Combined Proceedings IPPS 74:496-500. 2024.

Prenatal Care: Healthy Stock for Healthy Cuttings

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Keywords: sensors, substrate water, EC, growing degree days

Summary

At Willoway, we cultivate approximately 3,500 SKUs, primarily consisting of trees and shrubs with an additional propagation production exceeding three million cuttings per year, predominantly sourced from current production plants. We adhere to stringent protocols to ensure healthy stock, which in turn results in superior and healthy cuttings. This document aims to describe some of the methodologies that contribute to our ongoing success.

INTRODUCTION

There are many factors that contribute to a continuous successful outcome for future production needs. Nutrient management is a critical component in our ongoing efforts to produce quality liners on a consistent basis. Controlled release fertilizers are utilized as both a top dress and as a component to the propagation mix. We often vary the application of fertilizers based upon the specific crop, and timing during the year. It is clear that fertilizer applications in May are significantly different from those of August or September even for the same plant. Also, when using control release fertilizers, the timespan or the longevity of the particular product is of major importance as is the

release rate for nutrients such as nitrogen. We use fertigation on some crops to augment the dry formulations. The application of fertilizers is a critical component and with many individual crops such applications must be tailored specifically for those crops. One size does not fit all.

When developing a fertilizer program, it is essential to consider multiple factors. Three primary criteria are cost, plant outcome, and environmental considerations such as runoff, stream and body of water effects, and regulations governing nutrients like nitrogen and phosphorus entering waterways. Environmental stewardship is a responsibility we should all embrace with vigor. Willoway we have multiple interconnected ponds each with its own pump and either Anderson Injectors or Bauerle Precision fertigation system. There are several individual stock nutrients capable of being injected into the outgoing system either alone or in combination. These include nitric acid, phosphoric acid, $CaNO_3$, KNO_3, $NHNO_3$, $MgSo_4$ and a minors package.

We established new protocols in 2024 which include daily monitoring of inputs and metrics, tightened nutrient levels with more defined seasonal levels and changes, and a strong grower accountability. The outcome has been better mother plants and superior cuttings.

Water management, as in most nursery operations, is a continuous issue. At our Avon, OH farm, we have no ground water while there is limited access to Lake Erie at our Huron, OH facility. We recapture approximately 95% of our water and recycle it with city water available for targeted clear water or specialized fertilizer applications.

Our soilless media has a high-water holding capacity for nursery stock, and the use of water has to be tailored to specific plants. Adjustments, of course, are weather dependent along with product mix in the production areas. This can lead to a tendency to overwater in some situations. But we are making improvements in the mix ratios and in water monitoring and application.

We realize that improved accountability necessitates revised responsibilities, a regular targeted training program with improved tools such as a grower's manual, implementation of best management practices (BMPs) and technological advances.

Data for moisture, pH and substrate conductivity can be gathered at the plant level for specific crops using available instruments like Bluelab Pulse meters and probes (Bluelab Website | Bluelab USA).

Data generation and logging at Willoway is an important on-going process. We use a HOBO data system that has data loggers at each pumphouse to record pump activity and nutrient data. Data is available on dashboards for system management (**Fig. 1**).

Figure 1. Data collection stations at Willoway nursery.

Pumphouse data is tracked over each 24-hour period. It provides both flow and pressure data as well as sensor data for pH and nutrient monitoring. Set points are available that trigger alarms and emergency cuttoffs (**Fig. 2**).

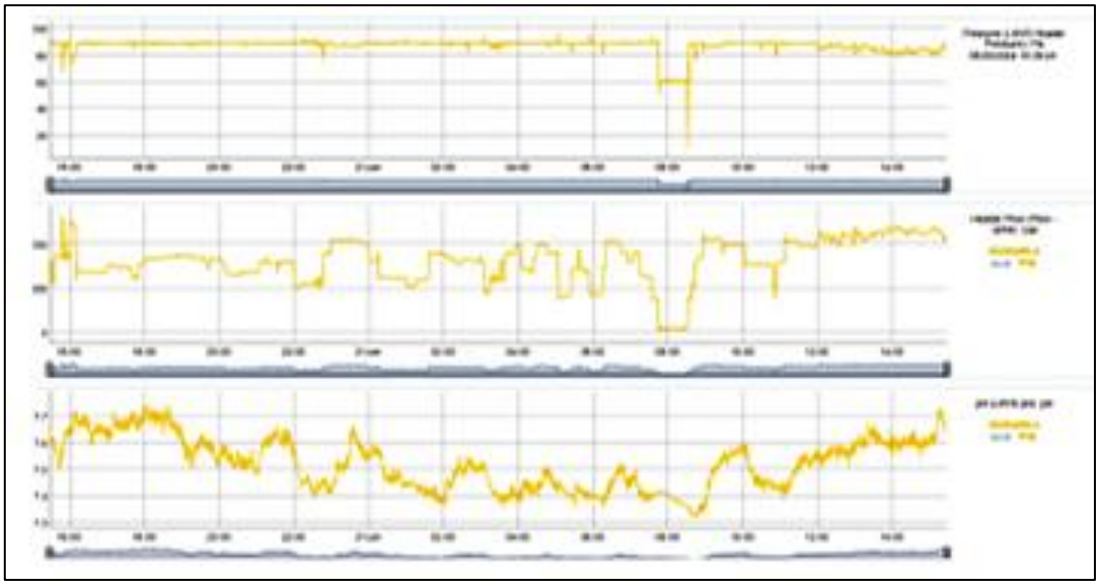

Figure 2. Example of pumphouse data output for 24 hours.

Substrate moisture can be measured at the container level using moisture sensors like Echo probes that connect to a wireless data logger to provide EC and container substrate moisture.

Results from our management efforts have proven themselves to be promising. It is still early but there are encouraging signs indicating reduced scap numbers and decreased pest and disease pressure. We have also observed improved rooting for difficult rooting crops like *Berberis* with a 60% rooting increase and 25% increase in *Hydrangea*.

Another technology we are exploring is using growing degree days gain insights into pest management and to schedule cutting harvest and improve rooting (Balteel, 2025 ; Barnes, 2005; Castillo and Castillo, 2001). Growing degree days use daily temperatures relative to a base temperature to predict a specific aspect of pest development or plant growth.

The relationship between growing degree days (GDD) to harvest cuttings and rooting percentages are illustrated for a *Berberis* (**Fig. 3**) and a *Hydrangea* crop (**Fig. 4**). It is clear that rooting percentage is significantly affected by the physiological state of the mother plant and in the case of *Berberis* Crimson Cutie rooting occurs best before the spring flush whereas in the case of the *Hydrangea* Incrediball optimum rooting has two peaks, one early on at close to 1000 GDD and the other at 2100 GDD.

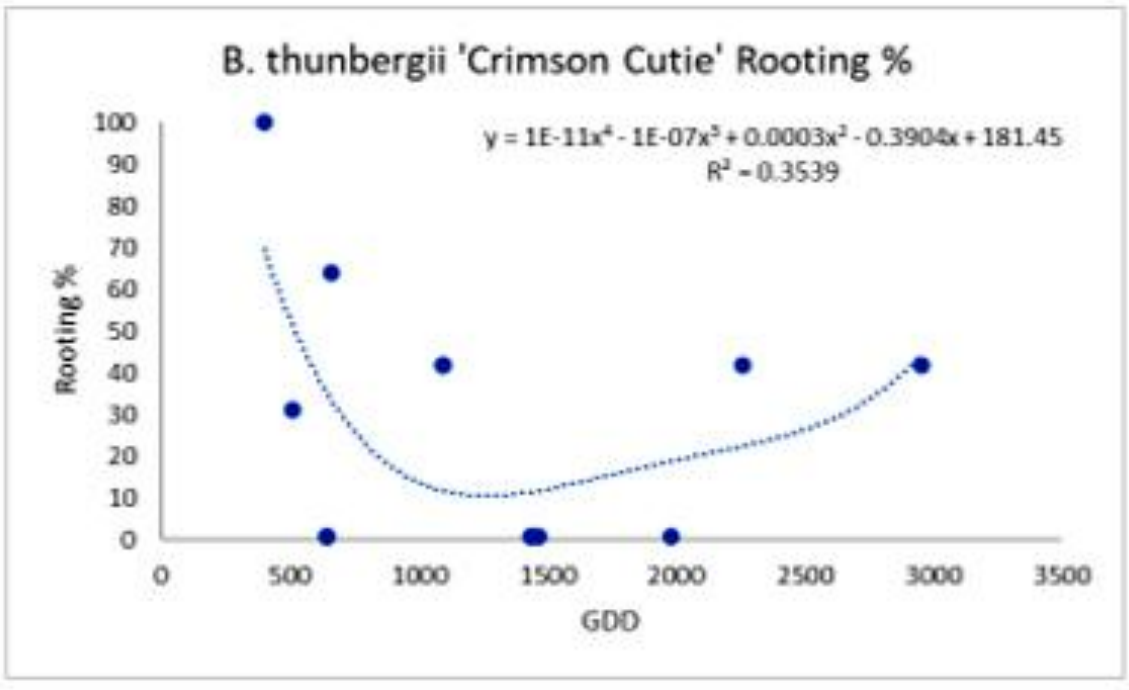

Figure 3. Rooting percentage in *Berberis thunbergii* Crimson Cutie in cuttings harvested after various growing degree days.

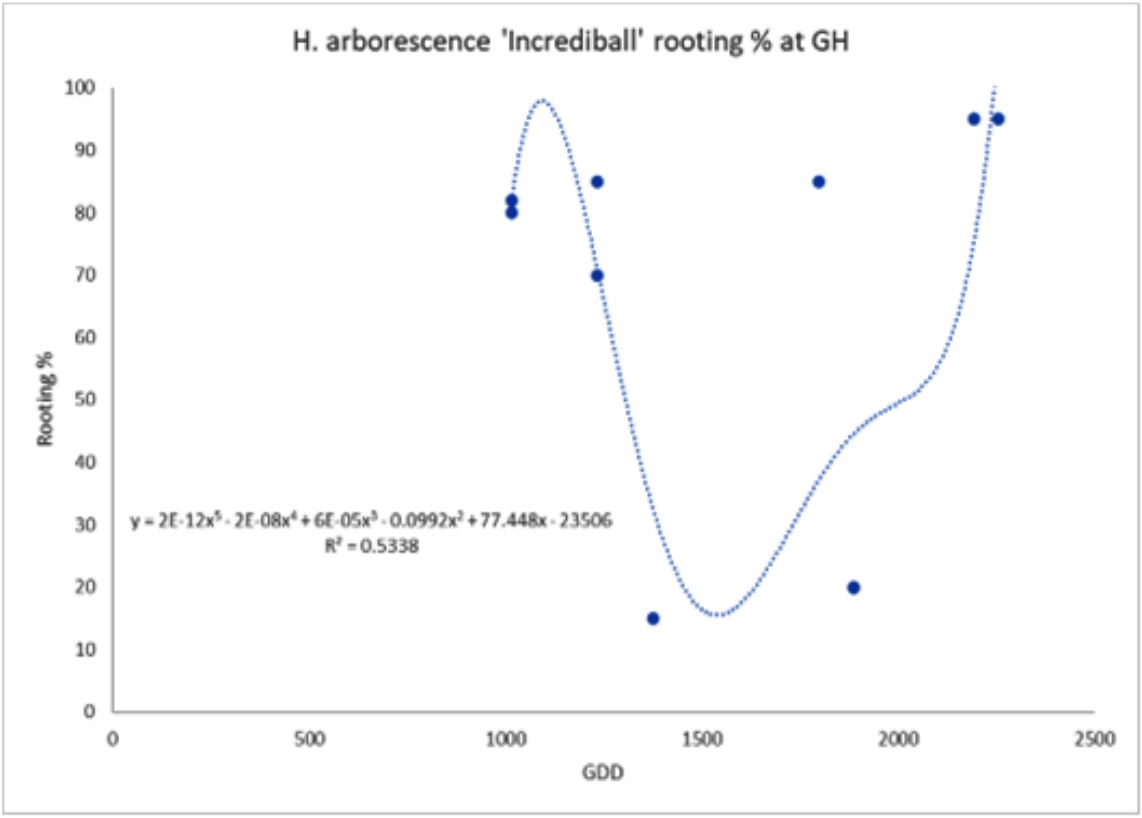

Figure 4. Rooting percentage in *Hydrangea arborescence* Incrediball in cuttings harvested after various growing degree days.

Conclusions

Improved plant health can improve numerous aspects of nursery production including stock plants by having a rigorous nutition and water management program. Growing degree days also offer another tool to improve cutting management. It needs to be specific for each crop and the models will get better as more data becomes available. Data may also be used from historical published propagation data if cutting harvest dates and rooting percentages are available. In conclusion, technology is an omnipresent component of our lives and work. Putting it into practice can yield significant improvements in any operation.

LITERATURE CITED

Baltell, B. 2017. Understanding growing degree-days. Michigan State University. https://www.canr.msu.edu/news/understanding_growing_degree_days

Barnes, H. W. 2005. Correlation of growing degree days and the timing of cuttings. Comb. Proc. Intern. Plant Prop. Soc. *55*:.386-392.

Castillo, Francisco, and Alfredo Castillo, 2001, How degree days effect the rooting percentage of *Cotoneaster acutifolia* cuttings. Comb. Proc. Intern. Plant Prop. Soc. *51*: 537.