MORPHOLOGY OF FLOWERING PLANTS

THE LEAF

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Introduction

- **The leaf is a lateral, generally flattened structure borne on the stem.**
- **It develops at the node and bears a bud in its axil.**
- **The axillary bud later develops into a branch.**
- **Leaves originate from shoot apical meristems and are arranged in an acropetal order.**
- Their major functions are **photosynthesis and transpiration**.
- **Green leaves** of the plants are called **foliage leaves**.
- **Nongreen** are called **scale leaves or cataphylls.**
- The leaves containing spores or sporangia are called **sporophylls.**
- **Floral appendages** like sepals, petals, stamens, carpels are called **floral leaves**.
- Leaves borne by embryo in the seed are called **Cotyledons**.

LEAF (PHYLLOPODIUM) IS DIVIDED INTO 3 MAIN PARTS :-

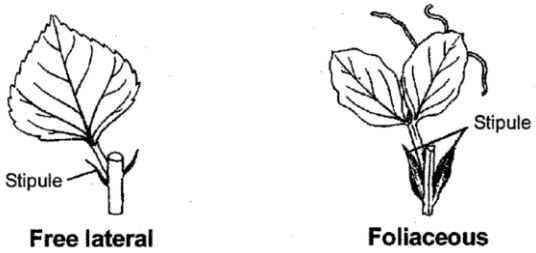
1. **Leaf base (Hypopodium) -** The part of leaf which is attached to stem is known as leaf base. Sheathing leaf base is found in monocots. In monocots. the leaf base expands into a sheath covering the stem partially or wholly. Pulvinus leaf bases are found in some legume plants. Swollen leaf base is known as pulvinus leaf base.
2. **Petiole (Mesopodium) -** The part of leaf connecting the lamina with the branch or stem is known as petiole. Petiole or stalk containing leaves are known as petiolate leaves and when petiole or stalk is absent then leaves are called sessile. In Eichhornia petiole swells up and in Citrus it is winged. The petiole helps hold the blade to light. Long thin flexible petioles allow leaf blades to flutter in wind, thereby cooling the leaf and bringing fresh air to leaf surface.
3. **Lamina (Leaf blade = Epipodium) -** It is a broad and green flattened part of leaf. Its main functions are photosynthesis and transpiration.

STIPULES :-

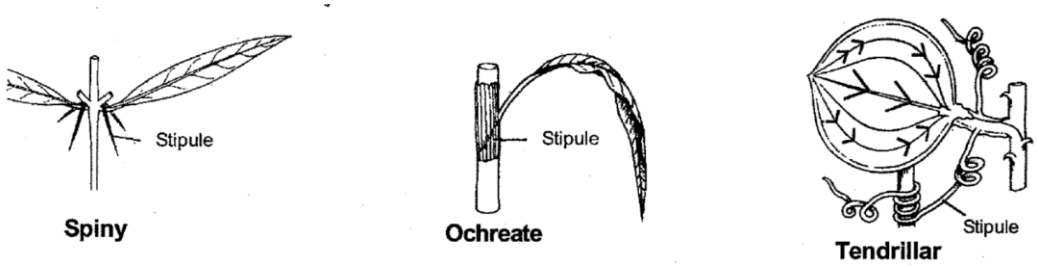
- Leaves of some plants have two lateral appendages on either side of leaf base, known as stipules. Leaf with stipule is known as stipulate leaf. eg. Fabaceae Leaf without stipule is called ex-stipulate leaf eg. Solanaceae. Liliaceae.

STIPULES ARE OF VARIOUS TYPES -

1. **Free lateral -** They are independently present on both sides of leaf base.
   Eg. Hibiscus rosasinensis (China rose).
2. **Foliaceous -** These type of stipules are leaf like. Eg. :- Pea



3. **Spiny -** Stipules modified into spine like structures. Eg. Zizyphus (ber)
4. **Ochreate -** When both stipules of a leaf combine together and form a tube like structure, then it is called ochreate. Eg. Polygonum
5. **Tendrillar -** Stipules are modified into tendrils like structure. Eg. Smilax



Types of Leaves -

Phyllotaxy:

It is the is the pattern of arrangement of leaves on the stem or branch. It is of following types

(i) **Alternate or spiral:**

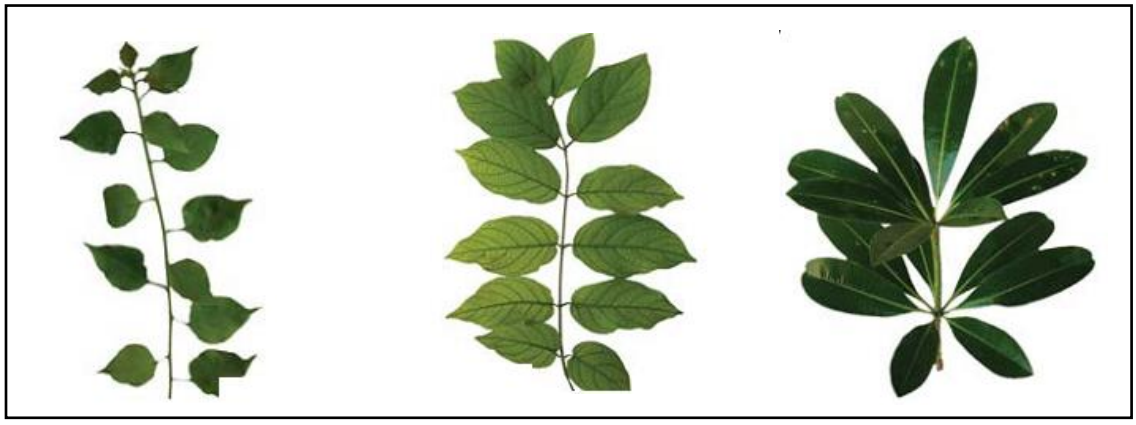
- **A single leaf arises at each node in alternate manner** and form two alternate rows (distichous) or three (tristichous) or more (orthostichous) vertical rows of leaves. **e.g. China rose, mustard, sunflower.**

(ii) **Opposite:**

- **A pair of leaves arise at each node and lie opposite to each other**. It is of two types.

(a) **Decussate:** The leaf pair formed at successive nodes is at right angles to the first one. **e.g. Calotropis.**

(b) **Superposed:** Leaves of the successive nodes lie in the same plane so that only two rows are formed on the stem. **e.g. Guava.**



(A) (B) (C)

Fig: Different types of phyllotaxy: (a) Alternate (b) Opposite (c) Whorled

(iii) **Whorled: If more than two leaves arise at a node and form a whorl,e.g. Oleander (Nerium), Alstonia.**

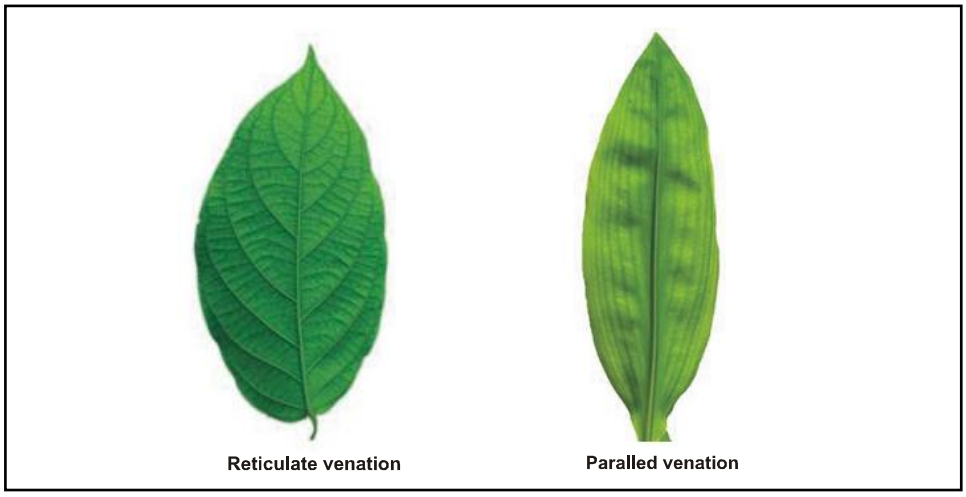
Venation:

The arrangement of veins and veinlets **in** the lamina of a leaf is called venation. It is of two types:

(i) Reticulate (ii) Parallel

(i) **Reticulate:** The veinlets are irregularly distributed in lamina and form a network. **e.g. Dicot plants.**

(ii) **Parallel :** The veins run parallel to one another and reticulations are absent. **e.g. Monocot plants.**



Note:

- **Reticulate venation is exceptionally found in the leaves of some monocot plants e.g. Smilax, Allocasia, Dioscorea.**
- **Some Dicot plants bear parallel venation in leaves e.g. Calophyllum, Corymbium, Eryngium.**

Types of leaf:

(i) Simple leaf:

- **A leaf is said to be simple, when its lamina is entire or when incised, the incisions do not touch the midrib. e.g. Banyan, Mango.**

(iii) Compound leaf:

- **When the incisions of the lamina reach up to the midrib or** tip of **petiole breaking it into a number of leaflets, the leaf is called compound. e.g. Pea.**
- **A bud is present in the axil of petiole but not in the axils of leaflets of compound leaves**.

Differences between Simple leaf and Compound Leaf		
S.N.	**Simple leaf**	**Compound leaf**
1	The lamina does not differentiate into leaflets.	The lamina differentiates into two or more leaflets.
2	The base of the leaf may have stipule.	The stipules may occur at the base of the whole leaf.
3	It may be borne in one or more planes.	Leaflets of compound leaf are always borne in one plane.
4	Simple leaves are produced on the stem in an acropetal succession.	Leaflets of a compound leaf develop almost simultaneously.
5	A bud lies in its axil.	A bud lies in the axil of the whole leaf but the individual leaflets do not bear axillary buds.

They are of two types

(1) Pinnately compound leaf **(2) Palmately Compound leaf**

(1) Pinnately compound leaf: A number of leaflets are present on a common axis, the rachis, which represents the midrib of the leaf as in E.g. Neem.

(2) Palmately compound leaf:

- **The leaflets are attached at a common point, i.e., at the tip of petiole, as in silk cotton.** like the finger of palm. **E.g. Cleome gynandra, Silk cotton.**

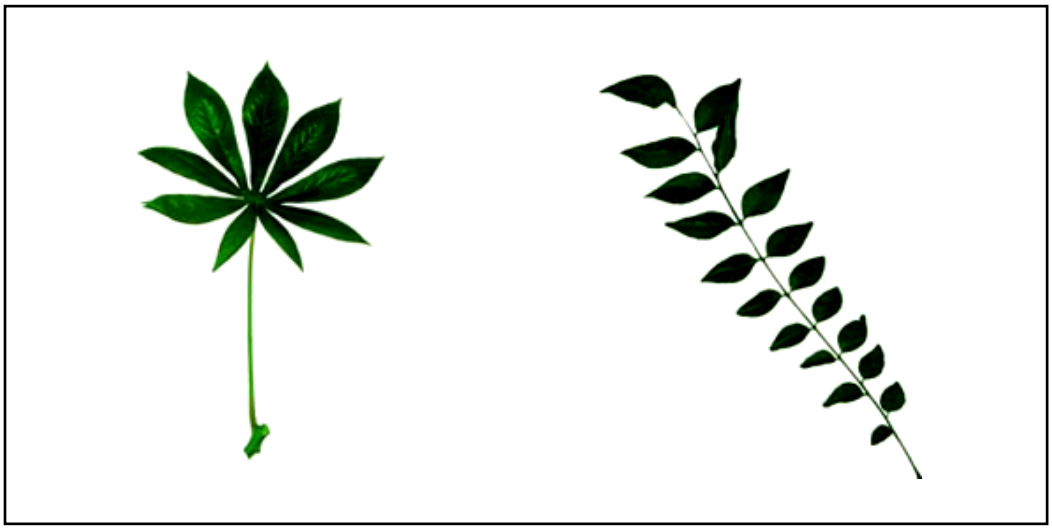


Fig. palmately compound leaf Fig. pinnately compound leaf

Differences between Pinnately compound leaf and Palmately compound Leaf		
S.No.	**Pinnately compound leaf**	**Palmately compound leaf**
1	Leaflets occur in two rows.	All leaflets are clustered together.
2	Leaflets are borne on an elongated axis.	Leaflets are attached to a common point.
3	A joint is not present between the leaflet and its axis.	A joint is usually found between the leaflet and its point of attachment.
4	It show feather like outline.	It possess palm like appearance.
5	Leaflets bearing axis is a continuation of petiole or a branch of midrib.	Leaflet bearing point represents the tip of petiole.

MODIFICATION OF LEAVES

When leaves are' modified into different structures then it is called modification of leaves.

(1) **Leaf tendril-** In some plants whole leaf is modified into a wire like structure which is called leaf tendril. Tendril helps is climbing. Eg. Lathyrus aphaca (wild pea) → Peas.

(2) **Leaf spine -** Leaves are modified into pointed spines. Eg. Opuntia, Cacti, Argemone.

(3) **Leaf pitcher -** Leaves of some plants are modified into pitcher shaped structure. Eg. Nepenthes (pitcher plant) (Only lamina is modified into pitcher). Water is stored in the

pitcher of Dischidia (complete leaf is modified into pitcher). In Nepenthes insectivorous pitcher while in Dischidia- non insectivorous pitcher is formed.

(4) **Leaf bladder -** In some plants, leaves are modified into bladder like structure Eg. Utricularia (bladder wort)

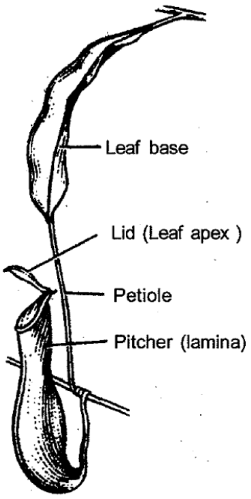
(5) **Phyllode -** In some plants petiole becomes flat leaf like green. Synthesises food and functions as normal leaf. Eg.: Australian acacia. Parkinsonia.

(6) **Leaflet tendril -** When leaflet is modified into tendril like structure then it is called leaflet tendril. Eg. : Pisum sativum (garden pea), Lathyrus odoratus (sweet pea).

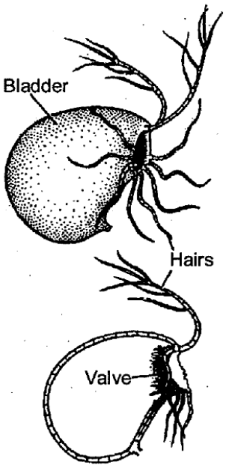
Note : Dionaea (venus flytrap) is insectivorous plant and it also has modified leaves.

(7) **Leaflet hook -** eg. Cat's nail (Bignonia unguis cati)

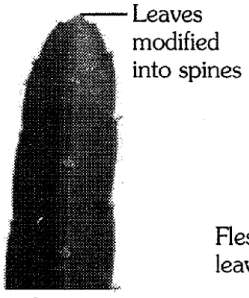
Leaf tendril



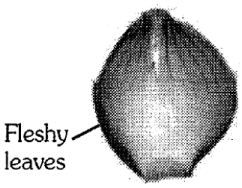
Leaf pitcher



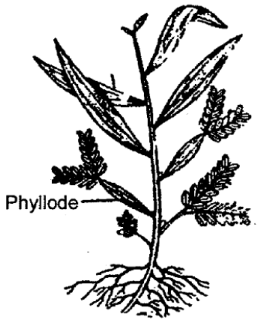
Leaf bladder



Leaf spines



Leaf fleshy leaves



Phyllode


Leaflet tendril