Hobby Hydroponics

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1 Introduction/ Background

The objective of this book is to provide the reader with information on the basics of hydroponics that can be applied to a small-scale or hobby setup. I shall describe how to start your plants, to care for them and to choose from various hydroponic hobby units that may be most suitable for you. Details of the various hydroponic cultures and how you may construct them yourself or from where you may purchase ready-to-start units along with supplies and components are presented.

While the commercialization of hobby or "popular" hydroponics really became very active in the past 15 to 20 years, simple, self-designed systems were in use since the 1940's and 1950's. At that time the most common methods were gravel culture and water culture.

The bucket system of gravel culture was the most common where a small bed of gravel had a bucket attached to a hose joining them (Fig. 1). A bucket was filled with nutrient solution and then supported above the growing bed to allow the nutrient solution to flow into the bed flooding it from the bottom upward. This was a sub-irrigation gravel culture system. Within a period of 5 minutes when the bucket completely drains into the substrate void spaces of the bed, it is lowered

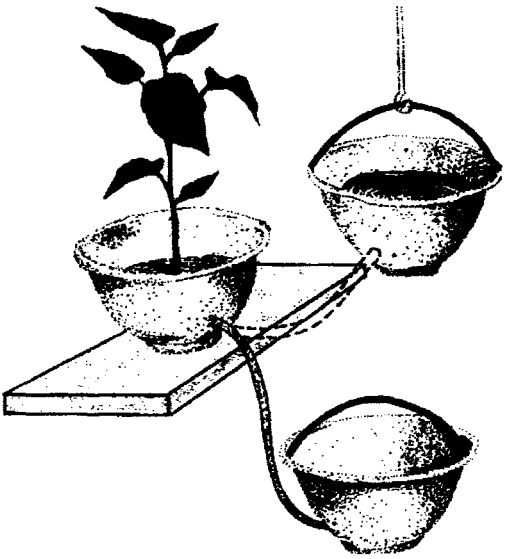

Figure 1. Bucket system of gravel culture.

below the level of the bed and the nutrient solution drains back to the bucket. This is repeated by hand a number of times a day depending upon the water demand of the plants that is determined by the temperature, light and stage of plant growth. While the system is very simple and works well, it requires that the hobbyist spend time during the day caring for his plants' irrigation needs.

A water culture system termed a "litter tray" system used a reservoir of nutrient solution in a rectangular tank with a tray of substrate located above the nutrient solution (Fig. 2). The most common medium was excelsior wood fibers, wood shavings, sawdust, dry straw, rice hulls or peanut hulls. The tray was 2 to 4 inches thick, constructed of wood with a wire mesh on the bottom to hold the substrate. Galvanized chicken wire of 1-inch diameter was coated with asphalt paint to prevent the release of zinc from its galvanized coating. The nutrient tank had a depth of 4 to 6 inches. The substrate would be watered when transplanting by hand for several days until the roots began growing

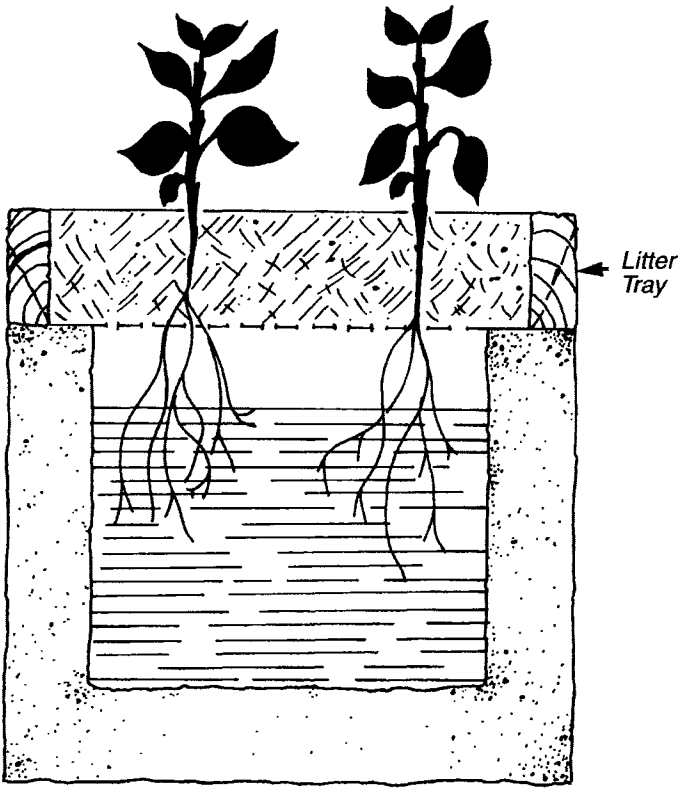

Figure 2. Cross-section of a typical water-culture bed.

into the nutrient solution below. Once the roots of the plants became established into the nutrient solution below, the solution level would be lowered gradually from 1 inch to 2 to 3 inches between the top of the solution and the base of the litter tray. This helped oxygenate the plant roots.

With the introduction of plastics, small pumps, timers and drip irrigation supplies, these similar designs could be modified to operate automatically. For example, using the principle of the litter tray, construct the tray of plastic sitting on top of a rigid plastic or fiberglass nutrient reservoir. The growing tray contains 2 to 4 inches of a substrate such as light-weight volcanic rock, Leca-clay pellets, Heydite-porous shale rock, perlite, sawdust, bark, or a mixture of rice hulls, peat or

coco coir. Small holes of about 1/4-inch diameter are drilled in the bottom of the tray. A plastic screen is placed on the bottom of the tray to prevent the substrate from falling through into the nutrient tank below. A small fountain pump plugged into a simple household time clock will operate pre-set irrigation cycles. The pump is attached to a half-inch diameter black polyethylene hose containing trickle tubes with irrigation emitters as it rises on top of the growing tray. The excess nutrient solution percolates through the perforated bottom of the growing tray back to the nutrient reservoir below.

One of the earlier automated hobby units was the "City Green" hydroponicums (Fig. 3). These units were available in the 1970's. They were the first commercial attempt at small hobby hydroponic systems. They were constructed of molded plastic having a nutrient reservoir in the bottom and an upper growing tray. Expanded clay or volcanic cinder rock was the choice of growing medium. A fish-aquarium air pump was placed in one corner of the growing tray where it was attached to a small polyethylene tube that entered the

Figure 3. "City Green" home hydroponic units.

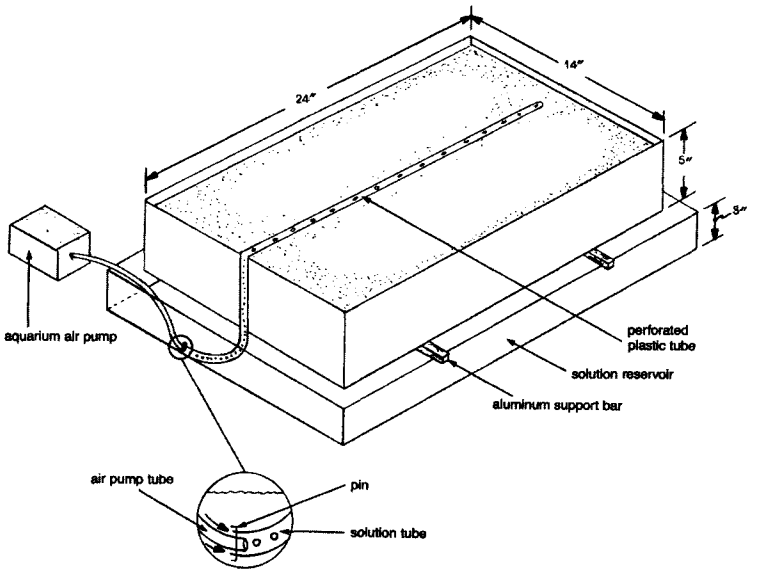

Figure 4. Components of an indoor unit. The use of air from an aquarium pump to move the nutrient solution up a tube to the growing tray.

nutrient tank below. This tube was inserted about one-half inch into a slightly larger diameter tube allowing a small space between the walls of the two tubes (Fig. 4). A pin held them together. As the aquarium pump forced air from the smaller tube into the larger one, the nutrient solution would be sucked into the tube together with the air bubbles. The solution with the air bubbles would rise in the larger tube to the surface of the growing tray where the tube was perforated to permit the nutrient solution to escape along with the air. The nutrient solution percolates through the medium and back to the reservoir underneath through the perforated bottom of the growing tray.

Perhaps one of the simplest hydroponic systems is the inverted bottle in a tray (Fig. 5). For the solution tray use a plastic flat of dimensions 10½ by 21 inches that has no holes. Place a bedding tray of 24 or 36 compartments in the flat, but remove one corner of the

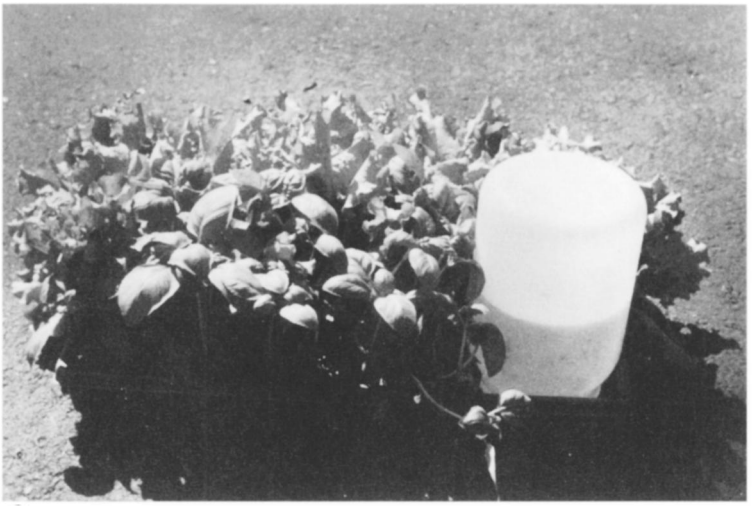

Figure 5. Inverted bottle in a nursery tray system for growing herbs and lettuce.

filler tray to allow room for placement of a 1-gallon plastic jar. It must have a large plastic lid. Drill a 1/4-inch diameter hole in the middle of the large cap and glue a split cork ring of 3 inches in diameter on the cap. The small gap will allow the flow of nutrients from the bottle into the tray as the plants take up the solution. The bottle is inverted in the bottom of the tray. As solution flows to the plants, the level is maintained by air entering the bottle through the hole in the lid permitting a small amount of solution to flow from the bottle.

Use vermiculite or perlite as a substrate. You can seed directly into the medium. Water the seeds for several days until germination occurs before placing the inverted solution reservoir in the tray. You can cover the tray with plastic for several days until germination starts, then immediately remove the plastic or the seedlings will get long and skinny from excess heat. This tray is good for baby lettuce and herbs or a combination of lettuce, beets, herbs, upland cress, arugula, mustards, mizuna, orach, chard, and spinach to form a mesclun mix.

Over the past 20 years with increasing interest in hobby hydroponics, many small-scale units have been developed to meet market demand (Fig. 6). Now it is very easy to visit one of over 750 hydroponic stores worldwide to purchase hobby units and all the supplies you will need to get started. It is estimated that today over 1 million households in the United States operate small hobby hydroponic systems. This, of course, has spread to almost all countries of the world. While I do not have the figures for other areas, we know by the number of hydroponic stores that exist in other countries that they must have many hobbyists using household units.

The objective of this book is to make you aware of the types of hydroponic hobby units that are available on the market today and the supplies you need to get started. I shall describe in detail some of the units available and suggest which crops they are most suitable to growing. This information I hope will assist you in your decision to enter into hobby hydroponics.

Hobby hydroponics will provide you with the benefits of pleasure, rewarding products, clean products and relaxation. You will achieve self-satisfaction by growing

Figure 6. Small home unit using a perlite-vermiculite medium.

your own "garden fresh" salads. These salads will be highly nutritious and free of pesticides. Nutritional analyses of hydroponic tomatoes and peppers have demonstrated increases of up to 50% in vitamin and mineral content. These included vitamins A, B1 (thiamin), B2 (riboflavin), B3 (niacin), B6 (pyridoxine), C and E. By using bioagents and natural pest control measures your product will be free of synthetic pesticides. You will also feel relaxed and relieved from everyday working stress as you attend your plants in the hydroponic garden. It will allow your mind to escape from your daily concerns as you train and care for your plants. This is especially helpful during the dark days of winter as you are looking after your plants under supplementary lighting.

Another aspect of the hobby is that there are many Web sites, links and e-mail addresses on the Internet to get assistance and new ideas for your hydroponic growing. You may ask questions or just wish to "chat" with other hobbyists growing hydroponically. There are hydroponic associations in most countries that have annual conferences and regular meetings in which you may participate to learn new things and meet new friends having similar interests as yourself. I describe some of these in the last chapter.

Table 10. Addresses and Web sites of Hydroponic Magazines.

The Growing Edge Magazine *www.growingedge.com*
P.O. Box 1027
Corvallis, OR 97339

These magazines also have extensive advertising by manufacturers and suppliers of hydroponic products to keep you informed of new developments.

References

Many books are available on hydroponics. Books are sold by hydroponic stores, garden centers and on the Internet such as *www.amazon.com* and w*ww.barnesandnoble.com*. The Hydroponic Society of America, The Growing Edge and Practical Hydroponics and Greenhouses also sell books.

AHA Conference Proceedings

Basic Hydroponics (2nd Ed.)—Ed Muckle

Beginning Hydroponics: Soilless Gardening—
Richard E. Nicholls

Cultivos Hidroponicos (5th Ed.) —
Howard M. Resh, PhD

Gardening Indoors—George F. Van Patten, et al.

Gardening Indoors with CO2—
George F. Van Patten, et al.

Gardening Indoors with HID Lights—
George F. Van Patten, et al.

Gardening Indoors with Rockwool—
George F. Van Patten, et al.

Greenhouses for Homeowners and Gardeners—
Natural Resource, Agriculture & Engineering
Science

Home Hydroponic Gardens—Peggy Bradley

Hydroponic Crop Production—Lon Dalton &
Rob Smith

Hydroponic Food Production (6th Ed.) —
Howard M. Resh, PhD

Hydroponics for the Home Gardener—
Stewart Kenyon

Hydroponic Gardening—Raymond Bridwell

Hydroponic Gardening—Lon Dalton & Rob Smith

Hydroponic Home Food Gardens—
Howard M. Resh, PhD

Hydroponic Hot House—James B. DeKorne

Hydroponic Lettuce Production—Dr. Lynette Morgan

HSA Annual Conference Proceedings

Hydroponic Tomato Production—Jack Ross

Hydroponic Tomatoes —Howard M. Resh, PhD