TRANSPIRATION EXPERIMENT

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OBJECTIVE:

To observe the transpiration pathway in a leek and parsley plant using different colour dyes mixed with water.

HYPOTHESIS:

When food colouring is added to the water, the mixture will enter the xylem vessels in the vascular bundle into the celery's stem. The mixture will then move by osmosis into the leaf's mesophyll cells, where it evaporates into the air spaces and finally diffuses out of the stomata into the air (it transpires out of the plant).

METHODOLOGY:

1.Depending on how many different plant types you are investigating and how many different colour dyes you are using, fill each one of the beakers with 220ml of water.I used 2 different plant types and 2 different colour dyes therefore I had 4 beakers/cups.

2. Add 3 drops of food colouring to each one of the beakers. Note: for more visible results avoid using green food colouring.

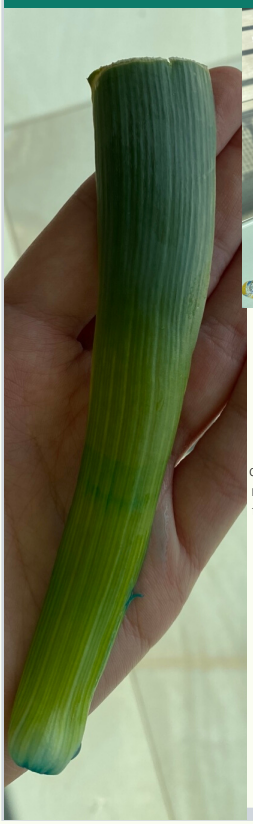
3. cut the bottom ends of all the plants using a knife (to help them absorb water better).

4. place the plants in the beakers of water and dye, make sure they are standing up right, if they are not and you do not have a clamp stand use anything you have around the house: I used wooden sticks meant for barbecues.

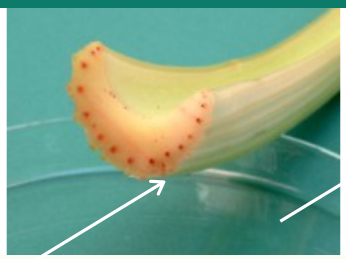
5. Leave the plant in the mixture for one hour and observe changes.

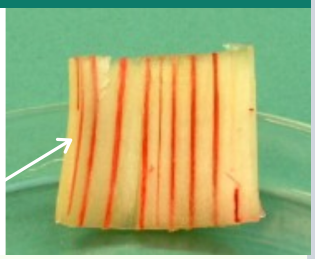
6. Leave for 24 hours (a day) and observe final results.

FINAL RESULTS:



-I'm sorry I accidentally forgot to cut the plants and take a picture of the cross-section so this is a picture I found online.





The dye is highlighting the xylem vessels, because it is the xylem tissue that moves water and other solutes from the roots up through the stem and into the leaves.In this case water and dye moved up the plant.

The water concentration in the beaker is higher than the concentration inside the plant, water moves into the plant by osmosis and passes along the cells following the potential gradient until it enters the xylem vessels.

Lignin deposited in the cell walls causes the xylem cells to die, they then become hollow (as they lose all their organelles and cytoplasm) or lumen and join end-to-end to form a continuous tube (lignin strengthens the plant to help it withstand the pressure of the water movement).Movement in the xylem only takes place in one direction: upwards.The water molecules are attracted to each other by hydrogen bonding – creating a continuous column of water up the plant (transpiration stream- transpiration causes water to be pulled up the xylem in the stem and roots in continuous flow).The water and dye mixture travels up the xylem vessels and into the leaves' mesophyll cells, evaporating into the air spaces and then transpiring through the stomata. Loss of water from the mesophyll cells sets up a water potential gradient which draws water by osmosis from surrounding mesophyll cells.In turn, the xylem vessels supply the mesophyll tissues with water.There are hundreds of stomata in the epidermis of a leaf most of which are located in the lower epidermis, this reduces water loss because the lower surface receives less solar radiation than the upper surface, each stomata allows the carbon dioxide necessary for photosynthesis to enter while water vapour evaporates through each one in transpiration.

This supports my hypothesis.

I did the experiment with two different types of plants: leek and parsley.I found that the colour change was faster in the leek indicating that transpiration happened faster and the dye was delivered to all parts of the plant faster.When adding water to the beaker, I used the same water for the two leek plants in different dyes and then refilled the measuring cylinder to fill up the two beakers for the parsley tests, this is not a fair test as I might have not kept the temperature of the water the same.If the water's temperature is higher, the water molecules have more KE and therefore they are moving faster and colliding more, this increases the rate of osmosis, the rate at which water enters the plant.This results in the rate of transpiration also increasing because evaporation and diffusion are faster at higher temperatures