STOMATAL DENSITY

Aim: To investigate the stomatal density of different leaves.

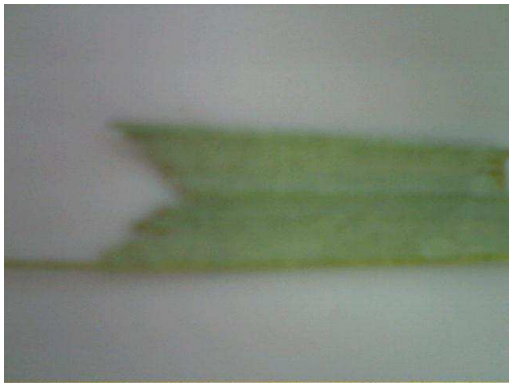
Apparatus:

- Light microscope
- Distilled water
- Water pipette
- Microscope slide
- Cover slip
- Scalpel
- Forceps
- Colourless varnish
- Ruler
- 4 different types of leaves:

1.

2.

3.



4.

Hypothesis:

The stomatal density of plants is dependant on their habitat. The key factor which the stomatal density will depend upon will be the water supply and the extent to which the environmental factors of each plant affect their transpiration rate.

Since the four leaves being investigated come from plants which vary to quite a large extent from each other in different aspects, I think there will be variations in their stomatal density, depending on how different their habitats are. Leaves whose habitats have very different water supply patterns will show great variation in their stomatal density.

Leaves 1 and 4 live in hot desert areas which lack in water supply. I therefore expect them to have low stomatal densities to minimise water loss.
Leaves 2 and 3 come from area rich in water supply and I therefore expect them to have a higher stomatal density than leaves 1 and 4 as they do not need to minimise water loss, but rather to maximise carbon dioxide absorption as it is a limiting factor for photosynthesis.

Method:

1. Polish a small part of a leaf (small enough for microscope examination) with a colourless nail varnish and wait for the nail varnish to dry.
2. Once the nail polish is dry, using a scalpel, remove the top layer of the leaf that has been polished. Then, using forceps, remove the dry top of the leaf where the nails vanish was polished. Place this on a microscope slide.
3. Using a pipette, put two drops of water over the leaf section and place a cover slip over it.
4. Set a light microscope to a power of magnification (40x)
5. Using a ruler, measure the area of the microscope lens.
6. Once the area of the lens has been calculated, place the slide under it.
7. Count the number of stomatas found under the lens.
8. Move to a different area of the leaf section and count the number of stomatas again.
9. Using the two figures obtained, calculate an average number of stomata per unit area. If the figures obtained are very different, obtain a third reading.
10. Repeat the steps above using three different leaves.

Results:

Stomatal density = Number of stomata/Area under observation

Leaf 1

Magnification – x40
Area of observation – 4.5 mm^2
Initial number of stomata counted – 25
Second number of stomata counted – 27
Average number of stomata: (25 + 27) / 2 = 26
Stomatal Density:
26/4.5 = *5.78 stomatas per mm^2*

Leaf 2

Magnification – x40
Area of observation – 4.5 mm^2
Initial number of stomata counted – 40
Second number of stomata counted – 40
Average number of stomata: 40
Stomatal Density:
40/4.5 = *8.89 stomatas per mm^2*

Leaf 3

Magnification – x40
Area of observation – 4.5 mm^2
Initial number of stomata counted – 36
Second number of stomata counted – 38
Average number of stomata: (36 + 38) / 2 = 37
Stomatal Density:
37/4.5 = *8.22 stomatas per mm^2*

Leaf 4

Magnification – x40
Area of observation – 4.5 mm^2
Initial number of stomata counted – 21
Second number of stomata counted – 19
Average number of stomata: (19 + 21) / 2 = 20
Stomatal Density:
20/4.5 = *4.44 stomatas per mm^2*

Conclusion:

As stated in the hypothesis, the stomatal density did show variation in the four different leaves, which corresponded to their habitats.

Leaf 1 and leaf 4 had the lowest stomatal density out of the four leaves. This is because these two leaves are usually found in hot deserts which are lacking in water supply. Leaf 4 is known as a desert leaf. It had the lowest stomatal density of all the leaves tested. A low stomatal density means less water loss because water loss in a plant occurs mostly through the stomatal pores in the leaves. Less stomatas means less transpiration and therefore a higher amount of water can be saved in the plant. Water loss must be minimised in climates which are lacking in water.

Leaves 2 and 3 have high stomatal densities as shown by the results. These two leaves are not desert leaves. Their habitats are usually rich in water. The plants therefore do not have to save a lot of water. A high stomatal density means the plants lose a lot of water and absorb a lot of carbon dioxide which is needed for photosynthesis. A higher concentration of carbon dioxide means a higher rate of photosynthesis. If water loss is not a limiting factor, then a high stomatal density is an advantage because more carbon dioxide is absorbed.

Evaluation:

The results proved to be quite accurate as they came to an agreement with the hypothesis made at the beginning of the experiment.

This experiment could have been made more accurate by counting more stomatas different parts of the leaf section being observed as it means a more accurate average stomatal density could be calculated.