TP 2 : Osmosis (Experiment to demonstrate Osmosis)

Objectives

The student will:

1) Observe the effects of different concentrations of salt solutions on potato cores.

2) Infer the relationship between weight loss and rate of osmosis.

3) Use a line graph to display data and draw conclusions.

In plants, osmosis is just as important. Plants with too little water will wilt. This happens when water moves out of the cells by osmosis. Without this water there is little pressure inside the cells and the plant can no longer support itself against the pull of gravity. However, after watering the plant, the cells become reinflated with water and the plant stands upright. The effect of water loss on plant cells is shown in the diagram below.

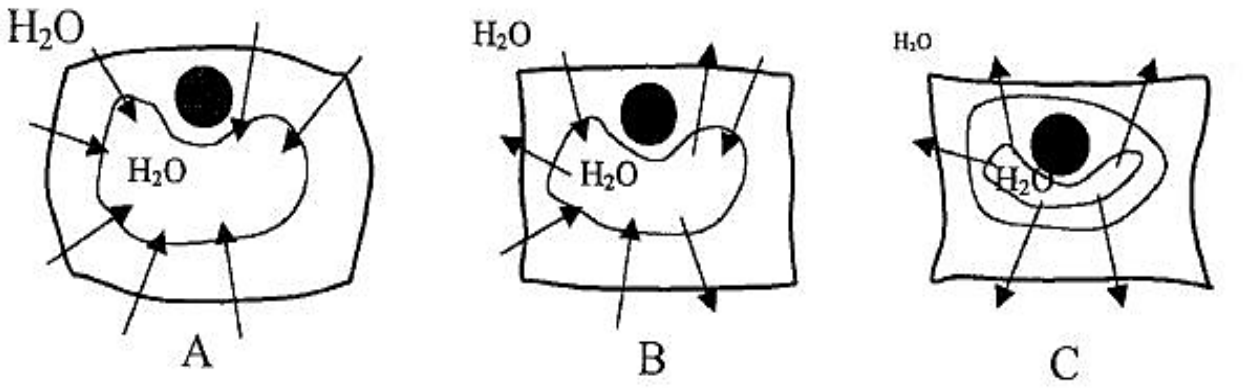


Figure 1. *A.* Plant cell placed in pure water. This cell will become inflated because the water outside the cell is at a higher concentration than the water inside the cell. As water moves in by osmosis the vacuole fills up and presses out against the cell wall. **B.** *The same cell in water equal to the concentration inside the cell.* This cell has no overall gain or loss of water because whatever moves out will be replaced by water moving in. **C.** *A cell placed in a salt solution.* This cell will lose water as the water moves by diffusion from higher to lower concentration. The cytoplasm of this cell has shrunken in a process called plasmolysis. (The size of the symbols for water represent the relative concentration: larger symbol = more water.)

In this lab activity you will observe the effects of osmosis on plant cells. you will use the weight of pieces of potato to see how much water moves in and out of cells in different salt solutions.

Materials (for each group)

potato · cork borer · knife or razor blade· beakers, baby food jars, or plastic cups · dropper · salt solutions (1%, 3%, 5%) · distilled water · balance · ruler.

Observing Osmosis in Potato Cells Procedure

1. Label 4 containers with your name and the following: distilled water, 1% salt, 3% salt, and 5% salt. 2. Using the cork borer, make 12 cylinders from your potato. Trim them with a knife

until they are 3 cm long. Caution: be very careful with the cork borer and knife. Always cut away from yourself. Make sure there is no peel left on the core. (If a cork borer is not available, you may also cut strips of potato using a knife. Try to make them all the same width.)

3. Place three cores in each of the containers and cover them temporarily. When you are ready, remove the cores and find the mass of each group of three using the balance. Mass all three of them together, not separately. You should mass them to the nearest 0.1 g. Record your data in the data table.

4. Immediately return the cores to the correct container and cover them with the correct solution. Place a lid on each container and set them aside for 24 hours.

5. After 1 hour, remove each set of three cores from their containers. Briefly blot them with a paper towel to remove excess water. Quickly find the mass of each group of 3 and record the mass in the data table.

6. Make observations of the texture, color and flexibility of the cores. Record these observations in the data table.

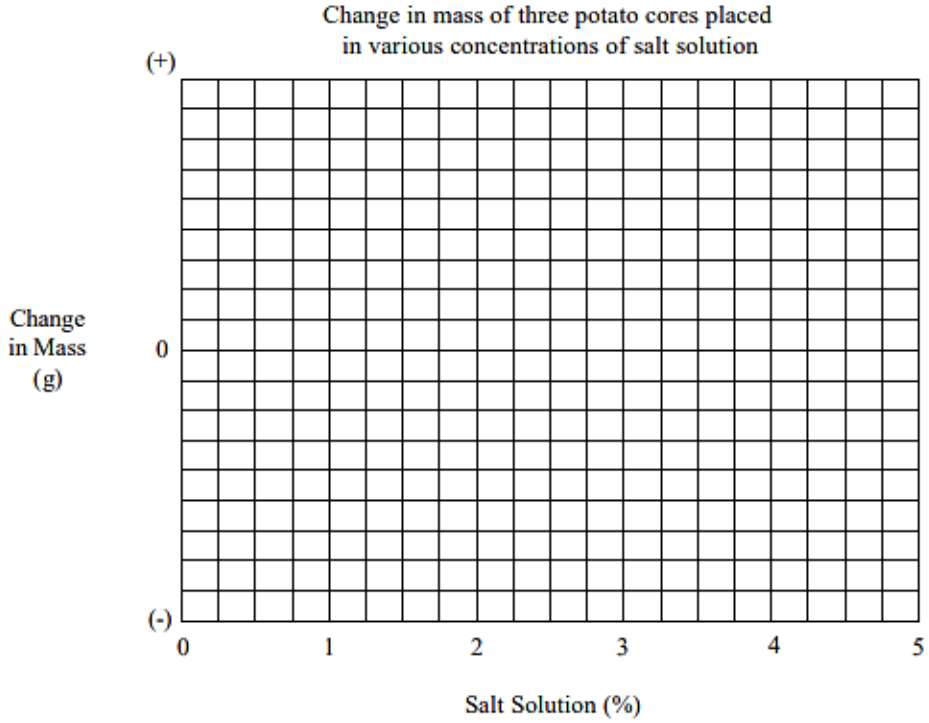
7. Determine the change in mass by subtracting. If the mass increased over the 1 hour, place a (+) in the data table next to the amount changed. If the mass decreased, place a (-) in the space.

8. Make a line graph of your data. The concentration of the salt solution is on the bottom because that is the variable you changed in the experiment. (Note: distilled water is 0% salt solution).

Data Table

Solution	**Begining Mass (g)** (3 cores)	**Ending Mass (g)** (3 cores)	**Change in Mass (g)** (give # and + or -)	**Observations**
Distilled water				
1% salt				
3% salt				
5% salt				

Graph



Questions

1. Which solution caused the potato cores to gain the most weight?

2. Was water moving into the potato cells or out of the cells in this case? How can you tell? Salt Solution (%) 0 1 2 3 4 5 Change in Mass (g) 0 Change in mass of three potato cores placed in various concentrations of salt solution (+) (-)

3. Which solution caused the cores to lose the most weight? Which way was the water moving in these?

4. Look on your line graph. Find the point where your line crosses the 0 line. This is the point where the cores do not lose or gain any mass. Follow down to the bottom axis to see the concentration of salt at this point. What is it?

5. Why do you think the workers at the grocery store spray water on the vegetables? Explain this using the term “osmosis.”