Project Update! Evaluating Biochar for Use in Container Production

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In Spring 2019, a trial was initiated by CCE specialists Deborah Aller and Mina Vescera to investigate the effects of biochar on nutrient availability, water retention, and plant health in field and container nursery production on Long Island. This article provides an update on the container portion of this research project, which is a 3-year long study funded by the Northeast Sustainable Agriculture Research and Education (SARE) Program.

Biochar may still be an unfamiliar word for some, so what is it? Biochar is a carbon-rich material made from organic waste materials and is intended for use as an amendment for environmental or agronomic benefit. It resembles charcoal but is not the same because it is highly porous, recalcitrant (slow to degrade) in the environment, and is not meant for use as fuel. Applying biochar for improved crop growth and soil fertility is an age-old practice, but interest in using biochar for ornamental horticulture applications is relatively recent and specifically in nursery production there is limited research available regarding its application and impacts. Additionally, biochar has gained traction for use in container production from an environmental perspective because it is a renewable material that can be used to replace a portion of peat-based and other non-renewable potting substrates (Fascella, 2015).

Container trials were established at the Long Island Horticultural Research and Education Center (LIHREC) on boxwood (*Buxus* x 'Green Mountain') and switchgrass (*Panicum virgatum* 'Heavy Metal') plants and a participating nursery operation in Cutchogue, NY on switchgrass only. These plants were selected for study because they are grown in large numbers, are economically important for nursery producers on Long Island, and experience recurring nutrient management challenges that have not been corrected through conventional methods. The biochar used in the study was a commercially available hardwood biochar produced via slow pyrolysis at 600°C. Laboratory analysis showed that the biochar contained 73% carbon, had a pH of 7.3, and no toxicity concerns. Prior to use, the biochar was inoculated for five days with a locally made compost tea to 'charge' the biochar surfaces for enhanced microbial activity, and nutrient and water retention upon application.

The biochar was applied at the time of planting into 1.5-gallon plastic containers at rates of 10, 20, and 30 percent (v/v) and was either incorporated into the potting media (mixed treatment) or placed as a layer at the bottom of the container (bottom treatment) (Figure 1). There were five replications per treatment plus a no biochar control (media only) and were arranged in a completely randomized design at the respective project locations. Data were collected on pH and EC (following the NC State Pour-Through Extraction method), media and foliar nutrient levels, nitrogen leaching levels, monthly plant health evaluations, and end of season root and shoot biomass (Figure 2).

Results from the 2019 switchgrass support no differ-

Figure 1. *Example of a panicum root ball with the 30% mixed vs. bottom biochar treatments.*

Figure 2. *Agricultural Stewardship Technician, Andrew DellaVilla, collecting leachate from a boxwood plant as part of the Pour Thru procedure.*

ences between treatments for above-ground or shoot biomass weight, pH, EC, and plant health, but overall root ball weight was greater in the control and mixed 20 percent biochar treatments than the bottom 10 percent and mixed 30 percent biochar treatments. Similarly, few differences were observed in the boxwood plants with no significant differences found for root ball weight, above ground biomass, pH, and plant health, but EC levels for the bottom 20 percent and 30 percent biochar treatments were lower than the control treatment. In terms of the impact of biochar on nitrate leaching levels, the effect was variable with both mixed and bottom biochar treatments showing decreased nitrate leaching compared to the control at certain leaching events. However, more biochar did not necessarily equate to a greater reduction in nitrate leaching (Figure 3). Data analysis is ongoing with the final year in this trial upcoming.

Study updates and a full description of trial results can be found at: *https://projects.sare.org/sare_project/lne19-384r/*.

References:

Fascella, G., 2015. Growing Substrates Alternative to Peat for Ornamental Plants. *http://dx.doi.org/10.5772/59596.*

LeBude, A., and Bilderback, T. 2009. The Pour-Through Extraction Procedure: A Nutrient Management Tool for Nursery Crops. North Carolina State Extension – Horticultural Science. Available at: *https://content.ces.ncsu.edu/the-pour-through-extraction-procedure-a-nutrient-management-tool-for-nursery-crops.*

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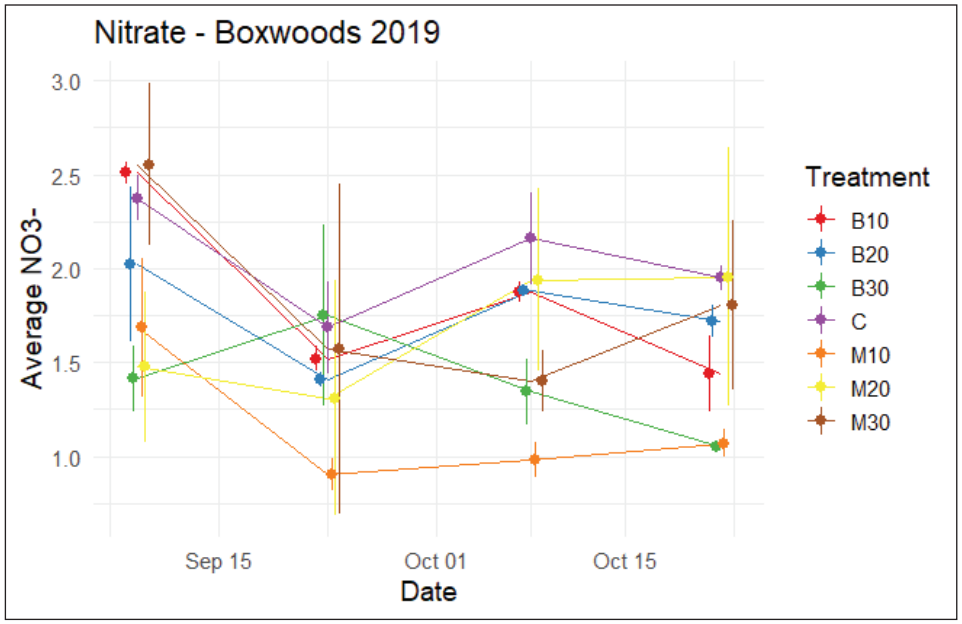

Figure 3. *Nitrate leaching levels across treatments for boxwood plants in 2019. Circles represent sample mean with vertical standard error bars.*