
25 - HYDROPONIC GROWING

PURPOSE

To build and maintain a simple hydroponic system, collect data, become familiar with the growth requirements of plants, and view hydroponics as a possible resource for increasing food productivity in areas with limited resources and rising populations

BACKGROUND

Hydroponics is the science of raising crops in a soil-free environment. It provides the grower with maximum control over the product.

MATERIALS

- 3 oz. styrofoam cups
- seeds - lettuce or basil are best in small systems
- 1 1/2 inch thick polystyrene or styrofoam board from hardware store
- perlite growing medium
- keyhole drill bit and drill or knife (Teachers may want to pre-cut the holes.)
- 10-gallon aquarium
- air pump
- plastic, aquarium tubing line
- air wand bubbler
- pH up and pH down
- pH test paper
- hydroponic fertilizer - all purpose blend

<[www.simplyhydroponic](http://www.simplyhydroponic.com)> has an excellent website, extensive directions and products

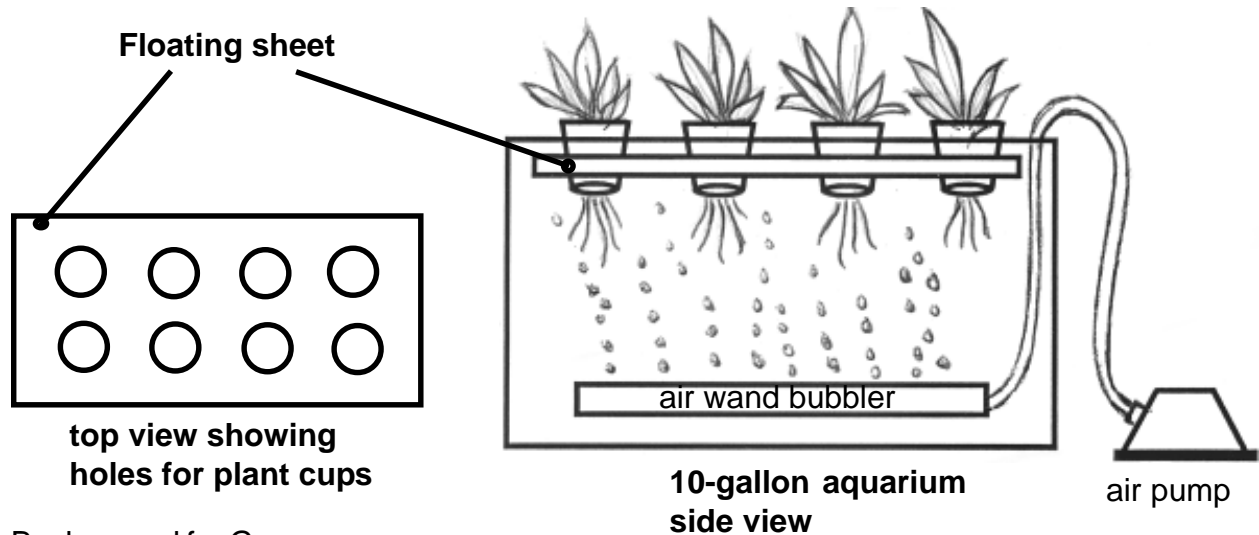
PROCEDURE

Plant seeds in 3 oz. styrofoam cup filled with perlite. Use a pencil to punch 2-3 drainage holes in the bottom of the cup. If the perlite falls through the holes, start over and put a piece of screen on the inside of the cup before you fill with perlite. You can also break pieces of another styrofoam cup as use as a chard to cover but not block the holes. Water thoroughly and place outdoors or in a sunny window.

After the seeds have germinated and the plants have a few leaves, you are ready to begin hydroponic gardening. Cut a polystyrene sheet or styrofoam board about 1 inch smaller than the inside of a ten gallon aquarium tank. The sheet should be free-floating but snug. Cut rows of evenly spaced holes with a knife or keyhole drill bit to accommodate the 3 oz cups - holes are about 2 inches in diameter. Be careful not to cut the holes so large that the cups will fall through the sheet.

Place an air wand bubbler in the bottom of the aquarium and fill the aquarium with nutrient solution (hydroponic fertilizer) as per directions on the package. Test the nutrient solution with pH test paper and adjust with pH UP or DOWN for a pH of 5.5 to 6.5. After the solution is thoroughly mixed, attach the air wand to an air pump using aquarium tubing. The tubing must be long enough to allow the air pump to sit outside of the aquarium. Place the plants in the polystyrene sheet.

Place the tank in window facing south or where it will get the best light if a grow light is not available. Do not leave the grow light on all night. Plants need a minimum of 4 hours of rest in darkness every night. Cover the sides of the aquarium with paper to control algae growth in the nutrient solution. You may want to cut a “window” flap in the paper for viewing the roots. Check the pH each week and add more water to replace what is lost through evaporation.



Background for Growers

There are 16 mineral nutrients that are essential for growth. The macronutrients are required in greater quantity than the micronutrients because not all minerals play an equal role in the development of plants. These are the macronutrient functions:

- calcium - promotes new root and shoot growth
- magnesium - used by chlorophyll to absorb light to make carbohydrates
- nitrogen - promotes development of new leaves
- phosphorus - aids in root growth and blooms
- potassium - aids in disease resistance and growth in extreme temperatures
- sulfur - contributes to healthy, dark green color in leaves

The micronutrients, boron, copper, cobalt, iron, manganese, molybdenum, and zinc, are normally acquired from soil, but must be supplied by hydroponic growers.

DATA

Students may set up additional aquaria and experiment by altering the pH, nutrients, light or temperature. Groups of students might want to compete to see who can grow the best lettuce in the least amount of time. Plant fertilizer is formulated to exclude some nutrients normally found in soil, it should not be used for hydroponic systems because it is incomplete.

	pH	Temperature	Plant height	Number of leaves
Week 1				
Week 2				
Week 3				
Week 4				
Week 5				
Week 6				

CONCLUSION

1. How is hydroponics different from agriculture?

2. Name one advantage and one disadvantage of hydroponics for the grower?

3. Why are growth nutrients divided into macro and micronutrients?

Date _____ Class _____ Name _____

4. List the requirements for photosynthesis and compare the limiting factors for plant grown in hydroponic systems with agriculture.

5. Plants feed by exchanging ions. As hydrogen ions are removed from the nutrient solution, the pH rises. Explain what happens to the pH of the nutrient solution as the plant grows?

6. How did altering the growth requirements affect plant growth?

7. What two Laws of Ecology relate to limiting factors?

8. What is the Green Revolution?

9. Put these stages of growth in order starting with dormancy: pollination, fruit production, fertilization, germination, and flowering.

10. Who is Norman Borlaug and what contributions has he made?
