Terraqua Column

Overview How does salt affect plant growth, like when we use salt to de-ice snowy winter roads? How does adding fertilizer to the soil help or hurt the plants? What type of soil best purifies the water? All these questions and more can be answered by building a terrarium-aquarium system that are connected together.

What to Learn What happens to the plants and animals when you put freshwater in the reservoirs? Saltwater? What happens to the plants and animals when you put different kinds of soil in the terraqua column? In this experiment, you will explore the relationship between land and water by constructing a terraqua colum (a terrarium and an aquarium in one). You will measure the effects of different types of water and soil on the ecosystem in the terraqua column.

Materials

- two 2-liter soda bottles, empty and clean
- two bottle caps
- scissors and razor with adult help
- Drill and drill bit with adult help
- tape
- thin rope for a wick, about 5 in long
- water, soil, and plants

Experiment

1. Cut bottle #1 below the shoulder (at the top, where it begins to curve). Start the cut with the razor, then finish with the scissors. This cut will give you two pieces.
2. Screw the cap on top.
3. Drill a hole in the center of the cap, while it is on the bottle. Set the two parts aside.
4. Cut bottle #2 below the hip of the bottle (at the bottom, where it goes from straight to curvy). Set the bottom piece aside.
5. Screw cap on the long part of the bottle.
6. Fill the reservoir of the first bottle with water.
7. Tie a knot at one end of the wick.
8. Put the wick through the cap with the hole (bottle #1).
9. Invert the section with the cap with the hole and set it in the reservoir. This is the chamber where the plants will go.
10. Finally, put the section with the cap with no hole on the very top of the terraqua column.
11. Create a data table.

Terraqua Column Data Table

Variable	Effect
Fresh Water	
Saltwater	

Reading

Water drips off the roof of your house, down your driveway, over your toothbrush and down the sink, through farm fields, and into rivers, lakes and oceans. While traveling, this water picks up litter, nutrients, salts, oil, and also gets purified by running through soil. All of this has an affect on fish and animals that live in the oceans. The question is, how does it affect the marine ecosystem? That's what this experiment will help you discover.

Land and aquatic plants are excellent indicators of changes in your terraqua system. By using fast-germinating plats, you'll see the changes in a relatively short about of time. You can also try grass seeds (lawn mixes are good, too), as well as radishes and beans. Pick seeds that have a life cycle of less than 45 days.

How to Care for your TAC (Terra-Aqua Column) EcoSystem:

- Keep the TAC out of direct sunlight.
- Keep your cotton ball very wet using only distilled water. Your plants and triops are very sensitive to the kind of water you use.
- Feed your triops once they hatch (see below for instructions)
- Keep an eye on plant and algae growth (see below for tips)

About the plants and animals in your TAC:

Carnivorous plans are easy to grow in your TAC, as they prefer warm, boggy conditions, so here are a few tips: keep the TAC out of direct sunlight but in a well-lit room. Water should condense on the sides of the column, but if lots of black algae start growing on the soil and leaves, poke more air holes! Water your soil with distilled water, or you will burn the roots of your carnivorous plants. Trim your plants if they crowd your TAC.

If you run out of **fruit flies**, place a few slices of banana or melon in an aluminum cup or milk jig lid at the bottom of a soda bottle (which has the top half cut off). Invert the top half and place it upside down into the bottom part so it looks like a funnel and seal with tape so the flies can't escape. Make a hole in the cap small enough so only one fly can get through. The speed of a fruit fly's life cycle (10-14 days) depends on the temperature range (75-80 degrees). Transfer the flies to your TAC. If you have too many fruit flies, discard the fruit by putting it outside (away from your trash cans) or flush it down the toilet.

You can't feed a **praying mantis** too much, and they must have water at all times. You can place 2-3 baby mantises in a TAC at one time with the fruit flies breeding below. When a mantis molts, it can get eaten by live crickets, so don't feed if you see it begin to molt. When you see wings develop, they are done fully mature. Adult mantises will need crickets, houseflies, and roaches in addition to fruit flies.

Baby **triops** will hatch in your TAC aquarium. The first day they do not need food. Crush a green and brown pellet and mix together. Feed your triop half of this mixture on the 2nd and the other half on the 4th day (no food on day 3). After a week, feed one pellet per day, alternating between green and brown pellets. You can also feed them shredded carrot or brine shrimp to grow them larger. If you need to add water (or if the water is too muddy), you can replace half the water with fresh, room temperature distilled water. You can add glowing beads when your triop is 5 days old so you can see them swimming at night (poke these through the access hole).

Exercises

1. What three things do plants need to survive?

2. What two things do animals need to survive?

3. Does salt affect plants? How?

Answers to Exercises: Terraqua Column

1. What three things do plants need to survive? (*water, soil, light*)
2. What two things do animals need to survive? (*food, water*)
3. Does salt affect plants? How? (*answers may vary according to student level. Students may simply say that plants wilt or die. Salt dissolves in water, causing water to be highly concentrated. Water then actually moves out of the plant, because it moves from areas of high concentration to areas of low concentration. Plants thus wilt.*)