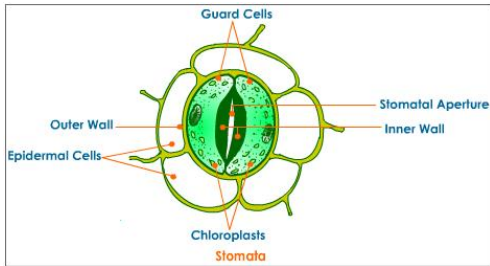


# Rhubarb Leaf Epidermal Cells

## ROLE.



**Rhubarb** is a cultivated plant in the genus *Rheum*. It is a herbaceous perennial growing from short, thick rhizomes. Historically, different plants have been called "rhubarb" in English and used for two distinct purposes. The roots of some species were first used in medicine. Later, the fleshy, edible stalks (petioles) of other species and hybrids (culinary rhubarb) were cooked and used for food. The large, triangular leaves contain high levels of oxalic acid making them inedible.

- The epidermis of the lower side of the rhubarb leaf is covered with small organelles called stomata through which they breathe. They do this through tiny openings in leaves called **stomata** (singular: **stoma**).
- **Stomata** open and close to allow the intake of carbon dioxide and the release of oxygen.
- The process of photosynthesis consumes CO<sub>2</sub> and generates O<sub>2</sub>, so in order for photosynthesis to occur the plant must have a way of letting CO<sub>2</sub> diffuse into the tissue of its leaves and excess O<sub>2</sub> diffuse back out. That is the role of the stomata.

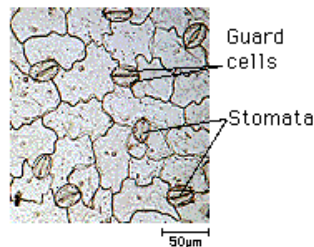
### Organelle – Epidermal Cells Structure & Function

#### Epidermal Cell Function

- There are two epidermal layers (upper and lower) but the lower one is generally of more interest because it usually contains stomata.
- The epidermis secretes a waxy cuticle, which serves to make the leaf waterproof and protect it from desiccation.
- As well as being impervious to water however the wax is also impervious to gases like oxygen and carbon dioxide.
- Because these gases need to move in and out of the leaf during photosynthesis, the lower epidermis has small pores called stomata (singular, stoma). Opening and closing these stomata is the function of the guard cells.

#### Epidermal Cell Structure

- The epidermal layer of leaves consists of flat cells that have a protective function. They are transparent (because they lack chloroplasts) so that light will be transmitted to the underlying photosynthetic tissues (palisade mesophyll and spongy mesophyll).
- Jigsaw shaped cells, packed closely together.
- They are covered by a cuticle, a waxy layer secreted by the cells
- There are no chloroplasts in epidermal cell



### Organelle- Stomata Structure and Function

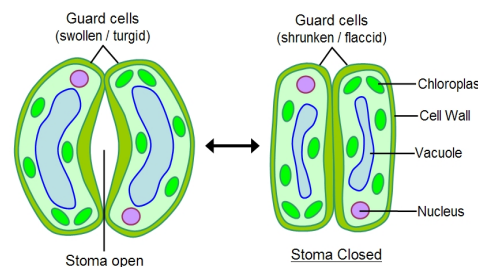
#### Stomata Function

- Stomata are breathing pores scattered over the leaf surface, and sometimes stem, that regulate the exchange of gases between the leaf's interior and the atmosphere. Stomatal closure is a natural response to darkness or drought as a means of conserving water. Each pore is controlled by the turgor of two guard cells (sides seen beneath pore's opening) on either side of it. When they are full of water the pore is open; when they lose turgor, the pore closes.
- The leaf epidermis has small pores, called stomata, which open up for photosynthetic gas exchange and transpiration. Stomata are scattered throughout the epidermis, but are typically more numerous on the lower leaf surface. Each individual stoma (pore) is surrounded by a pair of specialized epidermal cells, called guard cells. In most species, the guard cells close their stomata during the night to prevent water loss, and open their stomata during the day so they can take up **carbon dioxide** needed for growth of the plant

#### Stomata Structure

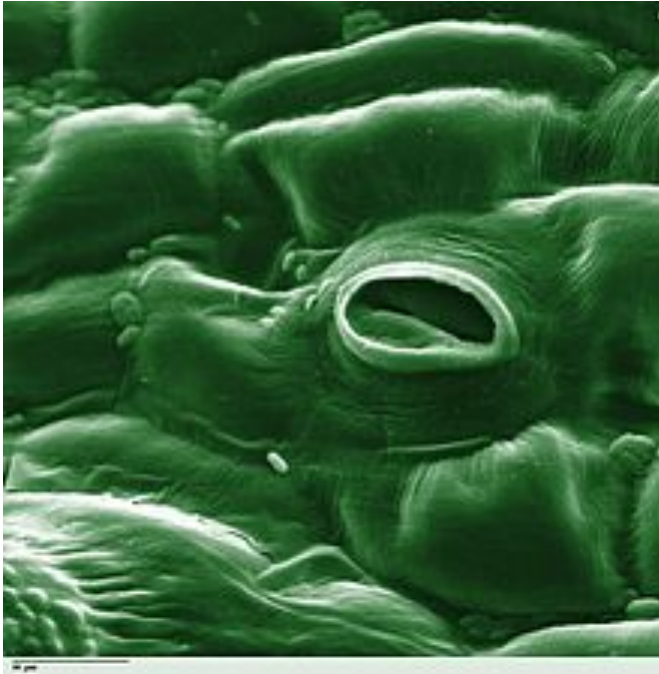
##### Stomata

- **Stomata** (sing. **stoma**) = pores in a leaf, mostly on the undersurface
- Each pore is surrounded by a pair of **guard cells**
- Guard cells can change shape to open or close the stoma



- Stomata are minute pores of elliptical shape, consists of two specialized epidermal cell called guard cells.
- The guard cells are kidney shape in dicotyledon and dumbbell shape in monocotyledon.
- The wall of the guard cell surrounding the pore is thickened and inelastic due to rest of the walls which are thin, elastic and semi-permeable.
- Each guard cell has a cytoplasmic lining, central vacuole. Its cytoplasm contains single nucleus and number of chloroplast.
- Guard cells are surrounded by modified epidermal cells, known as subsidiary cells or accessory cells, which supports in the movement of guard cells.

## Role of Stomata in Photosynthesis



- Stomata control the flow of gases in and out of leaves.
- During the day, when air temperatures rise and carbon dioxide levels are normal or above normal, the stomata open, allowing carbon dioxide to enter and photosynthesis to take place.
- Oxygen, a poisonous (to the plant) by-product of photosynthesis, exits through the stomata.
- At night, the glucose recombines with oxygen, releasing energy as the glucose molecule breaks back into water and carbon dioxide.
- The excess water exits through the stomata in a process called transpiration.
- So, stomata do not directly participate in photosynthesis.
- However, the stomata control the influx of carbon dioxide, a critical component of photosynthesis, and allow the excess oxygen to exit.
- Stomata also control the flow of water vapor out of the leaf, limiting water loss during drought and allowing excess water to exit.