From Forest Nursery Notes, Summer 2011

164. Biocontainer water requirements. Taylor, M., Evans, M., and Kuehny, J. Greenhouse Management 31(5):32-34. 2011.

ARE GREENHOUSES GREEN?

Biocontainer water requirements

By Matt Taylor, Michael Evans and Jeff Kuehny

Understand how to manage water loss before making the switch

Key Points

1. Many biocontainers have water permeable walls, which cause the growing substrate to dry faster than in traditional plastic containers.

2. Because water requirements may increase significantly with the use of certain biocontainers, the benefits of reducing waste plastic need to be weighed against increased water usage.

3. Greenhouse managers should evaluate which properties are most important and select biocontainers that best match their needs.

Despite the introduction of different types of biocontainers, limited research has been published regarding specific characteristics of biocontainers compared to traditional plastic containers. One particular area of importance is the amount of water that is needed to produce a commercial crop. Many biocontainers have water permeable walls, which cause the growing substrate to dry faster than in traditional plastic containers.

Research was conducted to determine the amount of water required and the length of time between irrigations to produce a marketable geranium crop. Water loss through the container walls was also determined (Table 1).

For the water use study, all containers were filled with a peat-based substrate. Plants were irrigated with 15-5-15 fertilizer at 200 parts per million nitrogen when the substrate surface was dry. At each irrigation, plants were placed on drainage trays, irrigated with 150 milliliters of water and the leachate was collected and measured. Geraniums were grown for eight weeks. Total water use and average irrigation interval are shown in Table 2.

The rice hull pot was the only 4-inch biocontainer that did not require more water than plastic containers to produce a marketable geranium. The rice hull pot also had the longest time interval between each irrigation. When the substrate volume was increased in the straw and paper containers, the amount of water required and the irrigation interval increased. These factors were not significantly different between the OP47 and the 5-inch plastic container control.

Measuring water loss

Containers tended to segregate into three groups based on water loss rates through the container walls (Table 3). Plastic, rice hull and OP47 containers had rates of water loss that were close to zero. Straw Pot, cocofiber, Fertil and peat containers had the highest rates of water loss. CowPots and paper containers had water loss rates that were between these two groups.

Although differences in plant growth and substrate surface area may have affected the amount of water required to grow a crop as well as the average irrigation interval, water loss through container walls was also a major factor affecting these two variables. The containers that had the highest rate of water loss through the container walls also had the highest water requirement and the lowest irrigation interval. Rice hull and OP47 containers are relatively impermeable to water, and had a similar water loss rate, water requirements and irrigation intervals as the plastic container control.

Because water requirements may increase significantly with the use of certain biocontainers, the benefits of reducing waste plastic would need to be weighed against the increased water usage. Where water use or availability is a major consideration, biocontainers such as OP47 or rice hulls may be preferred to other biocontainers that have a higher water requirement.

Algal and fungal growth

To determine algal and fungal growth, containers were filled with substrate, spaced pot-to-pot in flats, placed in a greenhouse and irrigated with 15-5-15 fertilizer at 100 ppm nitrogen to container capacity. OP47 and 5-inch plastic containers were placed in special biodegradable trays designed specifically for the OP47 containers. Containers were irrigated when 25 percent of the containers in a tray were dry. After six weeks in the greenhouse, containers were evaluated for algal and fungal growth as a percentage of the total surface area.

No algal or fungal growth occurred on plastic, OP47, cocofiber or rice hull containers. CowPots, paper and Straw Pot containers had 2-4 percent of their container walls covered with algal or fungal growth. Fertil and peat containers had the highest proportion of their surface covered with algal or fungal growth at 26 percent and 47 percent, respectively. These results may be attributed to the difference in water absorption by the container walls as well as the container wall chemistry. Biocontainers with no visible algal or fungal growth tended to be impermeable to water or dried quickly after irrigation and were composed of materials resistant to decomposition such as coconut fiber.

Match containers to needs

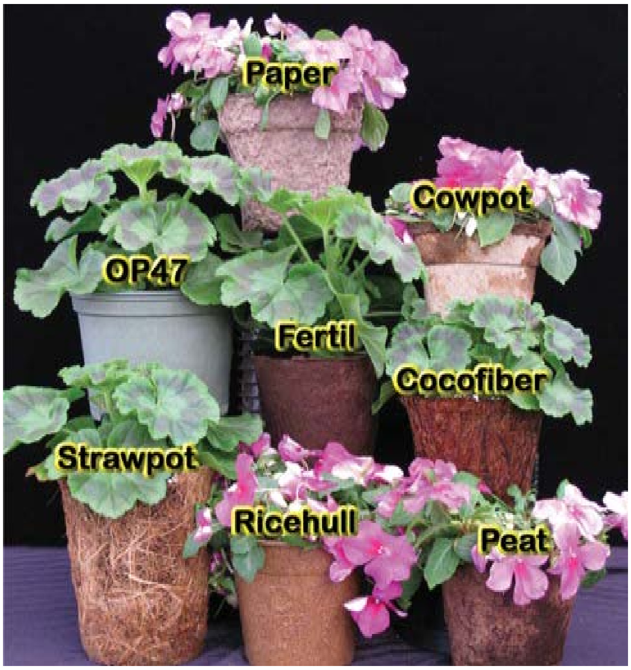
All biocontainers, except rice hull containers, allowed water to evaporate through their container walls and had higher water usage than traditional plastic containers. Depending on the specific part of the country and crop and cultural conditions, water use will be more

Table 1. Name, composition and supplier of biocontainers tested for water use and growth of algae and fungi on container walls.

Container name	Container composition	Supplier
4- and 5-inch plastic (Control)	Plastic	Dillen Products
Peat	Peat and paper	Jiffy
DOT/Fertil	80% cedar wood fiber, 20% peat and lime	Fertil International
CowPots	Composted dairy manure and a binder	CowPots Co.
Cocofiber	Coconut husk fibers and a binder	ITML Horticultural Products
Straw Pot	80% rice straw, 20% coconut fiber and a binder	Ivey Acres
OP47	Bioplastics	Summit Plastic Co.
Paper/Kord	Paper pulp and a binder	ITML Horticultural Products
Rice hull	Ground rice hulls and a binder	Summit Plastic Co.

Table 3. Average rate of water loss (in grams) per square inch of container surface per day for plastic and biocontainers for seven days after irrigation.

4-inch plastic (Control)	0.06
5-inch plastic (Control)	0.03
OP47	0.03
Rice hull	0.03
Paper/Kord	0.19
CowPots	0.23
Cocofiber	0.27
Peat	0.30
DOT/Fertil	0.31
Straw Pot	0.31



Plants in biocontainers tested.

or less important during crop production. When using Fertil and peat biocontainers, algal and fungal growth may be present in higher amounts compared to other biocontainers. Greenhouse managers wanting to improve sustainability by using biocontainers need to evaluate which properties are most important and select biocontainers that best match their needs. GM

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This project was supported by the Arkansas Division of Agriculture, Longwood Gardens and The LSU AgsCenter. The authors gratefully acknowledge SunGro Horticulture for providing growing substrate.

Table 2. Water required per container and average interval of time between irrigations during production of marketable geraniums.

4-inch containers filled with 400 ml substrate	Gallons of water per container	Irrigation interval (days)
Plastic (Control)	0.55	3.7
Rice hull	0.55	3.8
Straw Pot	0.68	3.2
Paper/Kord	0.73	2.8
Cocofiber	0.87	2.7
CowPots	0.97	2.5
Peat	1.09	2.2
DOT/Fertil	1.10	2.4
4-inch containers filled with 700 ml of substrate		
Paper/Kord	0.98	3.2
Straw Pot	1.05	3.3
5-inch containers filled with 740 ml of substrate		
Plastic (Control)	0.83	4.5
OP47	0.85	4.4

Greenhouse MANAGEMENT

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FEATURES

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