

Foliar applications of rooting hormone at Decker Nursery[®]

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INTRODUCTION

Decker Nursery currently uses only over-spray methods to apply rooting hormones on softwood and dormant hardwood cuttings of woody ornamentals. We have been evolving down this path away from liquid dip and powder application methods for the last 4 years. In this presentation, I will attempt to review the history of this evolution, our current methods of application, a summary of our observations, and the current status of research on the over-spray method.

HISTORY AND EVOLUTION OF HORMONE SPRAY APPLICATION

In the 50 propagation seasons in which I have participated in my career I have used rooting hormone powders and liquid dips for the majority of those years. I have seen people covered up to their elbows in talc rooting powders, cuttings coated with dry powders 1/8 of an inch thick due to a wet stems, spilled cups of rooting liquid dripping all over the propagation table and the laps of any person unfortunate enough to be downhill of the spill, cuttings hanging outside of the container of liquid hormone as the person dipping the handful of cuttings joyfully discusses the details of last night's adventures, and rooting results, either good or bad, that defied explanation and were not able to be repeated.

Sometime back about 2010 I first heard about IBA water soluble salts offered by the company Hortus (Figure 1). Initially I was very skeptical about this method as I saw multiple pitfalls:

- Sprayer application uniformity.
- Hormone storage in a sprayer once mixed.
- Inaccurate application from one day to the next.
- Basic resistance to change.



Figure 1. Hortus tablets used to dissolve in water for hand dipping of cuttings.

We did request information and were supplied some hormone tablets that could be used to make a standard liquid dip solution. Casual testing showed the dips rooted plants successfully compared to other hormone solutions on the market but we did not try the over-spray method.

On an IPPS Eastern Region annual conference tour we happened to visit a perennial grower whose propagator made an offhand demonstration of using an electronic sprayer to

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apply Hortus IBA over some perennial cuttings. I noticed that this expensive sprayer did atomize the solution much like mist from a cutting mist system. I had now found a tool that could be counted on to apply hormone in very small droplet size with excellent coverage on both the top and bottom of the foliage. I photographed the sprayer and had one purchased when I returned from the conference (Figure 2). At this time, we also purchased a quality electronic scale to measure out grams and our first purchase of the Hortus IBA water soluble salts.



Figure 2. Electronic sprayer BP-4 by Dramm.

In our first year we primarily used hand dipped cuttings during the winter hardwood propagation season. We tried to find information on how the overspray would work on dormant cuttings on species such as *Thuja*, *Juniperus*, *Taxus*, *Buxus*, *Chamaecyparis*, *Ilex*, *Picea*, and others but no information was available. I was under the impression that the belief was that the auxin entered the plant through stomata. I used logic to make assumptions. Fresh cuttings gathered cold from outdoors in a dormant state probably did not have open stomata. We discussed things and since it took a day for the cuttings to warm up on the heated greenhouse concrete floor, we would spray three times beginning the day after the cuttings were stuck. As to rates, we decided, due to the multiple applications, to use a rate about half of the hand dipped rate (generally about 1000 ppm).

As this first winter season progressed we noticed excellent callus formation on the cuttings and that the progress of the crops as a whole seemed more uniform than the dipped cuttings. If I recall, I believe we eventually did an overspray on some of the dipped cuttings that seemed to be lagging behind. This was our first off the cuff post sticking over-spray that has eventually evolved to a standard practice for slow to root plants.

Our next summer of softwood cuttings was more dramatic. Due to the success we had the previous winter we over-sprayed our first house of cuttings for three consecutive days. We saw rooting activity quickly and at a very consistent rate. We did not have to do any post-sticking applications as most of the softwood cuttings rooted too quickly and uniformly to require this step. All things considered this summer season was a success but we did notice that we had significant losses in some certain crops.

One significant difference from a nursery like ours and a science based University style experiment is that we often change multiple environmental factors such as plug design, rooting medium recipe, hormone application method, and then try to guess which factors most likely had an effect on success or failure. We just sort of assume we are smart enough to guess correctly. In our convoluted logic to use three applications of hormone but at a lower rate to save money and attempt to avoid hormone toxicity, we neglected to take into account that some species might just need a higher rate of hormone to successfully root. Combine this with other environmental changes and I can tell you stories about how Decker Nursery could not successfully root a cutting of *Euonymus alatus* 'Compacta' for about 3 years; but that is a story for around the bar later in this conference.

CURRENT METHODS OF APPLICATION

Over time we have developed some basic protocols for the use of this product. These are based on experience and results, not on scientific documentation. That research still does not exist at this time.

Dormant hardwood winter cuttings are generally gathered, processed, and stuck within 10 days, and placed in a heated floor Dutch style propagation tent. After sticking they are sprayed at a rate of 1500-2500 ppm based on the species for three consecutive sprays. After about 2 weeks, they are re-sprayed with IBA lightly at 2 week intervals (Figure 3). We have noticed once the cuttings progress enough to see signs of rooting that we see a jump in this rooting activity about 2 days after one of these re-applications of hormone. Spray protocols for IBA spray application are shown below.



Figure 3. Hormone application through windows of a rooting tent.

- We use only distilled water for the solution to avoid any contamination or hard water deposits in the spray nozzles.
- Each day's spray is marked by a small different colored flag so that the applicator can easily see how far back to spray on the 3-day rotation.
- We measure our hormone to mix with 1 gal of water to achieve desired rates. For instance, 1 gal of water and 30 g of Hortus IBA will yield close to 1500 ppm. Keep it simple!
- Unused hormone is stored in the sprayer and used the following day.
- All applications occur in the early morning prior to any sun related stress on the cuttings that might result in closed stomata.

Our summer softwood cuttings receive 3 days of hormone application after they are first stuck. Easy to root items might be at 500 ppm while cuttings with early dormancy, such as *E. alatus* 'Compacta', *Viburnum*, or *Rhus aromatica* 'Gro-low' might get 1500 ppm treatments (Figure 4). Any cuttings that are slow to root might get a re-application about 10 days after initial sticking. In reality, Dave Graff, one of our Senior Propagators, will roam the houses and spot target crops that he has observed to need a little helping hand (Figure 5).



Figure 4. Burning bush an example of a plant that requires higher rates of IBA in the summer.



Figure 5. Spot treating with IBA spray.

SUMMARY OF OBSERVATIONS

In the years that we have been using the over-spray hormone we have come up to some conclusions based on our observations:

- This method greatly improves worker safety. I come from a generation where I was instructed, by a State Nursery Inspector, to stick my bare arm into a 30-gal spray tank full of pesticides to stir the batch before spraying nursery stock when I was 16 years of age. I have watched propagation staff with white talc all over their hands or fingers dripping in hormone dip. In recent times, we were spending hundreds of dollars per year on latex gloves to protect the staff. Post-sticking hormone application limits exposure to one person who is wearing the proper protective gear. There is no longer any need to provide gloves to the staff. We have had five successful pregnancies amongst the staff of the Propagation Department in recent years all to give birth to healthy children. As I have somehow to date survived all these sins of my past, I have come to realize how important it is to error on the side of worker safety whenever possible.
- Over-spray of hormone, especially with multiple applications, removes almost 100% of the variables that could contribute to lack of uniform application of hormone. With an electronic sprayer, a mist is generated that rolls over, under, and through the cuttings. We immediately noticed, after switching to this method, significant

reduction in variation in rooting.

- We have seen, especially in *Buxus* and *Juniperus*, cuttings that had rotted below the soil line, root at that point downward into the medium. Obviously there was some sort of stress on the cuttings that caused the damage but the hormone re-application allowed the problem to eventually become a successful cutting (Figure 6).
- We believe that overall production is faster due to skipping the step of reaching to dip a handful of cuttings. I would estimate a 20% increase in daily production. This is easily balanced by a couple of minutes spent the next day spraying hormone over tens of thousands of cuttings.



Figure 6. A winter cutting good callus and root formation.

STATUS OF FUTURE RESEARCH

I know that as a propagator I would dread going back to hand dipping of cuttings. I would however like to see some research to clarify some of the unknowns about how these rooting hormones work.

- Are multiple hormone applications at time of sticking required?
- What are the most effective rates?
- Does time of day of application have an effect?
- What is the process or interval that is most effective for re-application of Hormone?
- Is toxicity a problem with multiple applications? We believe there may be an issue in this regard with certain *Thuja* cultivars.

Recently there has been an interest shown by Joel Kroin of Hortus to recruit researchers who might be interested in doing research at multiple Universities to try and nail down the science behind the observations. They are:

- Dr. Glenn Fain, Auburn University
- Dr. Eugene K. Blythe, Mississippi State University
- Kees Eigenraam-Rhizopan b.v., botany, Inc., Netherlands

Perhaps with the proper experimentation we can better understand how the over-spray method works and proper rates and timing.

