

## Selecting propagation media for rooted liners

Paul Fisher, Jinsheng Huang and Bill Argo, to be published in GPN, May 2007.

With so many media options on the market, how can you decide which to use for propagating cuttings? Options shown in Figure 1 include (a) **stabilized** media (foam, peat/polymer, paper-wrapped pots, or compressed peat or sphagnum), and (b) **loose** media (which typically contain a combination of peat, perlite, vermiculite, and/or coir). Stabilized media hold together as a solid cell, meaning that less rooting is required for a “pullable” plug that will not fall apart outside the tray. In contrast, loose media require well-formed plant roots (and therefore also require more time) to form a cohesive “pullable” root ball.

No one product is always “best” for your operation all the time. The proof is that leading growers often use more than one medium depending on the crop and time of year. At the Young Plant Research Center, we evaluate chemical and physical properties of propagation media, and their greenhouse performance. We will focus on aeration, water holding capacity, cost and crop time in this article, but there are other factors to consider in selecting a root medium:

- Rewetting both at the initial sticking and growing on.
- Fungus gnats/shore flies, and algae – Oasis foam is not a preferred substrate for fungus gnats because it lacks organic matter, although fungus gnats can enter the stem base directly. Media with low aeration and high water-holding are more susceptible to algae and shore fly problems.
- Ease of sticking, and the size and stability of the dibble hole in the sticking line.
- How firmly cells remain in the tray during shipping, in order to avoid credits.
- Design of the plastic tray for drainage, air ventilation, and holding the plug in place. The tray has a big effect on air and water characteristics, and holding the cell during shipping.
- Ease of transplanting - the root ball should hold together, and remove easily from the tray.
- Ability to customize the growing mix and tray configurations to your specific needs. In some cases, the media supplier may provide only a one-size-fits-all recipe.
- pH level and stability – there is very little buffering to change in pH, and this is largely up to grower management of fertilizer and water alkalinity.
- Nutrient charge – in reality, it is so easy to leach out the preplant nutrient charge with mist, that this is not a large factor and it is mainly up to grower management to replenish soil nutrients.

### **Aeration and water holding capacity**

*Bottom line: Media vary in how much air or water they hold – this is important for rooting success. Good rooting occurs if the mist frequency matches air and water porosity for a particular media.*

A cell in a propagation tray is made up of solid substrate along with pores that are either filled with water (smaller pores) or air (bigger pores). There is a trade off between air and water porosity. As a general rule, a high level of aeration makes it easier to grow roots under mist, because growers tend to over-apply rather than under-apply water during propagation. Heavy misting during propagation can lead to anaerobic conditions, algae, fungus gnats, shoreflies, slow rooting, disease, and nutrient leaching.

However, once the plant is rooted there is an advantage of having high water-holding content. Water uptake by a rooted plant helps to rapidly dry media down. Media that have low water-holding capacity need more frequent watering.

Oasis foam, which has high aeration, provides an example of how water and air characteristics affect propagation. Oasis is very forgiving for propagating poinsettia cuttings in the summer when mist is applied frequently because there are always some pores that are not saturated with air. On the downside, rooted cuttings held in Oasis need to be transplanted quickly because the media rapidly dries down.

In one test, we surveyed solid, air porosity, and water porosity of eight stabilized and eight loose commercial propagation media. All loose media were placed in the same 105-count 11 inch x 21 inch Blackmore tray for testing. Similar physical characteristics were observed across the eight loose media tested. The range of water porosity, air porosity and solid by volume for the loose media were 69 to 80%, 5 to 10% and 15 to 24%, respectively.

Stabilized media were evaluated in similar 105-size trays, except one 102-size product. There was more variability between stabilized media types than between loose media. Physical properties of stabilized media were affected by both cell dimensions and media components. Water porosity, air porosity, and solid for the stabilized media types ranged from 45 to 86%, 5 to 11%, and 8 to 45% respectively.

Figure 2 shows partial results from an evaluation of rooting in the sixteen media. Good quality calibrachoa plants were obtained with all media tested, *because we modified our scheduling of mist based on the media.*

### **Rooting and finish time**

*Bottom line: The shorter finish time with stabilized media can increase crop turns.*

There are two main stages in rooting of cuttings. In the first stage under mist, the goal is to produce initial roots so that the plant can begin to take up nutrients and is resistant to wilting. As discussed earlier, this is a matter of providing the right mix of air and water by managing mist frequency and media porosity. During the second stage, irrigation frequency is lower because plants are off mist, and the goal is to produce a well-rooted plug with acceptable shoot growth for transplant.

The biggest advantage of stabilized media occurs during the second, crop finishing stage. The cell is by definition already stabilized and cohesive. Therefore, not as much rooting is required to form a plug that can be pulled out of the tray without damaging the roots or having the root ball fall apart. For rooting stations, that can mean less credits resulting from lightly rooted plant material.

We work closely with a group of leading rooting stations, who report that a one-week shorter crop time is often achieved using stabilized versus loose media. Stabilized media will often cost around \$1 more per tray compared with loose media. Is that extra cost worth it? The exact details will vary depending on your business, but the answer is: YES, if you can gain more crop turns.

Let's take an example with a 4-week (stabilized) versus 5-week (loose) crop. The peak of spring propagation occurs over about 15-16 weeks (January to April). That means 4 crops could be finished with stabilized media versus 3 crops with loose media. This represents 33% more yield with the stabilized media. In other words, you would need 33% more greenhouse space with loose media to produce the same number of trays during that peak period. That also equals 33% more net revenue minus the extra cost of the stabilized media.

## **In Conclusion**

We recommend that growers continually evaluate alternative products. However, run trials first before changing growing media – that decision has downstream impacts on irrigation, fertigation, shipping, and profitability. If you are going to trial a new growing medium, there is a good chance the substrate will need to be treated differently from the medium you are currently using, for example with lower mist frequency if it has higher water-holding capacity and lower air porosity.

**About the Authors:** Paul Fisher ([pfisher@ufl.edu](mailto:pfisher@ufl.edu)) is an Associate Professor and Jinsheng Huang is a post-doctoral researcher in the Environmental Horticulture Department at the University of Florida. Bill Argo ([bargo@blackmoreco.com](mailto:bargo@blackmoreco.com)) is technical manager at the Blackmore Company. We thank our Young Plant Research Center partners Blackmore Co., Center Greenhouses, Costa Nursery, D.S. Cole Growers, Ellegaard, Four Star Greenhouses, Glass Corner Greenhouses, Greencare Fertilizers, Knox Nursery, Kube-Pak Corp., Lucas Greenhouses, Pindstrup, Pleasant View Gardens, Premier Horticulture, Quality Analytical Laboratories, Sun Gro Horticulture, and Welby Gardens, in addition to several propagation media companies. Use of tradenames does not imply endorsement, preference, or recommendation for any products listed or omitted.

Figure 1. There are many stabilized and loose media options. Three peat/polymer products are shown along the top. Bottom left shows a paper-wrapped Ellepot, bottom center is Oasis foam, and bottom right is a peat/perlite loose-filled tray.

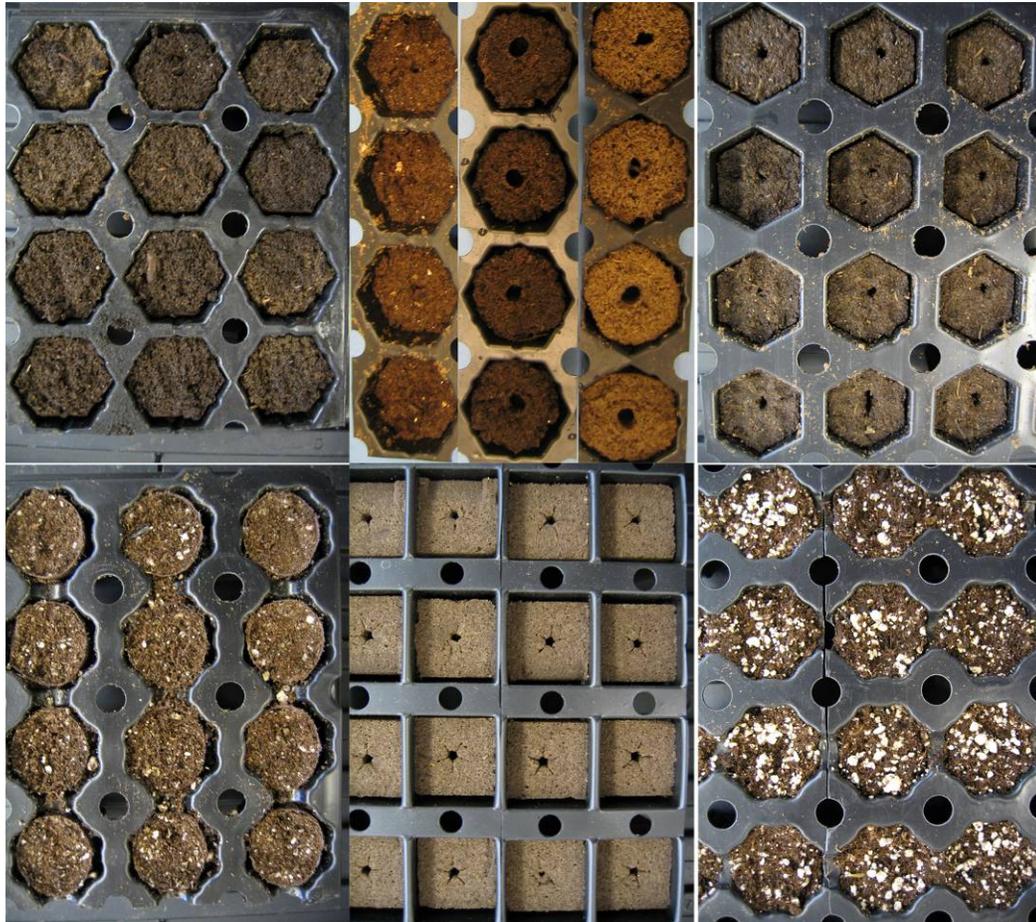


Figure 2. With stabilized media such as the paper-wrapped Ellepot, plants can be shipped or transplanted with fewer roots than would be required with loose media. This plant is 21 days old, from a 105-count tray.



Figure 3. Photos showing representative liners rooted in six commercial media products evaluated 33 days after sticking calibrachoa cuttings. The top three photos show Ellepots (left) and two peat/polymer products. The bottom three photos show root development in loose media. With sufficient time, and careful attention to irrigation, good rooting can be achieved in most commercial media.

