

Technology Brief

TESTING THE USE OF GLASS AS A HYDROPONIC ROOTING MEDIUM

This technology brief describes the results from a study of the use of crushed recycled glass as hydroponic rooting medium. Tests were conducted to compare the performance of crushed recycled glass and an expanded clay aggregate on plant growth yields.

The Experimental System

To test the hypotheses that glass can serve as a viable rooting medium, 20 basil plants were grown in crushed container glass and 20 were grown in expanded clay aggregate over a period of 72 days. (Expanded clay aggregate is a commonly used hydroponic rooting medium). The glass used in the experiment was crushed, mixed-color recycled bottle glass. Glass particles ranged in size between 2.36 mm and 4.74 mm (200 sieve and 4 sieve)

A reflector and 1000 watt halide bulb were shifted over the growing area by an electrically powered chain over 20 minute intervals during daily 14-hour light periods. Two self-contained ebb and flow systems flooded the glass-grown and clay-grown plant trays for a period of four minutes, four times a day. One 20-gallon reservoir supplied each system.

System Testing

To monitor the experiment, the conductivity, pH, and temperature of the nutrient solution were measured weekly. Conductivity was measured to compare the rates at which each rooting medium used nutrients. pH was measured to monitor acidity and to compare nutrient uptake.



Key Words

Materials: Crushed bottle glass.

Technologies: Hydroponics.

Applications: Hydroponic rooting medium.

Abstract: Results of testing to determine the suitability of crushed bottle glass as a hydroponic rooting medium.

Visual descriptions of plant growth were recorded daily. Each system was photographed weekly to document conditions.

At harvest, plants were cut from their roots and dried to eliminate transient differences in moisture content. Dry weights were recorded.

Test Results

Mean dry weight of the glass-grown plants was 21.5 grams, with a standard deviation of 5.1 grams. Mean dry weight of the clay-grown plants was 21.9 grams, with a standard deviation of 6.8 grams. No significant ($p=0.05$) difference in dry weight was found between plants grown in glass and plants grown in clay aggregate.

Photos document that the clay-grown basil were considerably larger during weeks four through eight. During week five, aerators were added to the nutrient solution tanks and reflective paper placed at the plant bases. By week nine, the glass-grown plants had “caught up.”

While there appeared to be no significant difference in the pH between the clay and glass solution tanks, conductivity appeared slightly lower in the glass tank during weeks four through eight. This corresponds with differences in growth during those same weeks. As clay-grown basil grew faster during weeks four through eight, it also used more nutrients, reducing the conductivity of its solution.

Conclusions

The final plant growth results are somewhat surprising given the noticeable difference in plant growth during weeks four through eight. The difference in growth may have been due to one of three factors.

1. The glass grown basil may not have been receiving enough oxygen due to the smaller size of the particles. (Also the relatively flat surfaces of the glass particles allowed for better packing than the rounded surfaces of the clay).
2. Light may have permeated the glass and reached the roots.
3. The darker color of the clay may have absorbed more heat and may have provided the clay grown roots with additional warmth.

These three factors were likely reduced during week five when aerators were added to the base of the plants.

Some challenges exist when using glass in this application:

1. Glass is heavier than the expanded clay aggregate.
2. Glass clings to fingers, creating an inconvenience.
3. Glass fines can cause skin irritation.

While the experiment indicates that glass can serve as a hydroponic rooting medium, its use as such will not likely create a large market for crushed mixed-color cullet. It may, however find a niche market among environmentally minded hobbyists.

The results of the experiment also suggest that crushed glass will not negatively affect plant growth when used in gardening and landscaping applications, such as decorative pebbles for indoor bulb gardening, or gravel for garden paths.

Acknowledgments

This technology brief was prepared by the **Clean Washington Center**. The Clean Washington Center is the Managing Partner of the **Recycling Technology Assistance Partnership (ReTAP)**. ReTAP's mission is to advance industry's use of recycled materials through technology extension services. ReTAP is an affiliate of the national Manufacturing Extension Partnership (MEP), a program of the U.S. Commerce Department's National Institute of Standards and Technology. ReTAP is also funded by the U.S. Environmental Protection Agency and the American Plastics Council.

Report Dated: December 1995

Fact Sheet Issue Date: January 1996

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