

Stomata Density



Apparatus and chemicals:

Fresh leaves taken from the common ivy [*Hedera helix*] or spider plants [*Chlorophytum comosum*]

Clear nail varnish

Adhesive tape

Tweezers

Clear plastics drinks bottles with tops removed at the shoulders make ideal cloches for controlling the atmosphere around a plant before leaf impressions are made.

Microscopes with graticules

Reference: Gateway Science Suite Biology
Module B4c 'make leaf prints and examine stomata under a microscope'

Plants need to exchange gases with the atmosphere, and these gases pass in and out of the leaf via stomata. These tiny pores are readily visualised using nothing more than clear nail varnish and adhesive tape. Once lifted and stuck to a slide, their intricate structure may be explored under the microscope. It has been found that leaves of the common ivy plant [*Hedera helix*] provide a robust enough surface for this imprinting process to work well, as does the common 'spider plant'.

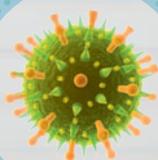


Procedure

- 1 The underside of the leaf is painted with clear nail varnish and set aside to dry. Several coats may be applied. Use several leaves in one painting session. Apply to the same part of the leaf epidermis as far as is practicable.
- 2 Once the varnish is dry, the painted area is held flat and the varnish layer is carefully peeled off using tweezers (or adhesive tape on one end of the varnish layer).
- 3 This imprint may then be applied to a microscope slide, and an investigation made. Drawings and magnification should be noted.

Questions and extensions

- 1 Examine the upper and lower surfaces, and record the stomata density on each.
- 2 Does the density vary over just one side?
- 3 Examine both sides of a leaf from a monocotyledonous plant [spider plant or grass].
- 4 Grow plants under clear domes taped to a bench or tray so the atmosphere around them may be controlled. Variables which could be investigated in this regime could be moisture levels; carbon dioxide levels and light flux. These changes may be slow to become noticeable so be prepared for some longer term investigative work in this brief.
 - The first could be investigated by having a small vessel of water present in the dome which was replenished before it all evaporated, or by including a desiccant in the dome such as silica gel
 - The normal concentration of carbon dioxide in the atmosphere is approximately 0.03%. This could easily be increased by reacting marble chips with dilute hydrochloric acid in a test tube under the dome.
 - The amount of light falling on the plant inside the dome could be altered by draping increasing layers of fabric over the dome.
- 5 Investigate the surface of succulents like cacti, or of needles from pines.



Further stretch-and-challenge here:

<http://aob.oxfordjournals.org/content/76/4/389.abstract>

This article abstract describes the use of stomata density studies of fossil leaves as a means of studying atmospheric composition in ancient times.

Annals of Botany 76: 389-395, 1995 - an article entitled Stomatal Density and Index of Fossil Plants Track Atmospheric Carbon Dioxide in the Palaeozoic by Jennifer C. McElwain and William G. Chaloner