

Chapter IV

The Leaves

Leaf

A leaf is a flattened lateral organ of a stem of vascular plant. It is the principal lateral appendages of stem. It has significant value for identification and photosynthesis and other physiological activities.

Characteristics of a leaf

- ❖ It is a thin dorsi-ventrally flattened organ borne above ground have distinct upper (adaxial) and lower (abaxial) part
- ❖ Composed of chloroplast and green in color
- ❖ Specialized for photosynthesis and other physiological activities
- ❖ Contains stomata which control gaseous exchange and transpiration
- ❖ Most leaves have distinctive adaxial (upper) and abaxial (lower) surface

Types of leaf

Foliage leaf: Green leaf having photosynthetic capacity.

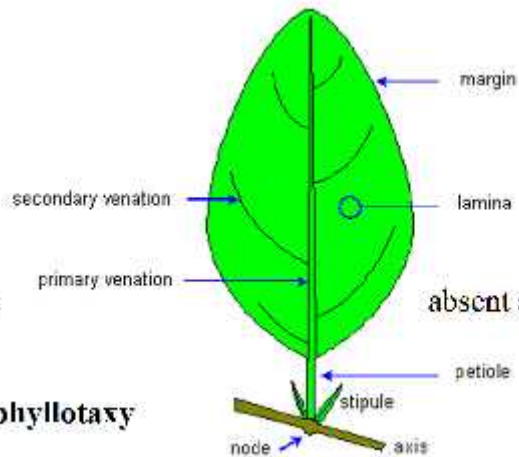
Cotyledon-Seed leaf, a significant part for supporting the embryo.

Parts of a leaf

Petiole: It is the stalk of leaf which is attached with stem

Leaf blade or lamina: The flattened part of the leaf which has mesophyll tissue

Stipule: The appendages of petiole, may be green in color and may be converted into tendrils



Sessile leaf: If the petiole is absent and only the lamina or blade is present.

absent and only the lamina or blade is present.

Arrangement of leaf or phyllotaxy

The arrangement of leaves on the stem or branch is called phyllotaxy which may be of the following types:

Alternate Phyllotaxy: Having one leaf in a node and leaves are arranged in spiral form e.g.

Opposite Phyllotaxy: Having pair of leaves in a node in opposite manner e.g.

Whorled Phyllotaxy: Having three or more leaves in a node e.g.



Type of leaves

- i) Dorsiventral leaf
- ii) Isobilateral leaf
- iii) Concentric leaf

On the basis of serration of lamina the leaves may be divided into two parts:

Simple leaf: The blade is not be serrated or divided.



divided into parts and the margin may

Compound leaf: The blade is divided into different parts and form leaf leaflet. However, the leaflet does not bear any bud at the base of the leaflet. The individual bladelike part of the compound leaf is called leaflets or pinnate.



Differences between simple and compound leaf

Serial Number	Simple leaf	Compound leaf
1	A simple leaf has a single blade. It may have incisions but these incisions are not deep enough to divide the blade into leaflets.	The blades of compound leaves are divided into distinct parts called leaflets.
2	An axillary bud is present in the axil of a simple leaf.	Axillary bud is present in the axil of a compound leaf as well, but the leaflets of a compound leaf do not have them.
3	Leaflets are not well developed and not separated from the rachis.	Leaflets are well developed and separated from the rachis.
4	Buds occur only on the axis of leaf.	Buds occur only on the axils of a complete leaf not in the axils of the leaflets.
5	Example: Mango, Guava	Example: Rose, Coriander, <i>Azadirachta indica</i> (Neem), <i>Moringa</i>

Differences between branch and compound leaf

Serial Number	Branch	Compound leaf
1	It does not bear axillary bud in its axil.	It bears axillary bud in its axil.
2	It contains terminal buds.	It does not contain terminal bud.
3	Axillary buds are present in the axil of leaf branch.	Axillary bud is absent in the axil of leaflet.
4	Nodes and internodes are present.	Nodes and internodes are absent.

Types of Compound Leaf

Pinnately compound leaf

When the leaflet originates from the rachis of the leaf is said the pinnately compound leaf
example rose, dum stick



Pinnately compound leaves are following types:

- i) Paripinnate e.g. Tamarind
- ii) Imparipinnate e.g. Rose
- iii) Unipinnate e.g. Rose
- iv) Bipinnate e.g. *Caesalpinia*
- v) Tripinnate e.g. *Moringa*

Palmately compound leaf

When the leaflets are originated or diverginated from a common point then the leaf is said to be a palmately compound leaf example



Types of Palmately compound leaf

- i) Unifoliate e.g. *lemon*
- ii) Bifoliate e.g. *Zornia*
- iii) Trifoliate e.g. *Feronia*
- iv) Quadrifoliate e.g. silk-cotton

Rachis: The main axis of leaf where the leaflets are borne, the branch of rachis is called rachilla.

Leaflet or pinnate: The individual blade-like part of the compound leaf which does not bear any bud at the axis.

Petiolule: The stalk of the individual leaflet

Leaf may be divided on the basis of duration of leaf

Deciduous: Leaves fallen at the end of the growing season do not persist the whole year i.e. not evergreen.

Evergreen: The plants bear leaves always i.e. always leafyness.

Persistent: Not deciduous functioning over two or more growing seasons

On the basis of shape leaves are classified as follows:

Entire: Smooth and devoid of toothing or crenation e.g. mango

Crenate: Margin is wavy toothed; dentate with rounded teeth e.g. *Bryophyllum*

Denticulate: Margin is finely toothed e.g.

Linear: Parallel margin without toothed

Dentate: When the blade is tooth shaped

Ovate: The blade is oval shaped e.g. China rose

Reniform: Kidney shaped blade e.g. *Centella*

Hastate: The blade is arrow-shaped

Deltoid: The leaf blade is triangular shaped

Dentate: toothed, such as *Castanea* (chestnut)

Entire: even; with a smooth margin; without toothing

Linear: parallel margins, elongated

Serrate: saw-toothed with asymmetrical teeth pointing forward, such as *Urtica* (nettle)

Tip

Acuminate: long-pointed, prolonged into a narrow, tapering point in a concave manner.

Acute: ending in a sharp, but not prolonged point

Cuspidate: with a sharp, elongated, rigid tip; tipped with a cusp.

Emarginate: indented, with a shallow notch at the tip.

Mucronate: abruptly tipped with a small short point, as a continuation of the midrib; tipped with a mucro.

Mucronulate: mucronate, but with a noticeably diminutive spine, a mucronule.

Obcordate: inversely heart-shaped, deeply notched at the top.

Obtuse: rounded or blunt

Truncate: ending abruptly with a flat end, that looks cut off.

Base

Acuminate: coming to a sharp, narrow, prolonged point.

Acute: coming to a sharp, but not prolonged point.

Auriculate: ear-shaped.

Cordate: heart-shaped with the notch towards the stalk.

Cuneate: wedge-shaped.

Hastate: shaped like an halberd and with the basal lobes pointing outward.

Oblique: slanting.

Reniform: kidney-shaped but rounder and broader than long.

Rounded: curving shape.

Sagittate: shaped like an arrowhead and with the acute basal lobes pointing downward.

Truncate: ending abruptly with a flat end, that looks cut off.

Venation

The arrangement of veins and veinlets in the leaf is known as venation. It is two types i.e. reticulated and parallel venation.

Reticulated venation: When the veinlets are irregularly distributed forming a network. It is two typed:

- i) Pinnate or unicastate type
- ii) Palmate or multicosted type

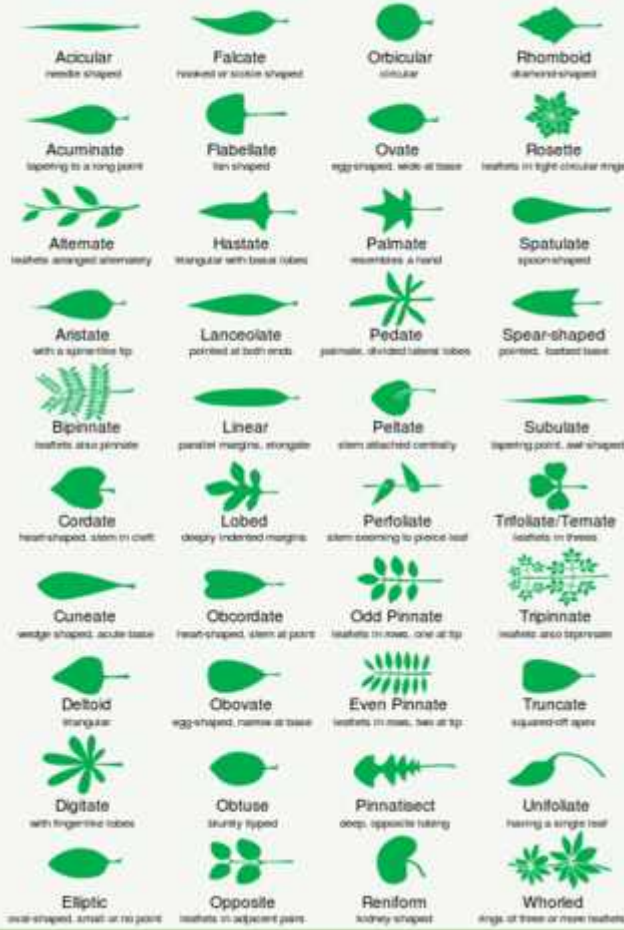
Parallel venetation: When the veinlets run parallel each other. The parallel venetation has following types:

- i) Pinnate or unicastate type
- ii) Palmate or multicostate type

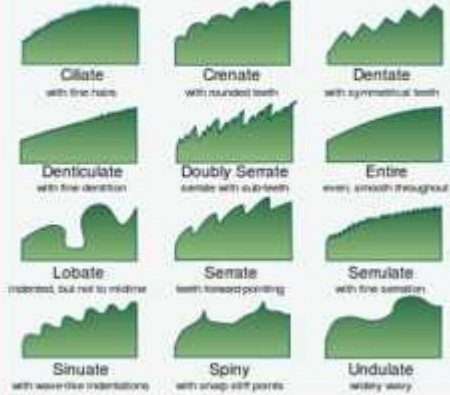
Functions of veins

- i) Vein gives mechanical strength to the leaves
- ii) Supply nutrients, water and food materials to different parts of the plant.

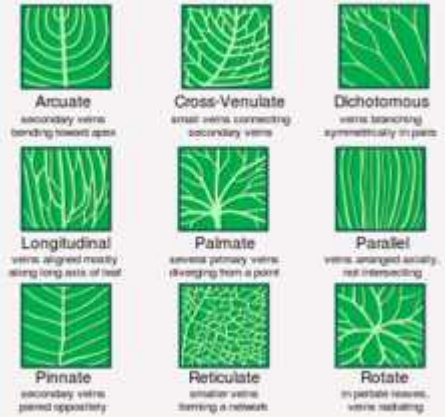
SHAPE & ARRANGEMENT



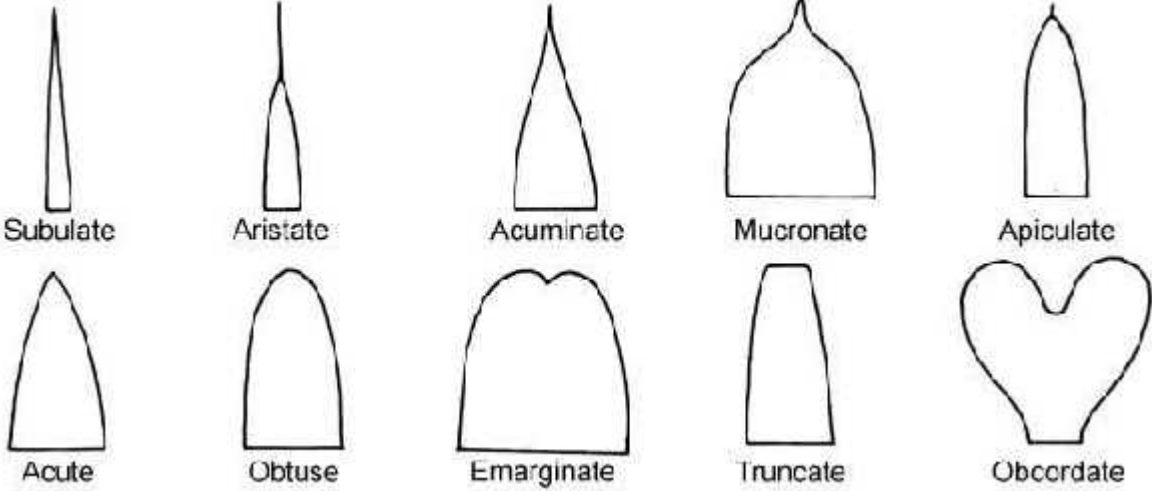
MARGIN



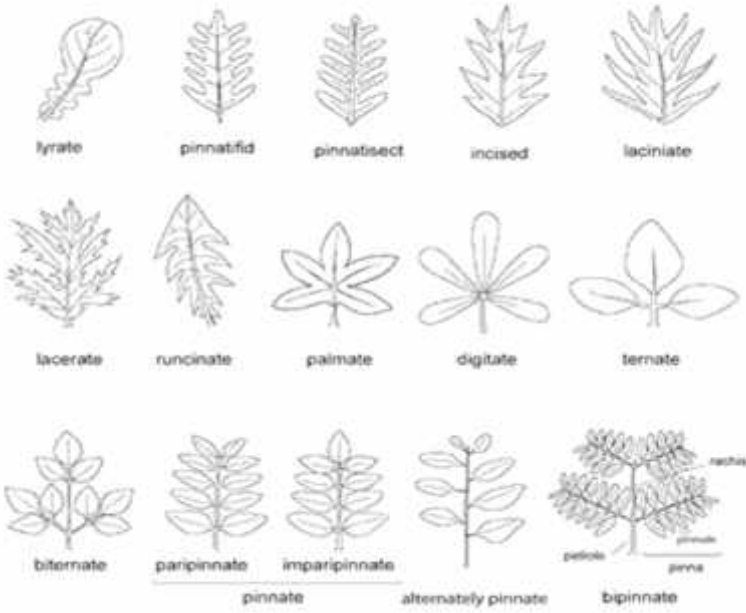
VENATION



LEAF APICES



Leaf shapes 2



Surface

Coriaceous: leathery; stiff and tough, but somewhat flexible.

Farinose: bearing farina; mealy, covered with a waxy, whitish powder.

Glabrous: smooth, not hairy.

Glaucous: with a whitish bloom; covered with a very fine, bluish-white powder.

Glutinous: sticky, viscid.

Papillate, or **papillose:** bearing papillae (minute, nipple-shaped protuberances).

Pubescent: covered with erect hairs (especially soft and short ones).

Punctate: marked with dots; dotted with depressions or with translucent glands or colored dots.

Rrugose: deeply wrinkled; with veins clearly visible.

Scurfy: covered with tiny, broad scale like particles.

Tuberculate: covered with tubercles; covered with warty prominences.

Viscid, or **viscous:** covered with thick, sticky secretions.

Hairiness

"Hairs" on plants are properly called trichome. Leaves can show several degrees of hairiness. The meaning of several of the following terms can overlap.

Arachnoid, or **arachnose:** with many fine, entangled hairs giving a cobwebby appearance.

Barbellate: with finely barbed hairs (barbellae).

Bearded: with long, stiff hairs.

Bristly: with stiff hair-like prickles.

Canescent: hoary with dense grayish-white pubescence.

Ciliate: marginally fringed with short hairs (cilia).

Ciliolate: minutely ciliate.

Floccose: with flocks of soft, woolly hairs, which tend to rub off.

Glabrescent: losing hairs with age.

Glabrous: no hairs of any kind present.

Glandular: with a gland at the tip of the hair.

Hirsute: with rather rough or stiff hairs.

Hispid: with rigid, bristly hairs.

Hispidulous: minutely hispid.

Hoary: with a fine, close grayish-white pubescence.

Lanate, or lanose: with woolly hairs.

Pilose: with soft, clearly separated hairs.

Puberulent, or puberulous: with fine, minute hairs.

Pubescent: with soft, short and erect hairs.

Scabrous or scabrid: rough to the touch.

Sericeous: silky appearance through fine, straight and appressed (lying close and flat) hairs.

Silky: with a depressed, soft and straight pubescence.

Strigose: with appressed, sharp, straight and stiff hairs.

Tomentose: densely pubescent with matted, soft white woolly hairs.

Felted-tomentose: woolly and matted with curly hairs.

Villous: with long and soft hairs, usually curved.

Woolly: with long, soft and tortuous or matted hairs.

Modification of Leaf on the Basis of Timing

Hysteranthous: developing after the flowers

Synanthous: developing at the same time as the flowers

Modification of leaf

Scale leaf- Leaves modified into scale e.g. onion

Phyllode- The petiole is modified into leaf structure

Cladode- The stem modified into leaf structure

Phyllary- A bract subtending the head in the member of Asteraceae family e.g. sunflower

Glume: A bract generally found at the base of spikelet in the Poaceae family.

Spathe: A boat-shaped bract found along with inflorescence spadix e.g. Arecaceae family