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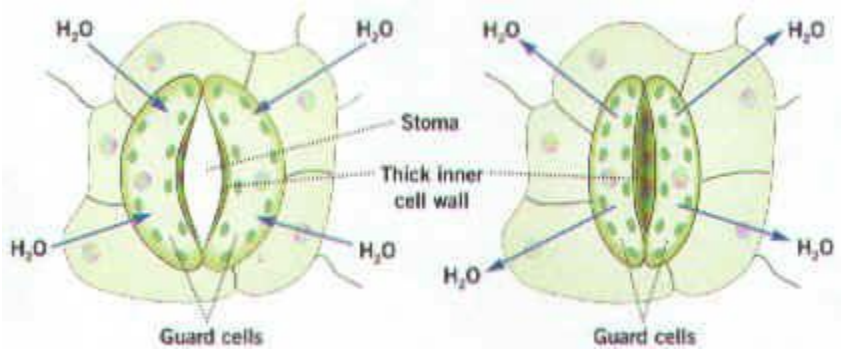
Counting Leaf Stomata



Introduction

Plants and animals both have a layer of tissue called the **epidermal layer**. Plants have special pores called stomata to allow passage of material. The **stomata** pores are surrounded on both sides by jellybean shaped cells called guard cells. Unlike other plant epidermal cells, the guard cells **contain chlorophyll** to do photosynthesis. This allows the cells to expand/ contract to open or close the stomata. Guard cells also close when dehydrated. This keeps water in the plant from escaping. The opening or closing of guard cells can be viewed in a microscope by adding different water concentration to the leaf tissue.

Most stomata are on the **lower epidermis** of the leaves on plants (bottom of the leaf). The number of stomata on the epidermal surface can tell you a lot about a plant. Usually, a high concentration of stomata indicates fast growth and wet climate. Lower concentrations of stomata indicate lower rates of photosynthesis and growth or adaptations for dry weather.

Purpose:

To view and compare the stomata from the leaves of several species of plant. THINK: Does the environment a plant grows in affect how many stomata it would have?

Materials:

3 leaves (1 from 3 different species), compound light microscope, 3 microscope slides, clear nail polish, transparent tape

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Procedure:

1. Obtain three leaves from different types of plants.
2. Paint a thick patch (at least one square centimeter) of clear nail polish on the underside of the leaf surface being studied.
3. Allow the nail polish to dry completely.
4. Tape a piece of clear cellophane tape to the dried nail polish patch.
5. Gently peel the nail polish patch from the leaf by pulling on a corner of the tape and "peeling" the fingernail polish off the leaf. This is the leaf impression you will examine.
6. Tape your peeled impression to a very clean microscope slide. Use scissors to trim away any excess tape. Label the slide with plant name.
7. Examine the leaf impression under a light microscope at 400X.
8. Search for areas where there are numerous stomata, and where there are no dirt, thumb prints, damaged areas, or large leaf veins. Draw the leaf surface with stomata.
9. Count all the stomata in one microscopic field. Record the number on your data table.
10. Ask two other groups for their results for the same plant leaf. Record all the counts. Determine an average number per microscopic field.
11. From the average number/400X microscopic field, calculate the stomata per mm^2 by multiplying by 8.
12. Follow procedures 2 - 11 with the other leaves.

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Data:

	Leaf 1	Leaf 2	Leaf 3
Name of Leaf			
Drawing in 400x (with a few stomata)			
Stomata in field 1			
Stomata in field 2 (other group)			
Stomata in field 3 (other group)			
Average Stomata in field			
Stomata/ mm2 (*8)			

Conclusion:

1. Which leaf had the most stomata? Why do you think this was so?

2. Explain, in detail, how guard cells open and close stomata?

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3. At what time of day would stomata be closed and why?

4. Why does the lower epidermis have more stomata than the upper epidermis of a leaf?

5. Define transpiration.

6. What two gases move in and out of the leaf stomata?

7. What does a larger number of leaf stomata indicate about the growing climate of that plant?

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8. Would you expect desert plants to have as many stomata? Why or why not?