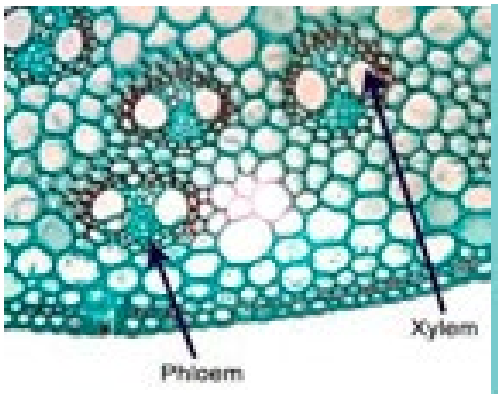
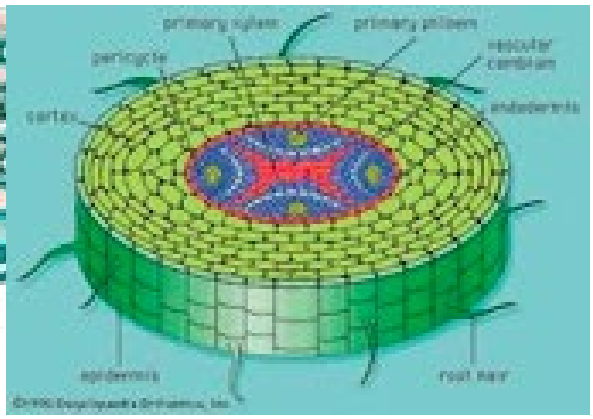
Investigation into the uptake of water by plants

Aim

This experiment looks into the role of the phloem and xylem and their role in the uptake of water. Within plants the xylem and the phloem can be referred to as vascular bundles. The function of the xylem is to transport water and dissolved materials up the plant, through the stem, to the leaf. The role of the phloem is to transport photosynthesis products through-out the plant. Water is essential for photosynthesis and the production of glucose for the plant, therefore the vascular bundles plays a major role in photosynthesis.

In this investigation in particular we will look at the role of the xylem. The xylem is adapted in many ways to maximize uptake of water. Xylem cells are dead with extra thickening made of lignin, which forms a long hollow tube, increasing the quantity of water reaching the leaves and veins. Xylem cells are located in the center of the vascular bundle and forms a cross like shape.





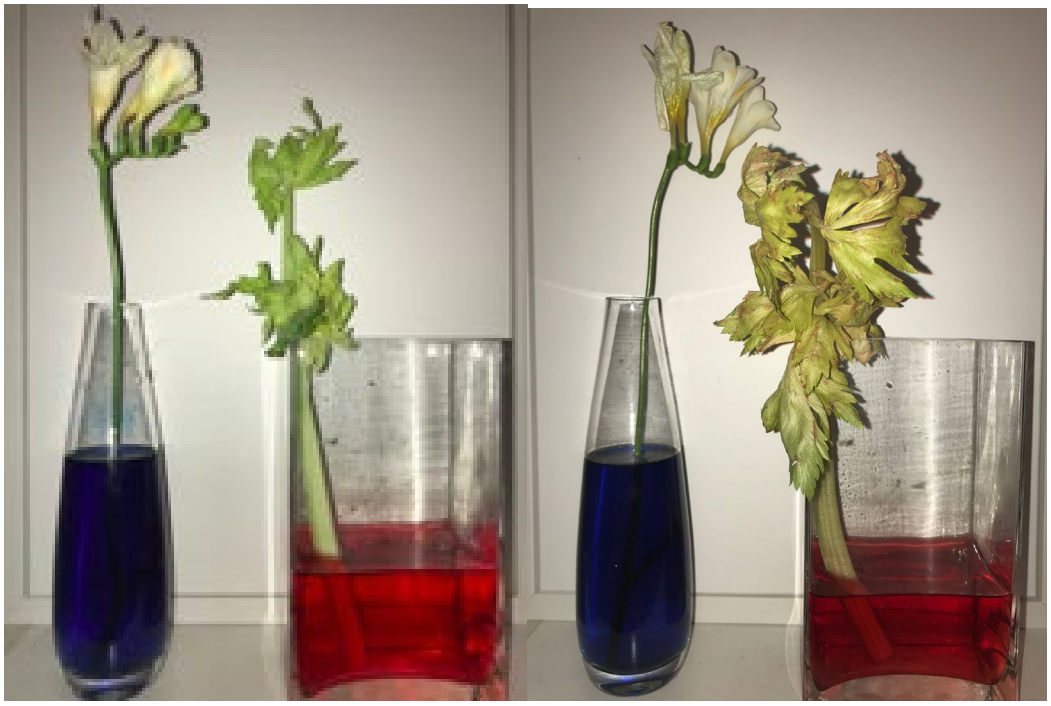
Hypothesis

I predict that the water will enter the plant at the bottom of the celery, and travel up the root through the xylem vessel, and into the veins of the leaves, leaving a colored tint on these parts. The water then will exit through small pores on the underside of the leaves, called stomata.

Methodology

1. Fill beaker with 300ml of water
2. Place 5 drops of food coloring in the water
   (not green, as the results will not be easily visible"
3. Cut the end of the stem of the plant with a knife
   (so that cells are fresh, and water uptake is maximized)
4. Place the plant in the beaker, standing upright
5. Leave for 24 hours and observe changes

Setup 24 hours after



Observation after 1 hour

After the first hour there was not a very noticeable difference in the pigmentation of the leaves, and stem, which suggests limited water intake within this time period. There was a slight tint at the base of the celery, which was submerged in the water, and where I predict that the water enters the plants. The flower showed little to no changes within the first hour.

Observation after 24 hours

After 24 hours, there was a significant difference in the plants. The celery had red streaks on the stem, and the base of the plant was a much darker red color than after 1 hour of observation. In particular the red dye highlighted small spots on the base of the plant, which I believe are the xylem vessels The veins on the leaves had a red tint and the rims of the leaves were also colored red.

With the flower the difference was less noticeable at the stem, as it has a much smaller stem, however it was pigmented blue by the dye. In the petals, there were clear blue streaks, however only present in two of the flowers.

Conclusion and Evaluation

Generally I think the experiment supported my hypothesis. Based on the coloration of the base, stem and leave of the plants, and understanding that the xylem transports water and minerals only up the plant, I think that I was correct in predicting the path that was taken by the water through the plant, and where it entered. The exit route of the water however cannot be fully proven as the stomata are too small to seen without a microscope, and the process of transpiration cannot be seen either, as it involves the release of water as vapour, which is transparent.

To improve this experiment, I could've added more food dye to see more clear results, as well as trying it with more than 2 types of plants to observe similarities and differences. Furthermore, I could also measure the displacement level of water, to better understand the quantity of water uptake for each plant.