Significance to the Horticulture Industry

Gibberellic Acid Impacts

Gibberellic Acid 4+7 Influences Shoot Growth of Seedling Pecan and Bitternut Hickory. Brandon M. Miller and Nina L. Bassuk. *Journal of Environmental Horticulture* 40(2):39-45

Current trends in nursery production have led to the repetitive use of easily grown, closely related taxa, resulting in increased species homogeneity in the landscape. This lack of diversity reduces landscape resiliency by increasing the susceptibility of managed landscapes to exotic pests and extreme weather events (Ma et al. 2020). Increased crop diversity in the nursery industry not only lends to increased diversity in managed landscapes but creates new opportunities for profit by nursery growers. Unfortunately, many desirable species remain nonviable due to production bottlenecks. For example, immense interest exists in effectively producing hickories; however, their slow shoot development and strong episodic growth require prolonged time investments, which reduce their viability as options for many nursery growers. An understanding of how certain plant growth regulators can be used to manipulate growth may bolster their potential. While hickories of section *Carya* were not responsive to gibberellic acid in our study, growers pursuing the production of pecan and bitternut hickory (in the section Apocarya) could apply solutions of 500 ppm GA 4+7 on seedlings to maximize shoot growth within the growing season. Additional research is needed to determine which cues promote additional shoot growth on hickory species of section *Carya*.

Japanese Beetle Resistance

Relative Resistance of Ulmaceae for Host Susceptibility, Feeding Preference, and Suitability for the Adult Japanese Beetle (Coleoptera: Scarabaeidae). Frederic Miller and George Ware. *Journal of Environmental Horticulture* 40(2):46-66

Seventy-three *Ulmus* and eight *Zelkova* taxa were evaluated in a series of no-choice and multiple-choice laboratory feeding bioassays and field defoliation studies for susceptibility, preference, and suitability for the adult Japanese beetle (*Popillae japonica*). North American elms *Ulmus alata* Michx., *U. crassifolia* Nutt, *U. rubra* Muhlenb, *U. thomasii* Sarg.; European elms *U. elliptica* K. Koch,, *U. glabra* Hudson, *U. laevis* Pall., *U. suberosa* Henry, *U. sukaczevii* Andr., Asian elms *U. davidiana* Planch., *U. microcarpa*, L.K. Fu, *U. multinervis* (syn. U. castaneifolia) Hemsl., *U. parvifolia* Jacq., *U. propinqua* Koidz., *U. prunifolia* Cheug and L.K. Fu., *U. szechuanica* Fang., *U. taihangshensis* S.Y. Wang, *U. wilsoniana* Schneid., cultivars 'New Harmony', 'Valley Forge', 'Frontier', 'Homestead', 'New Horizon', 'Pioneer', 'Patriot', U. 'Morton' Accolade, and U. 'Morton' Triumph, and *Zelkova serrata* (Thunb.) Mak. cultivars 'Green Valley' and 'Village Green', and *Z. schneideriana* Hand.-Mazz. were the least susceptible to feeding and/or the least suitable for reproduction. Laboratory no-choice feeding studies were correlated with field defoliation ratings, but were not a good predictor of adult female fecundity. Physical leaf characteristics (i.e. leaf thickness and toughness) differed by geographic origin. Asian and European elm leaves were thicker than North American elms, and Asian elm leaves were tougher than European and North American elm leaves, but leaf thickness and toughness was not related to host susceptibility or adult female fecundity. Hybridization significantly affected host susceptibility and appears to contribute to an "*U. pumila* and *U. carpinifolia* factor" for host preference, susceptibility, and suitability. Results from this study suggests there is a rich pool of *Ulmus* and *Zelkova* taxa for future breeding programs and for reforestation efforts due to loss of landscape trees and urban forest cover by lethal insect pests (i.e. Asian longhorn beetle [*Anoplophora glabripennis (*Motschulsky, 1853)], emerald ash borer (*Agrilus planipennis F*airmaire, 1888) and diseases (i.e. Dutch elm disease [*Ophiostoma ulmi* (Buisman) Nannf. and *Ophiostoma novo-ulmi* Brasier]), and for their broad hardiness range, ability to tolerate variety of soil conditions, and minimal maintenance in harsh urban environments.

Phytophthora Root Rot

Irrigation Frequency and Volume has Little Influence on Phytophthora Root Rot in Container-grown Rhododendron. Jerry E. Weiland, Carolyn. F. Scagel, Niklaus J. Grünwald, E. Anne Davis, Bryan R. Beck, and Jesse N. Mitchell. *Journal of Environmental Horticulture* 40(2):67-78

Plant pathogens in the genus *Phytophthora* cause root rot that decreases product quality and results in plant death and economic losses to the nursery industry. Nursery production of rhododendron is often severely compromised by root rot and there are few cultural practices to mitigate the disease. Recently, we found that *Phytophthora plurivora* is prevalent on rhododendron in nurseries in the Pacific Northwest, USA, but there is little information available to compare its pathogenicity in different environments to *P. cinnamomi*, a more well-studied *Phytophthora* root rot pathogen. While it is well known that Phytophthora infection is favored by abundant soil moisture, it is unclear whether irrigation management can be used to decrease root rot incidence or severity in container-grown rhododendron nursery plants. Our results indicate that: (1) low inoculum levels of either pathogen cause mild disease whereas higher levels cause severe disease; (2) *P. plurivora* causes similar losses in rhododendron plants as *P. cinnamomi*; (2) *Phytophthora* can be isolated from asymptomatic plants and may pose a risk to pathogen spread since even low inoculum levels can decrease plant health; (3) plants grown in media free of Phytophthora can adapt better to a broader range of irrigation regimes than plants grown in pathogen-infested media; and (4) reducing irrigation after infection has occurred is ineffective at reducing the amount of root rot caused by either *Phytophthora* species. This work provides novel insights into water management for control of *Phytophthora* infection in container nurseries.

Shade Effects on Dormancy

Potential Impacts of Shade Treatments on Dormancy of Overwintering Redbud (Cercis canadensis L.) Trees at Southeastern Nurseries. C. T. Werle and A. L. Witcher. *Journal of Environmental Horticulture* 40(2):79-86

Among the many challenges to profitable nursery production, global climate change may make an outsized impact in reduced tree quality due to damage from extreme climate conditions (Campoy et al. 2011). Tree phenology is highly sensitive to changing temperatures, with leaf bud break either advanced or delayed by warmer winter temperatures, depending on species and cultivar (Nanninga et al. 2017). One primary concern of higher winter temperatures includes the potential loss of dormancy in tree crops, with potential impacts on leaf and flower production and defense against frost injury and subsequent insect pest attacks (Augspurger 2013, Kim et al. 2014, Ranger et al. 2019). Nursery managers may be looking for ways to limit loss of dormancy in overwintering tree crops as a way of protecting against these abiotic and biotic stressors. For this reason, we looked for effects of shade treatments

on overwintering container-grown redbud (*Cercis canadensis* L.) trees in Mississippi and Tennessee. While air and root zone temperatures were similar for our full sun and shade treatments in the TN experiment, shade moderated other environmental conditions (stem temperature) at both sites and led to increased MTB over the full season in MS. Overwintering trees under shade in certain regions could potentially promote greater dormancy, delaying bud break and preventing late-season frost injury.

Vermicomposting Flower Waste

An Analysis of the Quality of Compost Produced from Vermicomposting Fresh Cut Flower Waste. Coleman L. Etheredge and Tina M. Waliczek. *Journal of Environmental Horticulture* 40(2):87-93

In recent years there has been a push in the floral industry towards sustainable practices and an environmental awareness of the impacts of the business (Papas 2021, Thursd 2020). At the biennial Trend Summit 2020 Conference, Symposium, and Workshop in which professionals within the floral industry meet to discuss current trends and the direction in which floral design should be guided to keep pace with an ever-changing world, the first statement on sustainability was crafted, which states, in part, a belief in the zero-waste hierarchy to rethink, redesign, reduce and repurpose (Thursd 2020). This research investigated if floral waste could be used in a vermicomposting system to create a vermicompost that could be used within the horticulture industry. Results suggest floral waste has the potential to be used in a vermicomposting system to create a quality compost suitable for use in the horticulture industry.