Hydroponic Techniques

By Susan Camp

An NPR report in early November on the controversy between traditional organic farming methods and hydroponics, or growing plants without soil, sparked my interest in the topic. Hydroponic farming proponents lobbied to retain their "organic" classification from the National Organic Standards Board, while the organic farmers wanted the label "organic" removed from hydroponic farming because the traditional philosophy of organic farming revolves around the regeneration and health of the soil. The traditionalists lost the battle 8-7, and hydroponic techniques were declared organic.

Hydroponics traditionally has been defined as "growing plants in water", but today, various soilless media, such as peat, coir fiber, and bark-bases mixtures are used by many commercial and home growers. The key to success with hydroponics is the addition of 13 essential nutrients to the water. Plants obtain the elements oxygen (O), carbon (C), and hydrogen (H) from air and water, but the macronutrients nitrogen (N), phosphorus (P), and potassium or potash (K) and micronutrients, including calcium (Ca), magnesium (Mg), iron (Fe), and zinc ((Zn), among others, must be mixed with water to form the fertilizer solution. Nursery and garden center fertilizers for soil-grown plants do not provide all essential nutrients, as plants obtain many mineral elements from soil and compost. Some specialty nurseries carry hydroponic fertilizers, as do online and mail order companies.

The correct dilution rate of the water/fertilizer solution is crucial, as too much fertilizer can burn the plant roots, while too little can prevent plants from developing. The pH of the solution should be maintained between 5 and 6. Test kits can be purchased from pond and fish supply stores. The nutrient solution must be changed every two weeks because the growing plants deplete the nutrients. Nutrients are consumed at different rates, depending on the developmental stage of the plants.

Several types of hydroponic systems are available. You can build your own system, but ready-to-assemble kits are available for beginners and growers who aren't handy or interested in constructing their own systems.

The two basic types are water culture systems, which include the nutrient film technique, aeroponics, and the aeration methods, and aggregate systems, which use soilless media.

The nutrient film technique is used by many home growers. Holes in plastic troughs or tubes hold plants that are continuously bathed in nutrient solution. In the aeroponic system, plants are placed in holes in an enclosed A-frame. The nutrient solution is sprayed into the enclosure by a vaporizer, and the mist covers the roots. With the aeration method, plants are placed 1inch above the solution tray so their roots can reach the solution, while an aquarium air pump delivers oxygen. Gravel or vermiculite may be used to stabilize the plants in the tray.

Aggregate systems utilize sand, vermiculite, gravel, or other soilless media to support the plants while they are bathed in nutrient solution. A container with a valve at the bottom is used in the flood and drain method. The plant roots are flooded with nutrients for 20 to 30 minutes at

specific intervals, then the solution is drained off. Excess solution is collected and reused in all systems and discarded after the two-week period of use. Depleted solution can be used to water garden or house plants.

Home hydroponic systems can be used in small spaces, for container or balcony gardening, or where nutrient-poor soil or lack of a water supply make soil gardening difficult. Home gardeners can produce healthy, fresh vegetables and berries year-round.

Most commercially grown tomatoes are hydroponically produced, and we will likely see increases in cucumbers, peppers, berries, and lettuce grown using hydroponic methods. The controversy between soilless and soil farmers will continue, potentially leading to improved methods of organic production of fruits and vegetables.

Virginia Cooperative Extension (VCE) Publications 426-084 “Home Hydroponics” and 430-100 “The Basics of Fertilizer Calculations for Greenhouse Crops” provide detailed information hydroponics and fertilizer use.

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