

There was a time when the sprouting of leaves and flowers was considered magic. However, scientists have been able to isolate many of the chemicals that contribute to plants' growth and development. Since these discoveries, gardeners have tinkered with methods of doing away with soil. The result has been hydroponics, growing plants in a solution of necessary nutrients. Many commercially prepared units are available, or you can make your own.

Hydroponics is defined as growing plants in a nutrient solution without using soil. Most methods of hydroponics use inert materials as a growing medium and as support for the plant. This is sometimes referred to as nutriculture, too.

The idea is to short-cut the complicated chemical exchanges that take place in ordinary soil and make the crucial nutrients directly available to plants. The basic nutrients required by plants include potassium, phosphorus, and nitrogen, plus several trace minerals. In gardening with soil, potassium, phosphorus, and the trace minerals are provided by the soil, and nitrogen is provided by decaying organic matter. Water dissolves the nutrients and supplies them to the roots of the plants. In hydroponics, all the nutrients are supplied to the plants by the solution, thus eliminating many chemical exchanges.

One way to make the nutrients directly available to plants is to set plants into an artificial aggregate soil, such as perlite, vermiculite, coarse sand, or gravel, and then add a specially prepared nutrient solution. Or the artificial soil can be eliminated and the plants grown by suspending the roots in the nutrient solution.

For the indoor or outdoor gardener, hydroponics can offer bonanza yields with maximum use of available space. With proper support, plenty of light, and conscientious care, a small pot can support a six-foot tomato vine. Most garden centers stock prepared nutrient mixes containing the critical elements. Or you can purchase the basic ingredients and mix your own nutrient solution; if the water contains chlorine, let the water stand overnight. Most of the chlorine will evaporate.

Use of a soilless medium is an ideal introduction to hydroponics, because washed sand, gravel, vermiculite, or perlite provides support for plants and allows air to penetrate properly. At the same time, the nutrient solution can wash around roots without eliminating valuable air.

Any container will do as long as it drains thoroughly. The container should be at least four inches deep. You might use flowerpots, plastic dishpans, or cat litter trays. Punch or drill holes in the bottom, if necessary, and cover the holes with cheesecloth, netting, or a piece of window screen, so growing materials will not be flushed from the container. Fill the container to within a half inch of the rim with perlite or other artificial soil, and tamp gently. Seeds should be started in a separate flat, then shifted to a hydroponic unit when seedlings are large enough to transplant easily without injury to the roots.

Big-time hydroponics

The greenhouse on the opposite page produces vegetables year round. Besides holding strawberries, peas, cabbage, lettuce, cucumbers, and cherry tomatoes, the greenhouse has room for marigolds, carnations, and sweet peas for cutting, as well as a host of houseplants. The

nutrient solution is automatically pumped into the growing medium in the plant trays two or three times a day. When the trays are full, the pump automatically shuts off and the solution drains back into the nutrient tank. The solution can be reused for about two weeks, and then it's time to throw it out and add fresh solution.

Small-scale hydroponics

Start with a simple hydroponic setup, and your interest will grow as plants flourish. Hydroponic systems are inexpensive but vary in the time they will require to put your mini-farm together.

The least expensive hydroponic system is also the easiest to operate. In fact, your children may become experts in hydroponics with this beginner's special. Fill an ordinary flowerpot with perlite. Add the young, sturdy plant, gently covering bare roots with the perlite. Pour a cup of nutrient solution through the perlite once or twice a day, depending on the strength of the solution, and catch the drainage in a bowl. The solution can be reused for a week. (Old solution may be used on the lawn or garden.) Although hydroponic gardening is not completely free of problems, you won't have to fertilize regularly to get healthy plants.

On a slightly larger scale, a junior-size hydroponic system can accommodate bougainvillea, tomato plant, chives, and lettuce. In the summer, it is perfect for the deck, porch, or any place where you have 1-1/2 x 3 feet of space to spare. The greenhouse top is optional--depending on unpredictable weather conditions in your area, insects, and your preferences. In fall and winter, the compact unit moves to a sunny window location indoors.

Made of kiln-dried redwood, the planters consist of two stacked boxes that fit snugly together. The sides are 2 x 12s attached to a half-inch plywood base. The lower compartments work as water/nutrient reservoirs; the uppers are filled with growing medium. Both compartments are lined with 20-mil vinyl.

The right side of the growing bed is boxed in to house the pump and to make adding nutrients easier. A cover with a half-inch grooved perimeter fits over the opening to prevent excessive evaporation. The nutrient solution is automatically pumped through twice a day.

If you're adventurous, try one of these other ways of applying the nutrient solution.