Special Issue

An Introduction to the Impact of Utilizing Alternative Containers in Ornamental Crop Production Systems

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Ornamental plant production relies almost exclusively on petroleum-based plastic containers. Within the United States, annual plastic use for ornamental plant containers is estimated at 1.66 billion pounds (Schrader, 2013). Worldwide, ≈8% of consumed petroleum is used for plastic production—with equal parts being used as base material and as energy to fuel the manufacturing process (Thompson et al., 2009). Noting the limits of both petroleum supplies and our ability cope with solid waste, many in the manufacturing sector are questioning the sustainability of plastic container production (Thompson et al., 2009). The volume of plastics, coupled with the potential for agrochemical and soil contamination, as well as photodegradation, limit recycling and place an increased burden on landfills. For example, California is estimated to dispose of 11,800 tons of plastic flats, trays, and containers annually (Hurley, 2008).

Studies indicate that consumers view the use of nonrenewable plastics during nursery and greenhouse production as unsustainable (Behe et al., 2013). This can hinder the green industry's efforts to promote themselves as "green" to environmentally conscious consumers. Recent market research suggests that consumers are willing to pay more for nonplastic or recyclable containers (Khachatryan et al., 2014; Yue et al., 2010) and that consumer product perception is highly influenced by container type compared with other sustainable attributes (Yue et al., 2011). As consumer and industry interest in environmentally responsible products continues, it is important for horticulture professionals to be aware of how currently available alternative containers (and the crops within them) perform in independent trials, as well as update information from early investigations on fiber-based containers (Ruter, 1996, 2000). This information is particularly timely as business differentiation based on social and environmental responsibility is becoming increasingly important due to the maturation of the U.S. green industry (Behe et al., 2013).

Alternative containers are produced using a range of natural materials typically derived from renewable sources or by-products of another manufacturing process. In general, commercially available alternative containers are constructed of pressed fiber or bioplastic. Pressed fiber and biopolymer-based containers are biodegradable or compostable depending on the material and the manufacturing process. Examples of pressed fibers include: bamboo, coir (coconut fiber), composted cow manure, paper, peat, rice hulls, rice straw, spruce fibers, wheat, or wood pulp. The porous nature of these containers can not only increase water use but also reduce root zone temperatures (Nambuthiri et al., 2015). Bioplastics are similar to traditional plastics and are created from either biopolymers (nonpetroleum based) or a blend of bio and petrochemical-based polymers. Because of the similarities, they can be used with potting machines and other mechanization without the need to retrofit equipment.

The majority of alternative containers differ from virgin petroleum-based plastic containers in that they

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Units

To convert U.S. to SI, multiply by	U.S. unit	SI unit	To convert SI to U.S., multiply by
0.4536	lb	kg	2.2046
0.9072	ton(s)	Mg	1.1023

are intended to be either plantable or compostable. Beyond this reduction in landfill waste, plantable containers eliminate the container removal, clean up, and disposal costs associated with a landscape installation because they remain intact when plants are transplanted. Compostable containers may be either composted at backyard or industrial compost sites; however, industrially composting adds a significant energy cost to disposal. A third category of alternative containers includes those made from recycled plastic bottles (e.g., water or soft drink). These containers do not biodegrade and therefore cannot be planted or composted.

This workshop provided an overview of alternatives to petroleum-based plastic containers for greenhouse, aboveground container production and pot-in-pot production systems. In doing so, the participating researchers: 1) assessed container strength, durability, and aesthetics at various stages of production and mechanization; 2) characterized water use and root zone temperature associated with alternative containers; 3) assessed container and plant performance both during production and in the landscape; and 4) conducted economic and environmental assessments of production using alternative containers. The articles derived from this workshop provide a unique insight to the use of alternative containers and provide guidance to the green industry and those who advise them.

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