Significance to the Horticulture Industry

Irrigation

The impact of substrate and irrigation interval on the posttransplant root growth of container-grown zinnia and tomato. Bruce R. Roberts, Chris Wolverton and Lauren Janowicz. *Journal of Environmental Horticulture* 35(1):1–5.

The current trend in ornamental and vegetable transplant production is to grow the plants in plug-cell trays. In an effort to improve irrigation management practices for the production of container-grown plug-cell transplants, we evaluated the effect of substrate type and irrigation frequency on the root growth [root dry weight (RDW), specific root length (SRL), root tissue density (RTD) and root length density (RLD)] of zinnia and tomato. The data show that, for soilless cultivation of zinnia and tomato, root growth can be increased by seeding in a high porosity substrate that allows good air and moisture exchange. In our study, plug-cell transplants grown in BPGM and re-watered at intervals of two (zinnia) or four (tomato) days showed significantly more root growth than similar transplants watered daily. Since the goal of irrigation scheduling is to maintain adequate substrate moisture while maximizing plant-water use efficiency, the choice of an appropriate growing medium possessing good moisture release characteristics is one of the most important decisions a grower can make. With proper substrate selection, irrigation scheduling options become more manageable, resulting in better root growth and greater transplant success.

Drought Stress

Drought stress reactions of different populations of *Quercus robur* L. and *Tilia cordata* Mill. Malte Selig and Heike Bohne. *Journal of Environmental Horticulture* 35(1):6–12.

Prescribed use of local tree populations not only for silviculture but also for plantings in the landscape will complicate the submission process and increase the cost of production due to a separated cultivation of different populations within each nursery. This can lead to problems concerning the supply of an adequate quantity of trees and shrubs. Our results show that all investigated populations of *Quercus robur* and *Tilia cordata* can cope with different drought conditions. Previous results showed that this is also the case for early and late frost stress (Selig and Bohne 2016a, 2016b). Hence prescribed use of local populations by the German Federal Nature Conservation Act (BNatschG §40) can be eased.

Laser-guided sprayer

Spray deposition inside multiple-row nursery trees with a laser-guided sprayer. H. Zhu, H. Liu, Y. Shen, Hengyu Liu and R. H. Zondag. *Journal of Environmental Horticulture* 35(1):13–23.

There is much more variability in tree architectures in ornamental nurseries than in tree fruit production. However, sprayers used in nurseries are adopted from other crops. Hence, the spray efficiency is very low. Specially designed sprayers are needed to improve pesticide application efficiency and reduce excess pesticide waste, thus improving the environment. In this research, the five-port automatic sprayer designed and evaluated for multiple-row container nursery crops demonstrated significant reduction in spray volume while providing adequate spray deposition and coverage inside canopies, thereby offering an environmentally responsible spray technology for the nursery industry to protect crops against damage from insects and diseases.

Neonicotinoid insecticides

Residues of neonicotinoid insecticides in pollen and nectar from model plants. Richard S. Cowles and Brian D. Eitzer. *Journal of Environmental Horticulture* 35(1):24–34.

Use of systemic pesticides in the production of ornamental horticulture crops presents a quandary: these materials can protect all portions of a plant with long-lasting effects and can be compatible with integrated pest management programs, because the residues are translocated throughout and are presented from inside the plant. However, based upon their systemic nature, they may also inherently pose risks to pollinators which avail themselves of contaminated nectar or pollen resources. Pesticide labels permit high rate applications in ornamental horticulture use of neonicotinoid insecticides, relative to agronomic uses. These rates can lead to elevated residues in pollen, and especially in nectar, which are predicted to be toxic to bees. Nurseries and ornamental greenhouse growers do need to recognize the potential for harm to pollinators from the use of nitroguanidine neonicotinoid systemic insecticides. Ways to mitigate the risk to pollinators include substituting foliar sprays over drenches, using the lowest effective application rates, switching to systemic insecticides that have lower intrinsic toxicity to bees when treating bee-attractive plants, or not using systemic insecticides on these plants. These mitigation approaches should be a high priority for research on establishing pollinator-safe practices in the ornamental horticulture industry.

Propagation

Effect of Propagation Tray Design on Early Stage Root Development of *Acer rubrum*, *Quercus rubra*, and *Populus tremuloides*. Darby McGrath, Jason Henry, Ryan Munroe and Erin Agro. *Journal of Environmental Horticulture* 35(1):35–40.

Root deflects are initiated at the propagation stage and misdirected structural roots makes trees less robust after transplanting, increasing tree mortality because roots are not placed advantageously for survival and establishment. Although manual correction (pruning or shaving) is possible for larger nursery stock sizes, root masses at the propagation stage are small and numerous, making it inefficient to manually shave the plugs. In propagation, air-pruning is an effective way to manage root growth and development using permeable-walled containers, which stop root growth at the wall-substrate interface by desiccating root tips. Plug-trays that have some air-pruning features in addition to plastic structures, for instance, are designed to direct roots (with either vertical or horizontal ribbing, lattices or strategically placed holes) still cause root deflections by forcing the roots to change direction (e.g. ascending, descending, circling or kinked roots). However, deflected roots can be greatly reduced by growing seedlings in propagation trays that minimize contact between the substrate and the tray cell walls.

The Journal of Environmental Horticulture (ISSN 0738-2898) is published online quarterly in March, June, September, and December.