

Plant structure – leaves, stems and roots



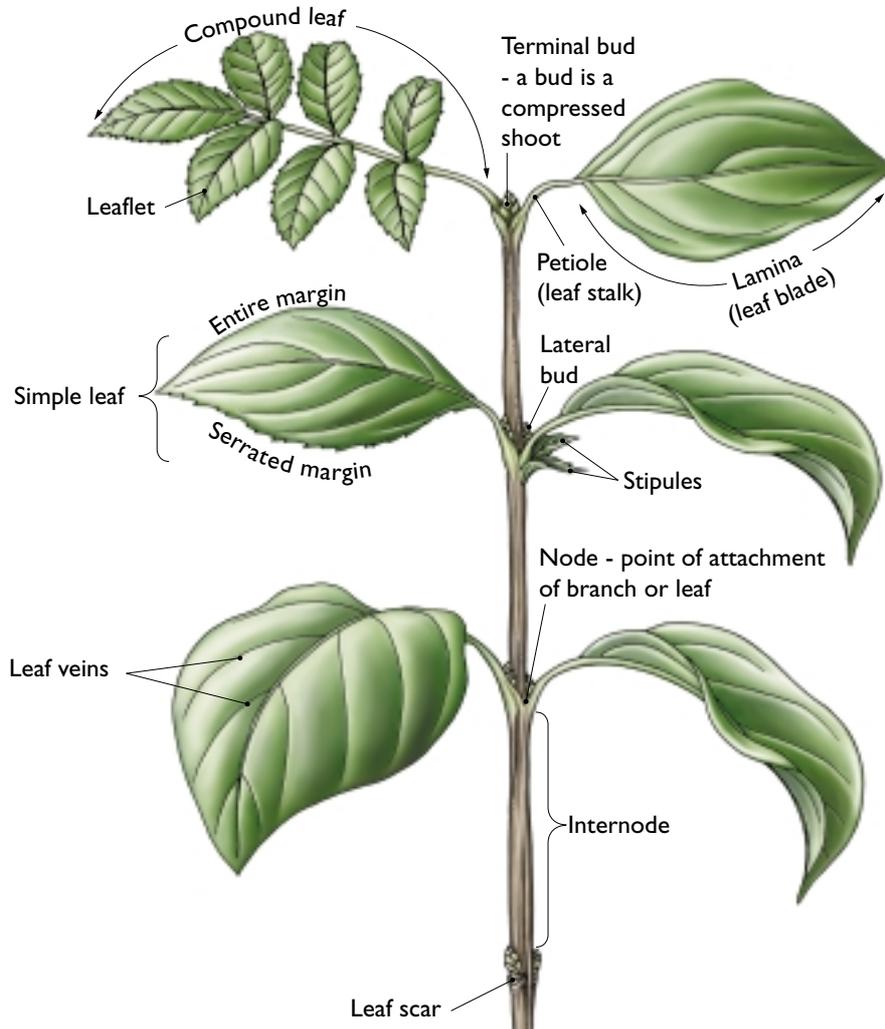
Kew information sheet B3

STRUCTURE

Leaves

Leaves come in a huge variety of shapes and sizes.

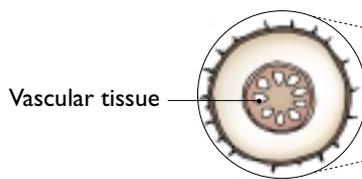
Many characters are used in classification and identification.



FUNCTION

Leaves are a plant's **food factory**. They are the main site of photosynthesis, where sugars are made from water and carbon dioxide, using sunlight energy.

Stems



Stems **support** the leaves, flowers and fruit.

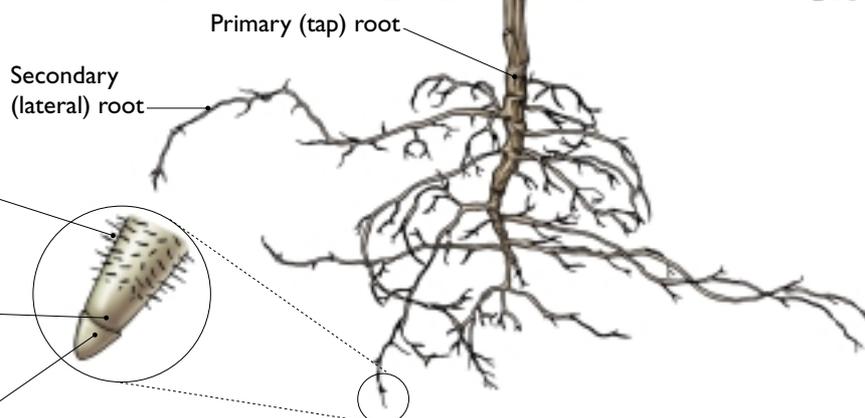
Stems **transport** water, minerals and sugars to leaves and roots.

Roots

Root hairs - provide huge surface area for absorption.

Root tip - area of cell division.

Root cap - protects and lubricates the growing root.



Roots provide **anchorage** in the soil.

Roots allow **absorption** of water and nutrients.

Roots allow **transport** of water and nutrients.

Adaptations of leaves, stems and roots

Leaves are the main site of photosynthesis – the production of carbohydrates using energy from sunlight. Photosynthetic leaves are usually thin, have a large surface area, and are arranged and angled on the plant for maximum light absorption. However, they can be adapted for other purposes including food and water storage, support and defence.

Food storage

Bulb
Onion (*Allium cepa*)



A very short stem axis with thick fleshy scale leaves.

Defence / water loss

Spine
Opuntia marnierana



Each leaf has become a woody and non-photosynthetic spine. The small surface area of the spine reduces water loss and protects the plant from herbivores.

Attraction

Floral bracts
Bougainvillea glabra



Leaves play the role of petals in attracting pollinators.

Carnivorous

Venus fly trap (*Dionaea muscipula*)

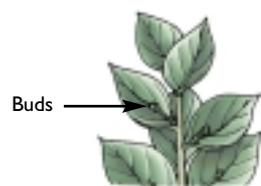


Leaves are modified to form an insect trap.

Stems tend to be above ground, erect and self-supporting. They usually end in a bud and bear leaves, lateral buds and reproductive organs. Lateral branches arise in the axils of leaves (the angle between leaf and stem). There are many variations on 'normal' stems. They may be underground, prostrate, or serve as storage, reproductive or support organs.

Photosynthetic

Phylloclad or cladode
Butcher's broom (*Ruscus aculeatus*)



Stem structure that looks and acts as a leaf.

Storage

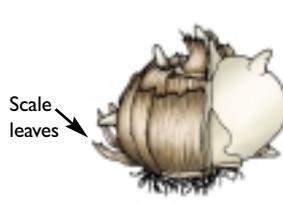
Rhizome
Ginger (*Zingiber officinale*)



Underground stem that grows horizontally below soil surface. Generally thick, fleshy or woody.

Storage

Corm
Crocus (*Crocus* species)



A short, swollen (vertical) stem of several nodes and internodes. Develops at or below ground.

Climbing/support

Tendrils
Grape vine (*Vitis* species)



Deciding whether a tendril is a modified stem or leaf can be difficult. Its position and presence/absence of reduced scale leaves give clues.

Roots tend to grow downwards, away from light and towards water. As a general rule, they bear neither leaves nor buds. Their primary roles are anchorage, absorption and transport. However, roots have adapted to fulfil a variety of other functions including storage, support and aeration.

Absorption

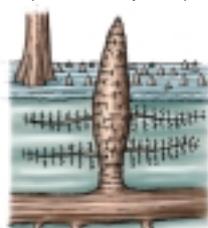
Aerial roots
Epiphytic orchid (*Oncidium* species)



Epiphytic plants grow on other trees using them for support. Their aerial roots rarely reach the soil so absorb water from rain or mist.

Aeration

Pneumatophores
Mangrove (*Sonneratia* species)



Air-breathing roots have internal air spaces connecting with the submerged roots.

Attachment

Ivy (*Hedera helix*)



Adventitious attachment roots grow from aerial stems, on the side in contact with a surface.

Support

Prop roots
Maize (*Zea mays*)



Aerial roots grow down from the stem into the soil.

Further information

Bell A. D. & Bryan A. (1993) *Plant Form: an Illustrated Guide to Flowering Plant Morphology*. Oxford University Press, Oxford.