# Auxin Application via Foliar Sprays©

**Samuel R. Drahn**
Bailey Nurseries, Inc., 1325 Bailey Rd., Saint Paul, Minnesota 55119 U.S.A.
Email: sam.drahn@baileynursery.com

## INTRODUCTION

Over the past 6 years Bailey Nurseries, Inc. has been delivering IBA (indole-3-butyric acid) to unrooted cuttings in a couple of ways; manual basal dips before planting and overhead sprays after planting is complete. Careful, repetitive trialing has shown us that many of the taxa respond equally as well to being sprayed with water soluble IBA after sticking instead of the traditional hand dip method that we have used for years. In both our Minnesota and Oregon propagation facilities the shift in delivery method has been driven by a desire to reduce our employees' exposure to chemicals, develop a more streamlined and sanitary approach to propagation, and to reduce the labor costs associated with rooting hormone applications. All of these goals need to be met while maintaining our standards of high quality, well-rooted cuttings. Using Hortis IBA water soluble salts has helped us reach these objectives with many of our taxa.

## MATERIALS AND METHODS

Cuttings harvested from our different production areas or bought from other suppliers are stored in our cold storage facilities and queued for planting. Our coolers are maintained at approximately 34 °F and 90% RH. By using water soluble IBA after sticking instead of dipping by hand this time in storage is reduced. After the cuttings are planted into the propagation trays or beds a single application of between 250 and 2000 ppm water soluble IBA is made. This is done a range of ways depending on the size of the area to be treated. For small areas a backpack-type sprayer is used. For large areas a hose and reel type sprayer with or without a boom-style irrigator is utilized. The product literature recommends to "spray the solution evenly over the cuttings until drops go down to the media." We believe delivering 1 L per 60 $ft^2$ sufficiently meets these guidelines. Approximately 25–30 gal of solution is applied to 6000 $ft^2$. Mirroring our existing traditional IBA rates has been the starting point for our water-soluble IBA trial rates. The product literature suggests using only distilled or de-mineralized water for these treatments to avoid precipitation problems. We feel this is not practical on such a large scale and have used well water since we began exploring this IBA delivery method.

Our results have shown that making these applications within 24 h of sticking is critical to our success. Typically the IBA is applied at the end of each day or first thing next morning when the light levels are low and the plants misting requirements are at a minimum. When cuttings have been treated with IBA during frequent misting cycles in the day no decline in efficacy has been noted. Applications that have been made several days after sticking have resulted in reduced final percentages and weaker, slower rooting in general.

The label identifies a zero re-entry interval and permits applications to be made while people are working in the houses. Waiting to treat the cuttings with IBA until the crews have finished planting and have left the house is a precautionary step that we feel more comfortable with. Each application is made by a specially trained and licensed pesticide applicator. Using only a select group of applicators reduces

the number of employees who are in contact with chemicals. This helps ensure consistency and accuracy and limits the amount of chemicals our employees are exposed to. The required personal protection equipment is long-sleeve shirt, long pants, shoes, socks, and waterproof gloves. Posting the application with signage and/ or cones is unnecessary.

Implementing any new technique requires time and patience to be successful. The switch from manual dips to overhead sprays has proven time consuming but rewarding. Each plant type needs to be thoroughly tested before we feel comfortable making a change to our production practices. The first trials consist of a 12-ft$^2$ section of cuttings to test for phytotoxicity and efficacy. Misting requirements have not changed with the use of this type of method. Blocks of trial plants are within the dipped sections, and are all given the same amount and duration of mist during the root initiation process. The cuttings are all weaned from mist at the same time. As our familiarity with the Hortis IBA water soluble salts on a particular plant increases so does the size of the trial. If the first trial proves effective the trial area will be increased in proportion to the size of the crop, usually about 10%. After a second season of positive results the trial area will normally be increased to approximately 1/4 to 1/2 of the crop. Multiple crop locations and sticking times allow us to expedite the trial process. It is only after three separate trials have occurred with successful results that the practice can become standard in our production methods.

## RESULTS

As our experience with this application method has grown so has the use of Hortus IBA water-soluble salts. Familiarity and repetitive success has given us comfort with this product. Over the last several years the percentage of crops treated with IBA after sticking has risen steadily (Table 1). This past season the amount of cuttings treated with IBA after sticking increased sharply. Currently 95% of our softwood crops in Minnesota that call for IBA are receiving overhead IBA sprays after sticking. And 100% of our Minnesota evergreen propagation is now slated to be treated this way also. In Oregon we treated approximately 20% in 2007. We anticipate the percentage of cuttings treated with IBA after sticking in Oregon to increase significantly as our trial numbers and confidence in this method build.

**Table 1.** Cuttings treated versus application method from 2003 to 2007 in Minnesota.

| Treatment | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|
| Hand dipped (%) | 99.62 | 95.6 | 91.95 | 86.1 | 5.16 |
| Overhead spraying (%) | 0.38 | 4.4 | 8.05 | 13.82 | 94.84 |

Using water soluble IBA after sticking has streamlined our propagation process dramatically by reducing the number of employees needed to treat cuttings with IBA. In 2007 approximately 8 million cuttings were propagated in Minnesota from 15 May to 15 Aug. Some form of IBA treatment was required for 79%. Another 5.2 million were produced in Oregon, of which 100% required an IBA treatment. Crews of 8–10 people have historically been responsible for treating these cuttings with IBA during this time. Using IBA after planting has reduced handling and storage time in the cooler and has freed up members of our propagation team to do other tasks. During the winter and at other times of the year we run similar crews for evergreen propagation and other softwood propagation schedules.

This method has also given us some piece of mind regarding stem burn and the possibility of contamination. Cuttings treated with overhead IBA applications are not exposed to alcohol. Concerns over the years on whether or not exposing the stems to solutions containing alcohol has contributed to some of the rot on some of the cuttings are moot. By using a formulation of IBA that is water soluble we can eliminate the possibility of alcohol burning or drying out the basal portion of the stems. Using water-soluble IBA after the cuttings have been placed in the greenhouse provides us some comfort by eliminating the possible cross contamination issues associated with dipping cuttings in a stock solution. The transfer of pathogens in a communal solution of hormones is not a concern with this method.

A majority of the crops treated with Hortus IBA water soluble salts react identically to cuttings treated with traditional IBA. Rooting and top growth are monitored throughout the season and carefully evaluated at harvest time to determine root mass and overall plant quality. *Acer, Berberis, Cornus, Diervilla, Euonymus, Forsythia, Hydrangea, Juniperus, Lonicera, Philadelphus, Physocarpus, Rhus, Rosa, Spiraea, Symphoricarpos, Syringa, Thuja, Viburnum*, and *Weigela* crops are all large genera Bailey Nurseries grow that respond well to overhead IBA applications. They are all currently, or are scheduled to be receiving, Hortus IBA water-soluble salts as their sole form of IBA in Minnesota. Currently all *Hydrangea, Spiraea,* and *Symphoricarpos* are treated with IBA after sticking in Oregon. *Clethra, Cornus, Forsythia, Hamamelis, Ilex, Philadelphus, Viburnum*, and *Weigela* are all in the final stages of trialing and should be added to the "treat all after sticking" list for the 2008 season in Oregon.

While similar rooting time and subsequent root and shoot development is most commonly seen, differences have been noted on several taxa. This varies from slight, subtle differences to results that have caused us to discontinue water-soluble IBA and continue with the traditional propagation method. Some taxa have shown a preference to the traditional hand-dip method in conventional IBA and some vice versa. Several taxa have exhibited growth differences with the over-the-top spray technique in multiple trials. *Amelanchier, Aronia, Rosa, Symphoricarpos*, and others tend to slow down their vegetative growth early on following the overhead application method. Vegetative growth and flowering is usually delayed by approximately 1 to 2 weeks. This is not discernible later on as plants are grown for several months after rooting and mowed back repeatedly to maintain height and promote branching before harvest. This season *Forsythia* and *Philadelphus* crops treated with IBA after sticking in Oregon looked better than the hand-dipped control. Cuttings within the trial blocks initiated roots more quickly and responded with darker green, more vigorous top growth. Root mass increased significantly also. Some *Viburnum* taxa have developed adventitious aerial roots from leaf nodes above the soil line when Hortus IBA water-soluble salts are applied to the cuttings. During the first two seasons all taxa of *Betula* cuttings in Oregon responded well to the overhead applications of IBA. This season many petioles were twisted at the 500 and 1000 ppm rates. An explanation as to why this seasons' trial acted differently than in previous years escapes us.

In multiple trials many of the *Prunus* and *Rhododendron* taxa have not rooted as well when treated from above after sticking at our Oregon facilities. Root initiation has been slowed and final percentages have been significantly lower in previous trials. *Rhododendron* and *Prunus* cuttings in Oregon have now been removed from

the future trial list. *Prunus besseyi* 'Pawnee Buttes' responds well to overhead IBA applications in Minnesota and currently receives IBA in this manner.

Switching IBA delivery from the traditional hand-dip method to overhead applications trades relatively high labor costs and low chemical costs for relatively high chemical costs and low labor costs. Treating cuttings with IBA after sticking is helping us reduce hormone application expenses. Wages for 8–10 people working 8-h days, over a 10-week period add up quickly. Conversely using kilograms of water-soluble IBA is expensive too. One 6000 $ft^2$ greenhouse contains approximately 90,000 softwood cuttings when spaced at 2-3/4 inches. It takes approximately eight people 3.75 h, or 30-labor hours to treat this many cuttings with IBA by hand. Applying water soluble IBA after the cuttings have been stuck takes an applicator approximately 1 h to prepare, transport to and from the application site, apply, and clean the spray equipment when finished. Chemical costs of water soluble IBA for an equivalent number of cuttings at 750 ppm equal approximately $74. The cost of traditional IBA needed to dip 90,000 softwood cuttings is approximately $16.

Our next step to further reduce the costs associated with the application of rooting hormones has been to apply lower rates of water-soluble IBA. For the past two seasons we have invested a lot of time evaluating the effect of halving many of the rates we commonly use. Surprisingly we have noticed very little difference in the outcome of these trials. All cuttings are given the same quantity and duration of mist and are grown side by side the cuttings that have been treated with a full rate. It has taken the same time for plants to begin root initiation and the subsequent growth has developed at a similar pace. This year we have looked at reducing rates even further by quartering the initial rate. If the normal rate was 1000 ppm we have begun treating the cuttings with 250 ppm after sticking. To date these trials have looked very promising also. When the trails are complete we hope to have established an optimal IBA rate for all of the taxa we grow. The goal of these trials is to produce the highest quality rooted cutting with the least amount of IBA possible.

## DISCUSSION

Using Hortus IBA water-soluble salts has helped us reduce our employee's exposure to chemicals. Limiting the number of employees who apply hormones in the greenhouses to a small group of trained, licensed chemical applicators gives us a more consistent, accurate application that we feel more comfortable with.

By applying water-soluble IBA after sticking our labor hours associated with treating cuttings with IBA have declined significantly. Our cuttings now spend less time in cold storage and in the preparation room where problems associated with lengthened exposure to temperature, humidity, and/ or handling can occur. Plants are not grouped and dipped together into a solution where pathogens may be transferred. Cuttings are not exposed to alcohol which may contribute to cuttings drying out and possibly being burned or damaged.

Significant financial savings have resulted from using this method of IBA delivery. Spraying the cuttings after they have been stuck instead of dipping them before, frees up planting crews for other work. On average, treating a crop with Hortus IBA water-soluble salts after sticking has allowed us to save approximately $0.038 per $ft^2$. Further rate reduction trials have looked promising and may help increase these savings in the future.