy. Talc powders should be stored in the dark at room temperature and they can last several years.
4. Application Type: Each application method has tradeoffs in terms of cost, safety, and efficacy. Make the best decision for your operation.

Overall, incorporating synthetic auxin, such as IBA, allows growers to enhance adventitious root development, uniformity, and quality in woody nursery crops, resulting in healthier liners (young plants) for production.

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CONTRIBUTORS

Dr. Nora Catlin
Floriculture Specialist
Cornell Cooperative Extension
Suffolk County
nora.catlin@cornell.edu

Dr. Chris Currey
Assistant Professor of Floriculture
Iowa State University
ccurrey@iastate.edu

Dr. Ryan Dickson
Greenhouse Horticulture and
Controlled-Environment Agriculture
University of Arkansas
ryand@uark.edu

Dan Gilrein
Entomology Specialist
Cornell Cooperative Extension
Suffolk County
dog1@cornell.edu

Dr. Chieri Kubota
Controlled Environments Agriculture
The Ohio State University
kubota.10@osu.edu

Heidi Lindberg
Floriculture Extension Educator
Michigan State University
wolleage@anr.msu.edu

Dr. Roberto Lopez
Floriculture Extension & Research
Michigan State University
rglopez@msu.edu

Dr. Neil Mattson
Greenhouse Research & Extension
Cornell University
neil.mattson@cornell.edu

Dr. W. Garrett Owen
Sustainable Greenhouse & Nursery
Systems Extension & Research
The Ohio State University
owen.367@osu.edu

Dr. Rosa E. Raudales
Greenhouse Extension Specialist
University of Connecticut
rosa.raudales@uconn.edu

Dr. Alicia Rihn
Agricultural & Resource Economics
University of Tennessee-Knoxville
arihn@utk.edu

Dr. Debalina Saha
Horticulture Weed Science
Michigan State University
sahadeb2@msu.edu

Dr. Beth Scheckelhoff
Extension Educator – Greenhouse Systems
The Ohio State University
scheckelhoff.11@osu.edu

Dr. Ariana Torres-Bravo
Horticulture/ Ag. Economics
Purdue University
torres2@purdue.edu

Dr. Brian Whipker
Floriculture Extension & Research
NC State University
bwhipker@ncsu.edu

Dr. Jean Williams-Woodward
Ornamental Extension Plant Pathologist
University of Georgia
jwoodwar@uga.edu

Cooperating Universities

Cornell CALS – College of Agriculture and Life Sciences

Cornell Cooperative Extension Suffolk County

UTIA Institute of Agriculture – The University of Tennessee

Iowa State University

College of Agricultural & Environmental Sciences – University of Georgia

UCONN

U of A Division of Agriculture Research & Extension – University of Arkansas System

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