

An Investigation of Plant Leaves ~ Which Plants Lose Less Water?

Land plants have special structures on the underneath surface of their leaves that can open and close to regulate other materials that flow in and out of the leaf. These special structures are called stomata. When the plant needs carbon dioxide, the stomata open, allowing the gas into the leaf. The stomata cannot remain open because water is lost out of the leaf during this process. Two guard cells, one on either side of each stoma, regulate the opening and closing of the stoma. As carbon dioxide moves into the leaf, oxygen, a waste product of photosynthesis, and water is released out of the leaf. This loss of water is called "transpiration." Only 1- 2% of the water brought from the roots is used during photosynthesis. The other 98-99% is lost through transpiration!

To show how this works, bring up two students to represent the guard cells of a stoma. Have them stand shoulder-to-shoulder, then step away from each other to show the stoma openhave them step back toward each other to show the stoma closed. Now bring up three more students, two to stand behind the guard cells, representing the water and the oxygen that is inside the leaf, and the other to stand in front of the guard cells, representing carbon dioxide waiting to get into the leaf through the stoma. Act out how the stoma opens to admit the carbon dioxide, and how the water and oxygen escape from the leaf at the same time. As the water is released from the leaf, the plant pulls in more water through its roots.

How are our native plants influenced by their surroundings? Many of our Southern Californian plants are designed to withstand certain hardships, such as drought conditions; they transpire less than some other plants. Take a walk, looking closely at different plants' leaves. There are clues as to which plants lose less water. Look for these characteristics:

- a. Smaller leaves transpire less
- b. Hard, waxy leaves transpire less (feel the leaves; stiff leaves are covered with wax)
- c. Light colored leaves transpire less (look for light green or grayish/whitish leaves)

To see that water is actually lost from the plants' leaves, during your walk, place a Ziploc bag over a very large leaf or a tree or shrub, and zip the bag closed. Revisit the bagged leaf in about two hours and you will see water trapped inside the bag during the process of transpiration.