

Application of plant growth regulators to woody ornamentals on commercial landscapes

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As the global climate changes, managed landscapes are subjected to reduced water availability, increasing temperatures and increasing disease and insect pressure. Woody trees and shrubs are maintained by routine pruning and irrigation along with periodic pesticide application to enhance the beauty and utility of the property and for their environmental benefits such plantings provide (Dombrow, Rodriquez, & Sirmans, 2000) (Laverne & Winson-Geideman, 2003). The maintenance of ornamental landscapes is a 76.1 billion dollar industry as measured by revenue in 2014 and is growing on average by 3.7% annually (IBIS World Reports, 2015). The landscape management industry is challenged to maintain the utility and health of plants in the face of climate change and a diminished labor pool (Wartgrow, 2014). Innovative tools and management strategies are needed to reduce total inputs while improving plant health and appearance for the future. Plant growth regulators, in particular gibberellic acid inhibitors may be applied to landscape shrubs to control vegetative growth, which can improve water use efficiency, reduce routine maintenance operations and fertilizer inputs.

Landscape plants are routinely pruned to maintain visibility of signage, for safety, retain a desired aesthetic look, or to maintain desired size in the landscape. Pruning of shrub material in particular is a labor and time intensive process that is often completed on a contractual basis for the practitioner. However, as plants are pruned a biochemical growth response is triggered that stimulates additional vegetative growth. The resulting plant growth must be pruned again to maintain the desired plant appearance. Applying a gibberellic acid inhibitor (GAI) to slow vegetative growth will improve the profitability of maintenance while improving plant health (Smiley, Fraedrich, & Holmes, 2009). GAI inhibits the production of gibberellic acid in the apical meristem. Reduced gibberellic acid reduces cell elongation and expansion resulting; in the appearance of shorter vegetative plant parts. The resulting plants retain the desired form and function of plant parts, in smaller stature (Rademacher, 2000).

Gibberellic acid inhibitors are applied to many plants species but *ligustrum*, *eleagnus*, *pyracantha*, and *photinia* have been widely evaluated to reduce canopy growth while in the nursery production (Norcini, 1991) (Ruter J. M., 1994) (Keever, Foster, & Stephenson, 1990). In the nursery plants are grown to a desired size and shape determined by the market over a period of months. While in the nursery, plants receive consistent water, fertilizer, and have homogenous soil profiles which provide predictable growth patterns. Subsequently, the economic returns for the grower on PGR usage may be prudent. A GAI may be applied to the plant as a soil substrate drench or a foliar spray. Determination of how to apply the GAI rests with the grower based upon the production schedule, plant species, and length of time desired for plant material to mature (Deneke & Keever, 1992) (Norcini & Knox, 1989). Vegetative growth may be inhibited anywhere from 15 – 70% depending upon the plants growth pattern and whether a soil versus foliar application is made (Ruter J. M., 1994) (Norcini & Knox, 1989). Data from research from nursery shrubs provides nursery growers with consistent results. But a landscape user is applying GAIs in a vastly different environment and nursery data does not necessarily apply. A landscape user must maintain plants for the life span of the plant unlike a nursery user's needs for a period of months. The long term viability and effects of GAI usage for growth reduction in the landscape is relatively unknown.

In a landscape environment the variability of abiotic factors and cultural management reduce the predictability for the application of a GAI as the natural growth rates varies (Ruter & Martin, 1994). Further research is needed to quantify the effect of GAIs on plants in the commercial landscape under conditions encountered by practitioners. Questions regarding the expected reduction in vegetative growth in a variety of climates and growing conditions require investigation to enable users to make prudent management decisions. Using field research conducted in realistic landscape environments under current industry management the will be evaluated with a range of GAIs being applied. To further develop applicability of research the necessary economic metrics will be evaluated as well. Analysis of the

operational aspects related to pruning landscape shrubs under standard industry practices with and without GAIs being used.

The information developed from this research may lead to a shift in the current management practices of woody landscape plants. Using a gibberellic acid inhibitor to reduce the vegetative growth may reduce the pruning requirements to maintain a commercial customer's desired landscape desires. Meanwhile the landscape practitioner may realize improved economic viability for their management efforts.

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