



Finding alternative growing methods for West Virginia's farmers is a large part of the research portfolio at West Virginia State University. In trials using a vertical hydroponic growing system for fruits, herbs and edible flowers, research has identified renewable and biodegradable substrates that will help farmers reduce production costs and improve the sustainability of hydroponic production.

Searching for a Renewable/Biodegradable Hydroponic Substrate for Crop Production

Who cares and why?

Hydroponics is an alternative method to producing crops inside a structure year-round or in locations with poor soil. Hydroponic substrates have traditionally used products that are not renewable or biodegradable, thus increasing production costs and reducing the sustainability of hydroponic production. West Virginia State University explored whether a renewable/biodegradable substrate can be identified for United States growers.

One option to reduce hydroponic production costs is to find a substrate that can be recycled or composted rather than paying a disposal fee. The traditional substrate uses a combination of perlite and coir, of which only coir is renewable or biodegradable. An alternative to perlite is parboiled rice hulls (PBH), a renewable side product from rice production. Kenaf has similar properties to coir and could be an alternative. No research had been done with PBH or kenaf in hydroponic production, so researchers are interested in determining if PBH and kenaf can be replacements for perlite and coir to create a U.S.-produced, biodegradable and renewable hydroponic substrate.

What has the project done so far?

In trials using a vertical hydroponics system with strawberries, herbs and edible flowers, comparing perlite-based substrates with PBH showed no statistical differences. However, the harvested weight was less for plants in PBH-based substrates, likely due to problems wetting PBH substrates and maintaining moisture during the trials. Plant establishment in PBH substrates was difficult since the substrate dried out between irrigation times, which caused the plants to dry out and often desiccate.

A second set of trials replaced coir with kenaf, as well as replacing perlite with PBH. Overall, the results supported using





kenaf as a coir replacement for most crops. Mixing kenaf with perlite or PBH was problematic and would require additional research. Substrates with PBH were again problematic in both establishments, but also identified production issues with edible flowers and strawberries. Strawberry production was almost non-existent in the PBH-based substrates, but this occurrence was due to the poor establishment of the plants when the PBH media dried out between irrigation times.

Impact Statement

- PBH can be used as a renewable replacement for perlite in hydroponic production. However, additional management is required during transplanting and production to maintain adequate moisture for the plants.
- Kenaf can be used as a replacement for coir in hydroponic substrates for most crops. Additional research is needed to find better ways to incorporate kenaf in substrates.

What research is needed?

More research should be conducted on methods to incorporate kenaf into perlite or PBH to create a consistent media. Additional research should identify ways to reduce the desiccation problems with the PBH media during early plant establishment.

Want to know more?

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Additional links: <http://www.umes.edu/ard/Default.aspx?id=46285>

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