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Growth of Cyclamen in Biocontainers on an Ebb-and-Flood Subirrigation System

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Summary. **The objective for this research was to evaluate the growth of a long-term crop in biodegradable containers compared with traditional plastic containers using a subirrigation system. Plastic, bioplastic, solid ricehull, slotted ricehull, paper, peat, dairy manure, wood fiber, rice straw, and coconut fiber containers were used to evaluate plant growth of 'Rainier Purple' cyclamen (*Cyclamen persicum*) in ebb-and-flood subirrigation benches. The days to flower ranged from 70 to 79 and there were no significant differences between the plastic containers and the biocontainers. The dry shoot weights ranged from 23.9 to 37.4 g. Plants grown in plastic containers had dry shoot weights of 27.6 g. The dry shoot weight of plants grown in containers composed of wood fiber was 23.9 g and was lower than plants grown in plastic containers. The plants grown in the bioplastic, solid ricehull, slotted ricehull, paper, peat, dairy manure, rice straw, and coconut fiber containers had significantly higher dry shoot weights than plants grown in plastic containers. Dry root weights ranged from 3.0 to 4.0 g. The plants grown in the plastic containers had dry root weights of 3.0 g. Plants grown in paper and wood fiber containers had higher dry root weights than those grown in plastic containers. The only container that negatively affected plant growth was the wood fiber container. Plants preformed the best in solid ricehull, slotted ricehull, and coconut fiber containers based on dry shoot and dry root weights, but all containers were successfully used to produce marketable cyclamen plants.**

The greenhouse floriculture crop production industry includes such commodities as flowering potted crops, perennials, and annual bedding plants. This sector of the horticultural production industry was valued at $3.94 billion for the top 15 producing states in 2011 (U.S. Department of Agriculture, 2012). Most greenhouse floriculture crops are grown in containers. The container size is dictated by the length of time the crop will be in production and the desired finished plant size. For example, florist potted crops such as cyclamen, poinsettia (*Euphorbia pulcherrima*), and chrysanthemum (*Chrysanthemum ×morifolium*) require longer production times to grow to marketability and are typically grown in larger containers than most annual bedding plants.

Petroleum-based plastics (plastic) are the most common materials used to fabricate containers for greenhouse crop production. Plastic is relatively strong, resists mildew and algae growth, and can be molded into a variety of shapes and sizes. However, after use, these containers are typically discarded, and this results in large amounts of waste plastic containers going to landfills. One potential solution to the large amounts of waste plastic greenhouse containers is the use of biocontainers. Biocontainers are generally defined as containers that are not petroleum based and break down quickly when planted into the soil or placed into a compost pile.

Biocontainers are generally categorized as being plantable or compostable (Evans and Hensley, 2004; Evans et al., 2010). Plantable biocontainers are containers that allow plant roots to grow through their walls and may be directly planted into the final container, the field, or the planting bed. Compostable biocontainers cannot be planted into the soil because the roots cannot physically break through the container walls and the biocontainers do not break down quickly enough to allow the plant roots to grow through the container walls. Instead, these containers must be removed before planting but can be placed in a compost pile to decompose in a relatively short time (Mooney, 2009).

There are many types of plantable biocontainers. Composted dairy manure containers are made of compressed composted cow manure held together with a binding agent. Peat containers are made from peat and paper fiber. Paper containers are made from paper pulp with a binder. Rice straw containers are composed of 80% rice straw, 20% coconut fiber, and a proprietary natural adhesive as a binder. Wood fiber containers are composed of 80% cedar fibers, 20% peat, and lime. Coconut fiber containers are made from the medium and long fibers extracted from coconut husks and a binding agent. One type of compostable biocontainer available for greenhouse production is the ricehull container, which is made of ground rice hulls with a binding agent. These containers are available in different sizes and may have solid or slotted walls. Another group of compostable biocontainers are bioplastic containers that are made from a bioplastic derived from polylactic acid or wheat starch, which is then thermoformed into containers.

Differences in growth have been reported for several bedding plant species when grown in biocontainers and compared with growth in plastic containers. Kuehny et al. (2009) evaluated the growth of pansy (*Viola ×witrockiana*) and petunia (*Petunia ×hybrida*) in various biocontainers. They found that the leaf area of pansy

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Mention of trade names implies no endorsement of the products mentioned, nor criticism of similar products not mentioned.

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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
29.5735	fl oz	mL	0.0338
0.3048	ft	m	3.2808
2.54	inch(es)	cm	0.3937
25.4	inch(es)	mm	0.0394
28.3495	oz	g	0.0353
1	ppm	$mg \cdot L^{-1}$	1
(°F – 32) ÷ 1.8	°F	°C	(°C × 1.8) + 32