Kurdistan Region - Iraq
Ministry of Higher Education and Scientific Research
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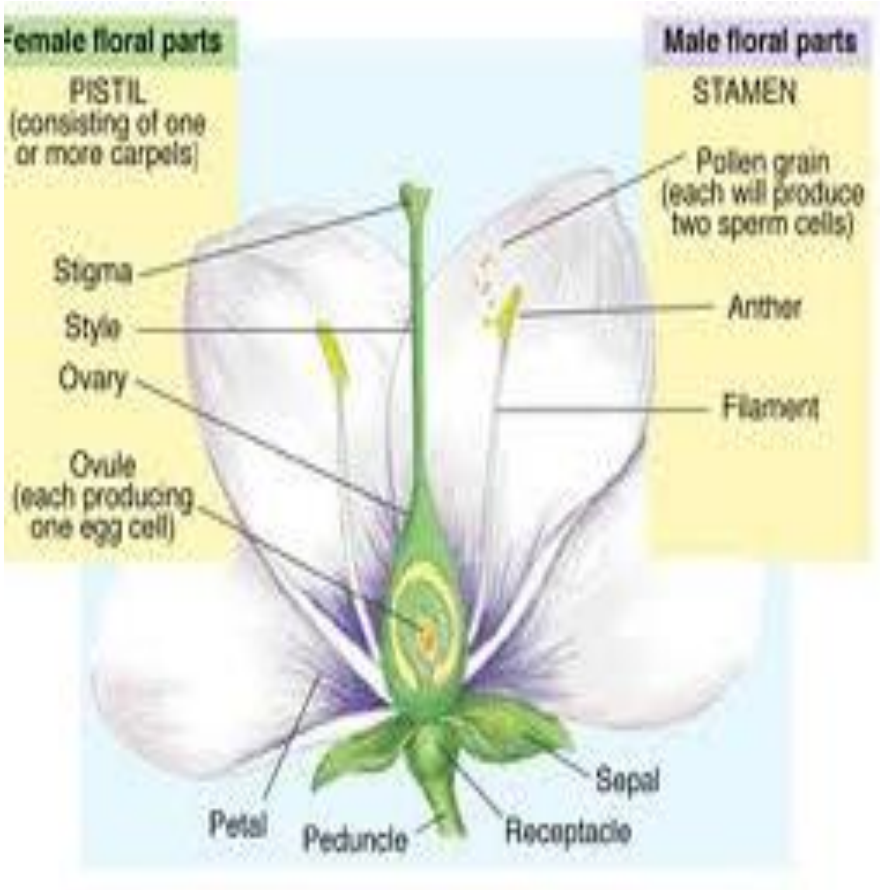
Field Crops Dept.

2023-2022

PLANT TAXONOMY



Theory Lecture Mr. Serwan T. Al-Dabbagh

Practical Lecture Mrs. Firas Dheiya Al- otraqchi

Plant taxonomy:

This is that branch of biological science which is concerned with identification, nomenclature and classification in a system made up according to the available evidence of phylogenetic relationship.

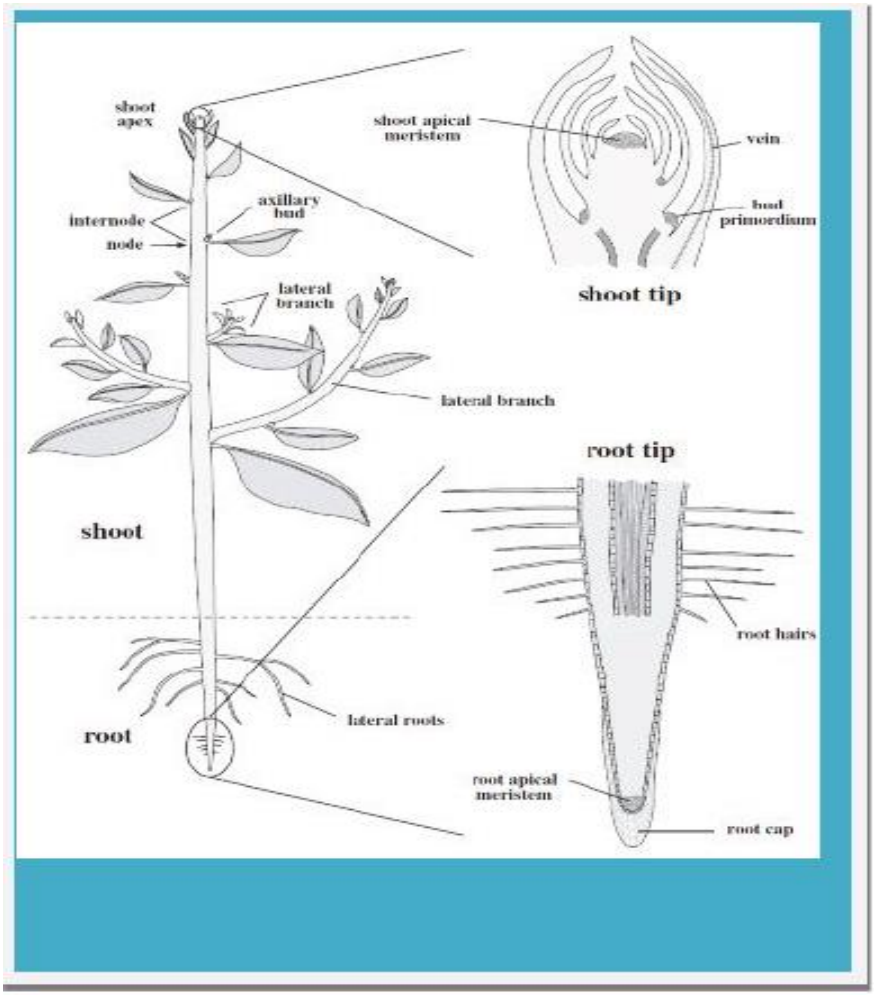
Plant Body

Plants morphologically are divided into two main parts:

- Vegetative organs.
- Reproductive organs.

Roots anchor the plant and absorb water and inorganic nutrients. **Leaves** act a solar collector. They are typically broad and flat. Leaves are determinate in their growth.

In general the leaf grows to certain size and shape, and then all growth stops. In shoots, new growth occurs at buds at the tip of the shoot and at the points along the stem where the leaves are attached (the nodes).



Morphological Features

plants divided in to:

- **Herbaceous plant:** is a plant that has leaves and stems that die down at the end of the growing season to the soil level. They have no persistent woody stem above ground. Herbaceous plants may be annuals, biennials or perennials. (***Vicia, Iris***)
- **Woody plant:** is a plant that has root and producing strong woody stem by secondary growth, Woody plants are usually :

1- **Herb:** A plant which has no persistent parts above the ground, e.g. ***Triticum* sp. *Ranunculus, Fumaria etc.***
2- **Shrub:** A woody short plant in which side shoots are well developed, so that there is no trunk, e.g. ***Punica*** and ***Rosa*** sp.
3- **Tree:** A tall woody perennial plant with a well-marked trunk, e.g. ***Eucalyptus, Pinus Acer, Myrtus*** etc.

Root

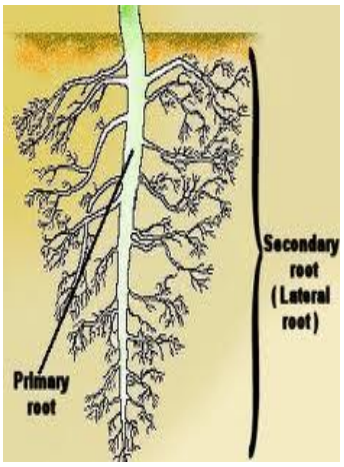
Root origin

Main roots develop from the radical of a seed, forming the primary root, it branches off to secondary roots but,**Adventitious roots** originate from the stem, branches, leaves, or old woody roots except primary root .

Root system

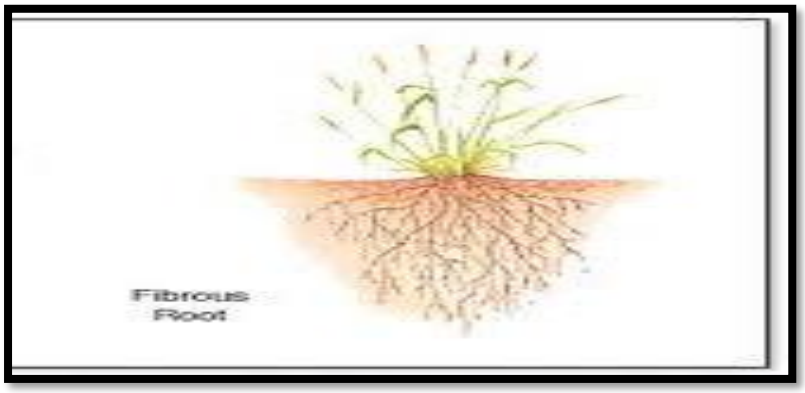
1- Tap root system: composed of primary root and their branches they, found in Dicots

Norma l tap root,



2- Adventitious or fibrous root system

composed of numerous roots grow near the base of stem equal in length, they commonly occur in monocots.



Modified Roots:

Some roots are modified to carry out specialized functions of mechanical and physiological nature.

Modified tap roots

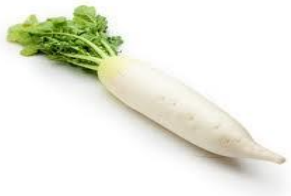
Fleshy or swollen roots (Succulent roots)

Thick and fleshy, mostly storage, morphologically classified to:

1- Conical: widest at the top and tapering steadily towards the bottom: e.g. *Daucus*.

2- Napiform: It is very broad at the top and tapers suddenly like a tail at the bottom: e.g. *Brassica rapa* L.

3-Fusiform: this root is widest in the middle and tapers towards the top and the bottom: e.g. *Raphanus sativus***.**



4- Globiform: globoid in shape: e.g. *Beta vulgaris* .

5-Fasciculated roots: as found in Asparagus and Dahlia

6- Root tubers: e.g. Ipomoea batatas .

Modified Adventitious roots

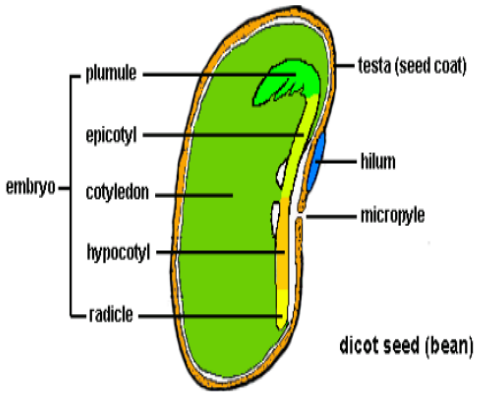
1- Prop roots: These are aerial roots that arise from a stem and subsequently sink into the soil to provide additional support to the plant such as in corn (*zea mays*).

2- **Parasitic** or **haustorial roots:** - These are specialized roots in parasitic plants that penetrate the tissues of a host plant, as in (Cuscuta).

Stem morphology

Stem is the axis of a plant bearing leaves with buds in their axils. It is formed by the plumule of the seed.

The plumule grows upwards into the sunlight, and develops into the leaf-bearing stem of the plant.

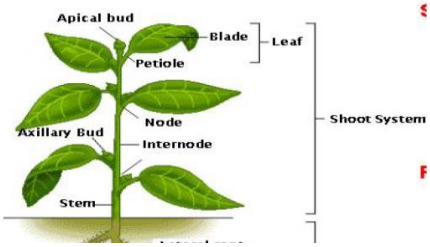


Part of a stem;

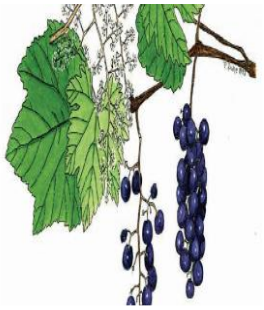
1. Shoot tip
2. Node
3. Inter node
4. Bud, A terminal bud

Stem branching system

1. Monopodial; indeterminate
As fined in : ***Prunus*** and ***Pinus***



2. Sympodial; determinate, as fined in ***Vitis***



Stem habit types

Aerial (Terrestrial) stem:

1. Erect; e.g. *Papaver* and *Morus* spp

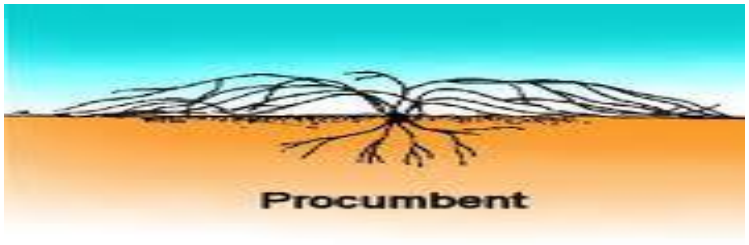
2. Ascending; e.g. *Nerium oleander* L.

3. A scape: as in Liliacea

4. Weak; Some plants poses stem unable to holding itself, these includes;

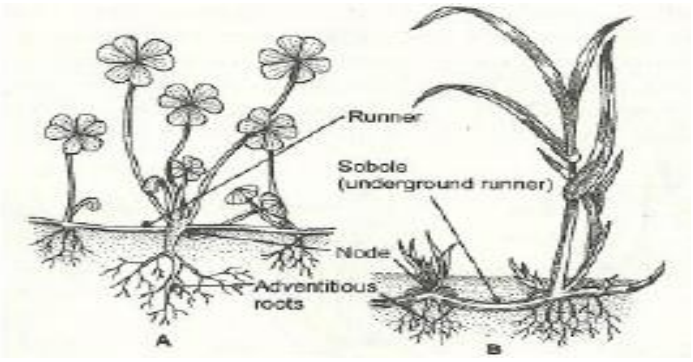
a. Prostrate; Some plants are adapted to lying on the ground at least in part these includes;
i. Decumbent; lying on the ground, but with the end ascending, e.g. *Verbena* .

ii. Procumbent; trailing or lying flat but not rooting. e.g. *Andrachne* (LAMA) and *Citrullus* (HANDHAL).



b. Stoloniferous rhizome; A shoot that bends to the ground and takes root, that gives rise to a new plant at its tip. e.g. *Fragaria* and *Viola* .

C. Runner- A slender trailing shoot taking root at the nodes. e.g. *Cynodon dactylon*



d. Twining- Sprawling across objects without specialized climbing structures.

e.g. *Convolvulus* .

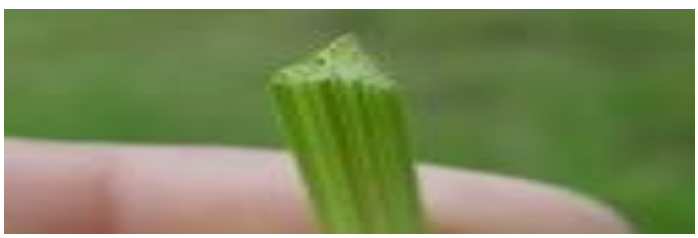
e. Climbing- growing upward by means of tendrils, petioles, or adventitious roots. e.g. *Passiflora* and *Hedera helix*

Aerial stem shapes

a. **Winged stems-** Some plants possess thin flat expansion on its stem, e.g. *Verbascum*, *Onopordum acanthium.* and *Lathyrus* .

b. **Angular stems;** Divided according numbers of angles to:

i. Triangular-as fined in Cyperaceae family.



ii. Quadrangular- as fined in Labiatea family and *Vicia faba*

c. **Cylindrical stems-** circular in transverse section, as fined in Poacea (Gramineae) family, these includes:-

i. Hollow cylindrical stems- e.g. *Triticum* sp. and *Hordeum sp.*

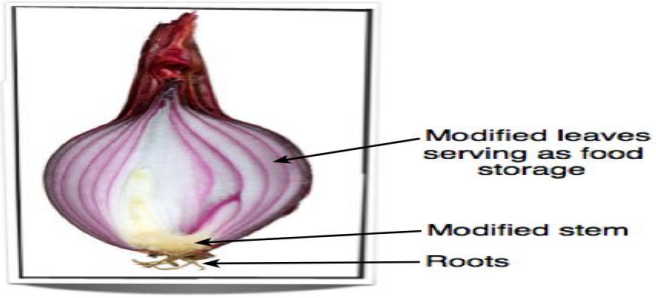
ii. Solid cylindrical stems- e.g. *Bambusa*.

Modified stems

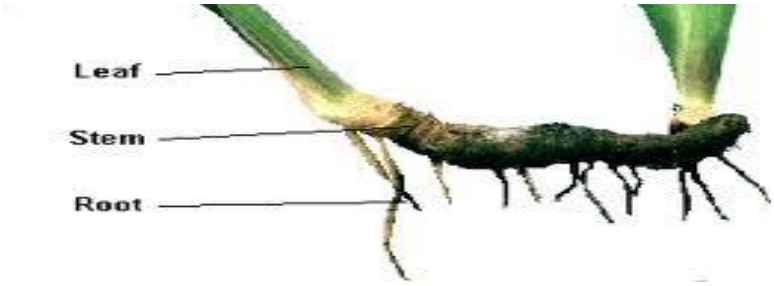
(1) Underground modifications (Subterranean stems)

1) **Corms -** e.g. *Crocus* and *Leontice*

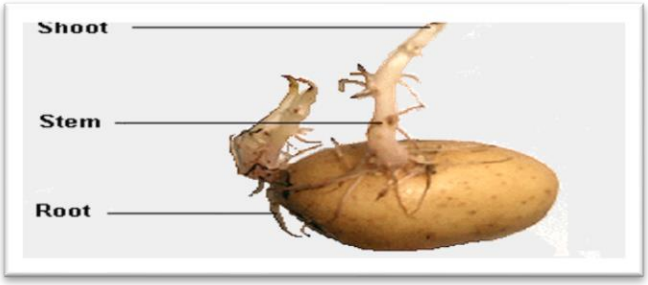
2) **Bulbs -** e.g. *Allium cepa* and *Tulipa* .



3) **Rhizomes** - e.g. *Zingiber officinale* and *Cynodon dactylon*.

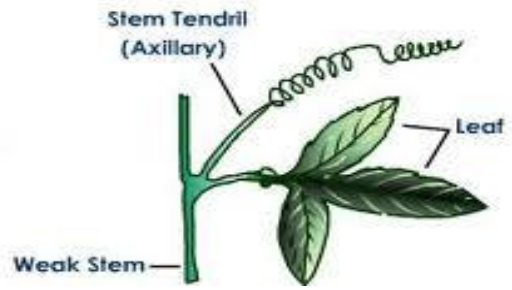


4) **Tubers**- e.g. *Cyperus rotundus* and *Solanum tuberosum*.



(2) Arial modifications

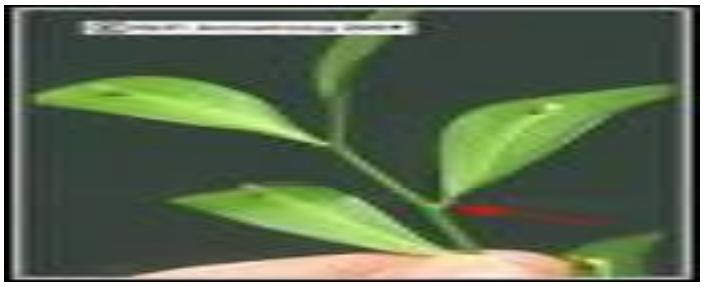
1) **Stem-tendril -** e.g. *Passiflora* and *Vitis* .



2) **Thorn or Spiny stems** - as fined in *Alhagi* sp and *Astragalus* sp. *Bougainvillea*

3) Phylloclade - e.g. *Opuntia*

4) **Cladode or Cladophyll** - e.g. *Asparagus* and *Ruscus*



Leaf Taxonomy

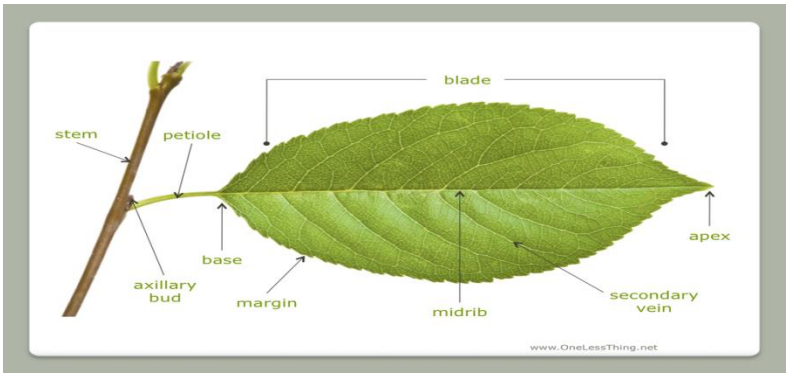
Leaf is a lateral appendage of the stem born at the node and bears an axillary bud in its axil. It is usually expanded and concerned with the manufacture of food (photosynthesis and transpiration).

Parts of leaf

1- **Blade or Lamina:** the flat, expanded portion of the leaf.
2- **Petiole:** the stalk that supports a blade, leaf without a petiole is sessile; in compound leaf each leaflet usually has its own petiole, which is called a petiolule.

3- Stipule - flat, often leaf-like flap below a leaf. Not all leaves have stipules. Not all leaves have stipules; the leaf is then termed exstipulate). Stipules can be highly modified into tendrils, spines, scales, ect.Stipule -

4- Axillary bud - the bud in the axil - the angle between the leaf and stem.



Duration of leaves:

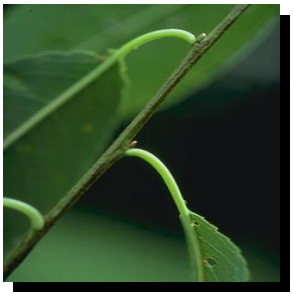
i. **Caducous;** leaves fall of as soon as they are formed as in *Opuntia*.

ii. **Deciduous** or **annual;** leaves fall of at the end of a particular season as in *Acer* and *Prunus* □

iii. **Persistent;** leaves last for a long time as in most tropical trees, as in *Eucalyptus*, *Citrus* and *Rosa*

Leaves arrangements (Phyllotaxy)

1- **Alternate leaves** - one leaf attached per node.
2- **Opposite leaves** - two leaves attached per node.
3-**Whorled** - arranged two or more per node.



Alternate

Opposite

Whorled

Types of leaf incision (simple & compound leaves)

Indentation of the lamina margin is called leaf incision. Accordingly two main categories are recognized; Simple leaf & Compound leaf.

1-Simple leaf: the blade one piece.

2-Compound leaf: - the blade is divided into two or more pieces, each pieces called leaflet.

- **Parts of compound leaf**

1- Leaflet 2- Petiole 3- Rachis 4- petiolule 5- Rachilla

- **Types of compound leaf**

A- According to **numbers of leaflets** compound leaf divided in to :

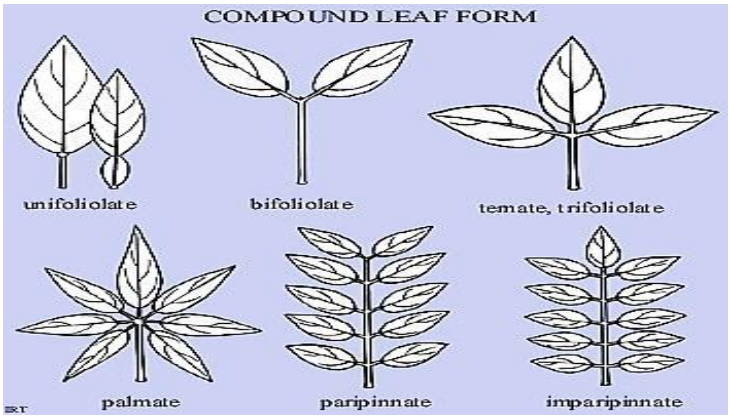
1- Unifoliate
2- Bifoliate
3- Trifoliate
4- Multifoliate

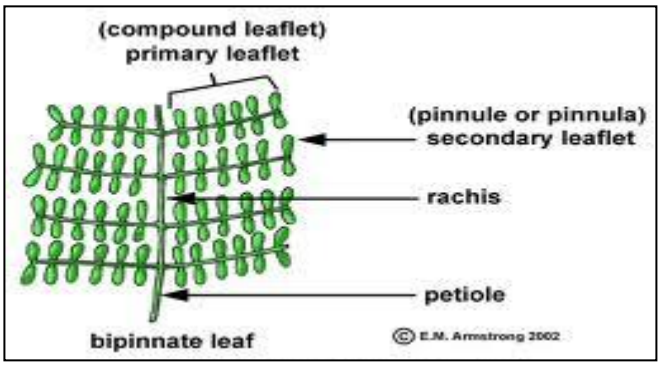
B- According to **arrangement of leaflets** compound leaf divided in to:

1- Palmately compound
2- Pinnately compound 3- Bipinnate 4- Tripinnate

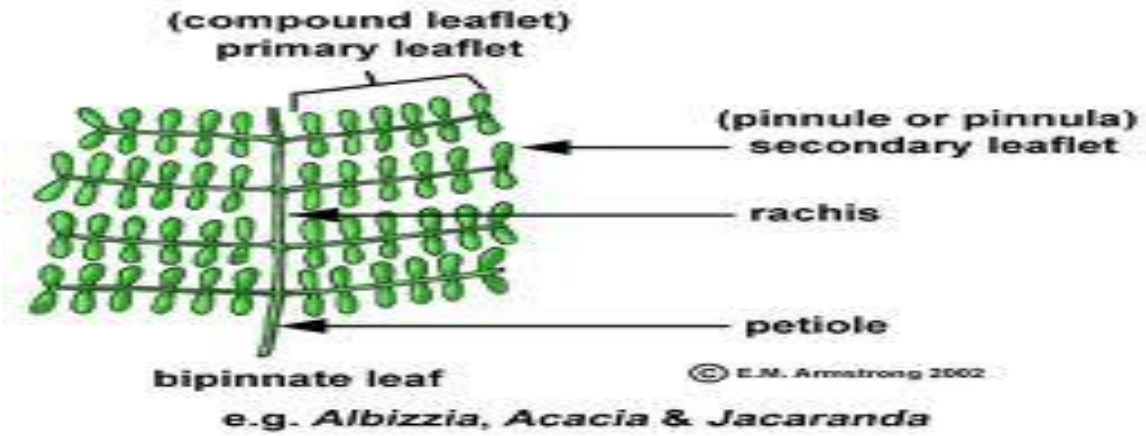
A- Odd – pinnate or Imparipinnate

B- Even-pinnate or Paripinnate



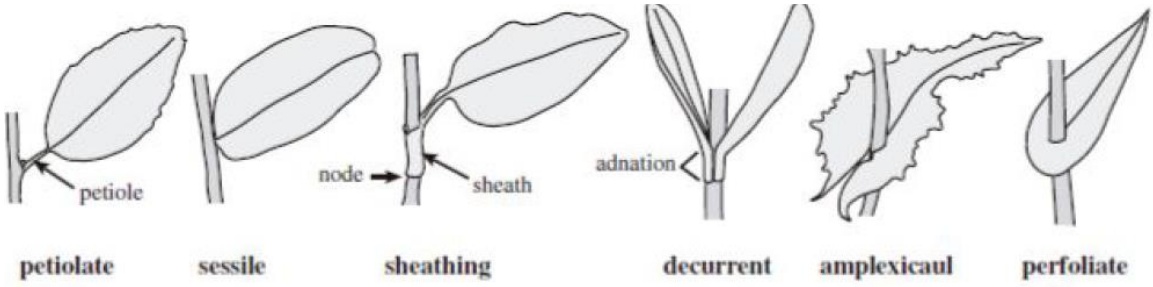


3-Bipinnate



Leaf base attachment; The point of attachment of the leaf to the stem. In general, leaves may be petiolate, with a petiole, or sessile, without a petiole. Leaflets of a compound leaf are, correspondingly, either petiolulate or sessile. It may be variously modified as follow;

A. **Pulvinus** – a swollen leaf base, as in ***Musa*** sp.
B. **Sheathing** – as in **Poaceae** and **Umbelliferae.**
C. **Amplexicaul** – as in ***Sonchus***
D. **Perfoliate** – as in ***Bupleurum***



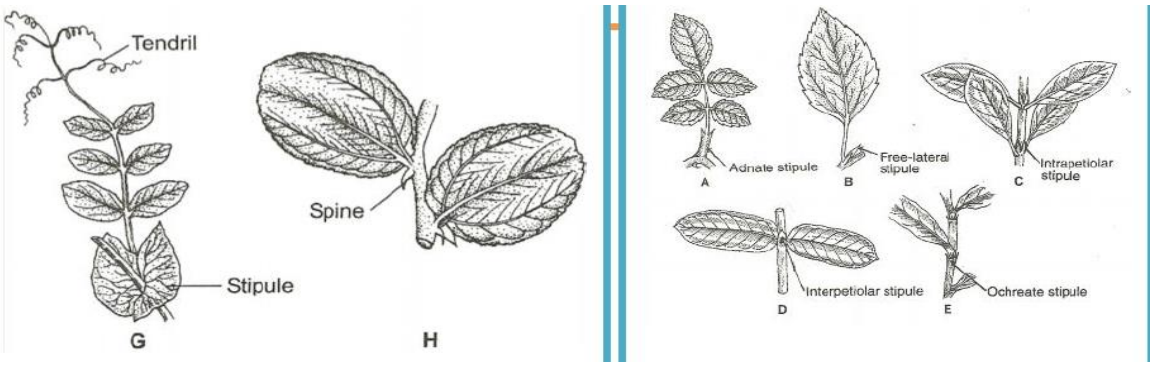
Stipules

A pair of lateral outgrowth present at the base of the leaf. Leaves possessing stipules are called stipulate and lacking are exstipulate as in Melia aza dirachta .

Stipules may be of various types;

i. Adnate – as in Rosa .
ii. Free lateral – as in most members of Malvaceae , e.g. Althea . Malva and Hibiscus rosa .

- a. Foliaceous – leafy stipules, as in *Pisum.*
- b. Spinous – as in *Zizyphus* and *Capparis*.



Leaf shapes

1. Shape

Important shapes of lamina are:

A. Acicular – needle shaped, as in *Pinus*

B. Linear – longer and slightly broader, as in grasses.

C. Lanceolate – lance shaped, as in *Nerium* and *Eucalyptus*.

D. Oblong – more or less rectangular as in *Vinca* and *Mentha*) .)

E. Ovate – egg shaped as in *Hibiscus rosa*).

F. Cordate – heart shaped, as in *Morus*)

G. Sagittate – as in *Convolvulus* **.**

H. Hastate – like sagittate but the two basal lobes are directed outwards, as in *Convolvulus* and *Ipomoea* (WARD ATTELEFON).

I. Reniform – kidney shaped, as in *Malva* and *Alcea* (AL-KHITMA).

J. Spathulate – spatula shaped, as in *Lactuca* (KHAS) and *Calendula officinalis* (AL-UQHWAN).

k. Elliptical – like an ellipse as in *Salvia* and *Ficus benjamina*

N. Rotund – orbicular or circular as in *Pelargonium* sp. and *Ficus***.**

O. Deltoid – triangular as i*n Populus* .

P. Tendril leaf– the terminal leaf modified to tendril, as in *Lathyrus*

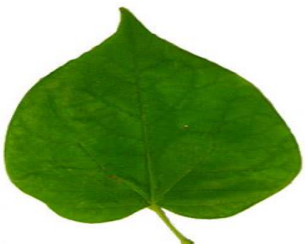
Acicular

Linear

Lanceolate

Oblong

Ovate



Cordate

Sagittate

Hastate

Reniform

Spathulate

Elliptical

Rotund

Deltoid

Tendril leaf

Leaf margins

1-**Entire** - smooth, with no teeth or lobes.
2-Serrate - with sharp, forward-pointing teeth as in *Hibiscus rosa*.
3-Dentate - with teeth which point outwards as in *Lantana* .
4-Crenate - with low, rounded scallop-like teeth as in *Hydrocotyle*.
5- **Spiny** – teeth pointed to form spines, as in *Onopordum sp*
6-Lobed – margin much dissected or incised, as in *Raphanus*

Entire

Serrate

Dentate

Crenate

Spiny

Lobed

leaf Apex :

The anterior tip of the lamina is called apex. It may be of various shapes:

1) **Acute –** pointed and narrow as in *Nerium* .
2) **Acuminate –** apex drawn out into long tapering tail as in *Eucalyptus*.
3) **Obtuse –** apex blunt or broad angled as in *Ficus* .
4) **Mucronate –** apex broad but with a shape point, as in *Vinca rosea*
5) **Cuspidate –** spiny, as in *Ananas* and *Phoenix* .
6) **Emarginate –** deeply notched obtuse apex as in *Bauhinia* .

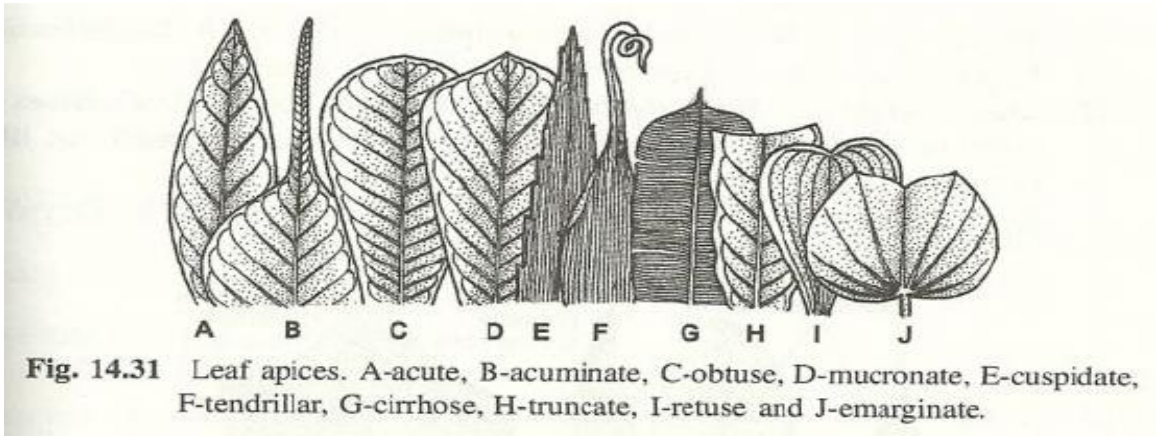


Fig. 14.31 Leaf apices. A-acute, B-acuminate, C-obtuse, D-mucronate, E-cuspidate, F-tendrillar, G-cirrhose, H-truncate, I-retuse and J-emarginate.