Water Movement in Plants

Materials

2 stalks of fresh celery (one with the leaves on)
1 carrot
red and green (or blue) food coloring
millimeter ruler
2 200 mL beakers
scalpel

Procedure

Part A - Water Movement in Stems

1. Using a scalpel, remove approximately 1 cm from the bottom of two celery stalks. Remove the leaves from one of the celery stalks.
2. Pour approximately 100 mL of water into a 200 mL beaker and add five drops of red food color. Immerse both celery stalks in the solution for 30 minutes and proceed to Part II of the lab.

a) Predict which celery stalk will show the greatest movement of dye up the stalk. Provide a reason for your prediction.

3. After the 30 minutes, place both celery stalks on paper towels and, using the scalpel, make three cuts in each at 1 cm intervals, starting 1 cm from the bottom of the stalks.

b) What evidence suggests that water has moved up the stalk?

4. Continue cutting the celery stalk until the dye can no longer be seen in the xylem vessels.

c) Using a ruler, measure the distance in millimeters the dye has moved in each stalk. Record your measurement. Express this as a ratio of the distance moved to the length of the stalk.

Part B - Water Movement in Roots

5. Cut off 2 cm from the lower end and 1 cm from the top of the carrot.
6. Put the lower end into a 200 mL beaker that contains 2 cm of water that has been strongly coloured with green or blue food colouring. Set the beaker and carrot aside for 24 h.
7. Observe the carrot and record any changes that have occurred.
8. Cut off 1 cm from the lower end and observe the cross section. Repeat at the upper end of the carrot. Compare the two cross sections and record your observations.
9. Choose a deeply stained region and cut a very thin cross section with a razor blade. Prepare a wet mount. Observe the stained cells in the microscope and describe their structure.
10. Use the razor blade to cut the rest of the carrot lengthwise through its core. Note the location of the stained cells.

Questions

d) Through what kind of tissue is the dye moving?
e) Explain how water moves up the stems of plants?
f) What evidence is there that water moved into the leaves?
g) *From your results*, what can you say about the role of leaves in transpiration?
h) Why do plants need to get water from the soil?
i) In which part of the carrot root do you think root xylem is located? How can you tell?
j) What evidence tells us that water is absorbed through the roots?