Stomatal Density

Introduction

The stomata on the leaf surface open to allow carbon dioxide into the leaf for photosynthesis, and to allow oxygen to escape into the atmosphere. However, open stomata also allow water vapour to exit the leaf. To minimise water loss, plants close their stomata when they are experiencing water stress. Different types of plants may possess comparatively different quantities of stomata on the surface of their leaves. C3 plants live in temperate conditions and experience lower levels of water stress, while C4 plants live in hot and humid environments and experience higher levels of water stress.

Hypothesis

Predict, with a reason, which plant will have a higher density of stomata on their leaves (C3 versus C4)

Materials

- Leaf from a C3 plant
- Leaf from a C4 plant
- Clear nail polish
- Sticky tape
- Microscope slide
- Light microscope

Method

1. For each leaf, paint a small area on the underside of the leaf with clear nail polish and allow to dry
2. Place some clear sticky tape over the nail polish and gently press down on the leaf
3. Peel the sticky tape off the leaf to create a cast of the underside of the leaf
4. Stick the tape to a microscope slide and observe under the light microscope
5. Calculate stomatal density by dividing the number of stomata by the area of the field of view
6. Area (πr^2) can be determined by using the following diameters for the different magnifications:
   - 40× = 5 mm
   - 100× = 1.8 mm
   - 400× = 0.45 mm

Results

Group	1	2	3	4	5	**Average**
C3 plant						
C4 plant						

Discussion

1. Discuss why leaf casts were taken of the underside of the leaf (as opposed to the upper surface)

2. The following leaf cast was taken from a Venus fly trap. Deduce, with a reason, the likely habitat of this plant based on the stomatal densities of the C3 plant and C4 plant