

### 3.6. Leaf incisions (Compound leaf)

The leaf has incised margin, and the incision goes so deep, touching the midrib, so that the lamina breaks up into lobes or segments called leaflets. Compound leaves may be **pinnate** or **palmate compound leaves**.

#### 3.6.I. Pinnately compound leaves

Pinnate compound leaves may be **paripinnate** which the rachis is terminated by pair leaflets. Or maybe **Imparipinnate** which the rachis is terminated by an odd leaflet as in (figure 1.16).

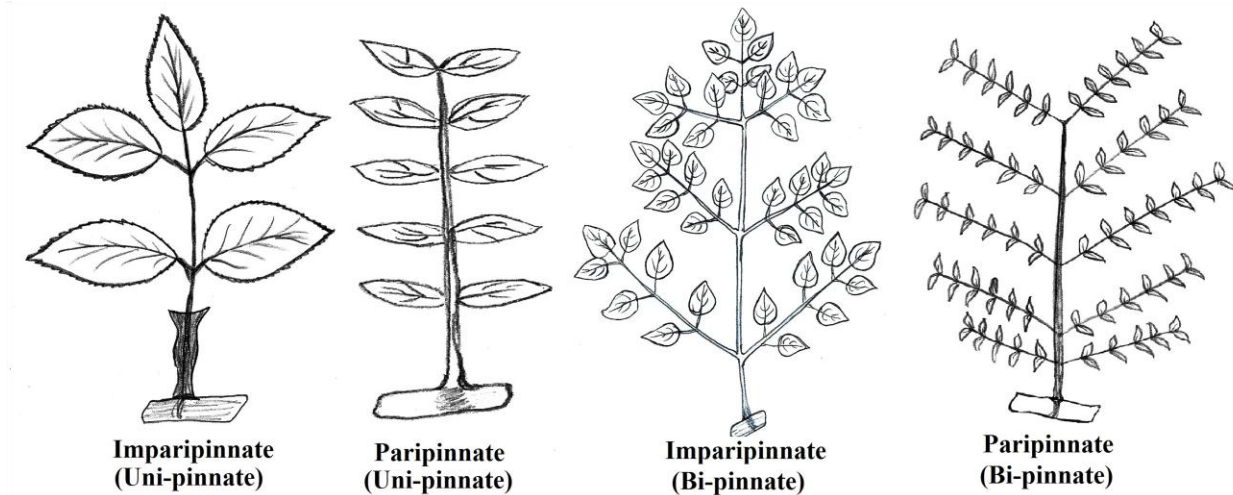


Figure 1.16: Pinnately compound Leaf structures

#### 3.6.II. Palmately compound leaves

In palmate compound leaves, the rachis does not differentiate and the lamina appears articulated or attached to a point on the top of the petiole. According to the number of leaflets, the palmate compound leaves may be of the following types (figure 1.17).

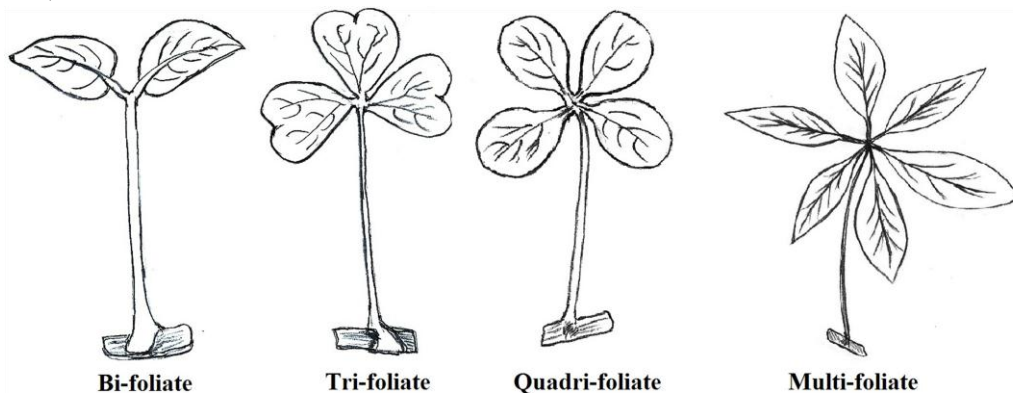


Figure 1.17: Palmately compound Leaf structures

### 3.7. Leaf venation

The pattern of arrangement of the vascular system in the lamina is called **leaf venation**. It is mainly of two types; **netted** or **reticulate** (Dicot leaves) and **parallel venation** (Monocot leaves) (figures 1.18 and 1.19).

#### Ψ- Reticulate venation; (figure 1.18).

Netted or reticulate, in which the ultimate vein-lets form an interconnecting netlike pattern, e.g., most dicot flowering plants.

Reticulate leaves can be;

- 1) **Pinnately veined (pinnate netted)**, with secondary veins arising along length of a single primary vein (the midrib or, in a compound leaf, midvein); as in *Lactuca* and *Myrtus*.
- 2) **Palmately veined (palmate-netted)**, with four or more primary veins arising from a common basal point; as in *Vitis* and *Ricinus*.

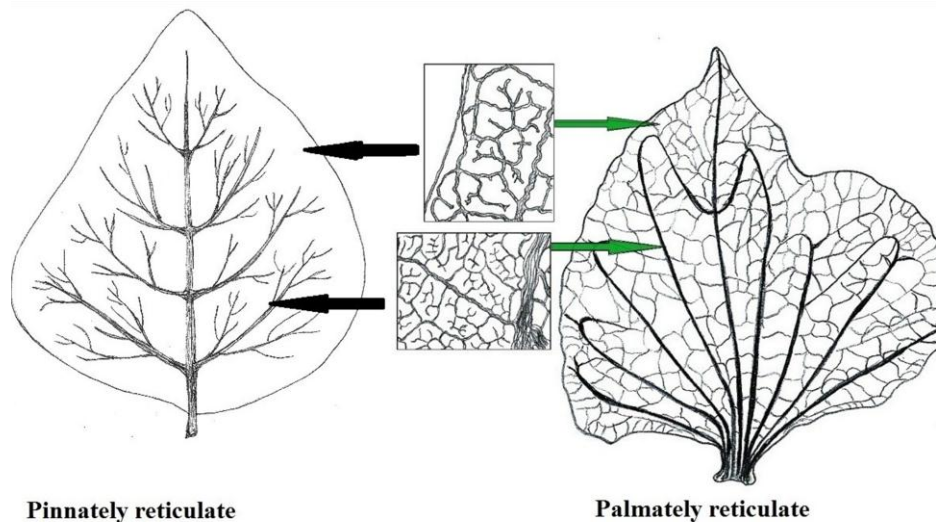


Figure 1.18: Leaf venation types (Reticulate)

#### Ψ- Parallel venation; (figure 1.19).

Similar to parallel venation in having transverse ultimate veinlets are;

- 1) **Pinnate-parallel (also called penni-parallel)**, with secondary veins arising from a single primary vein region, the former essentially parallel to one another (e.g., *Phoenix reclinata*);
- 2) **Palmate-parallel**, with several primary veins (of leaflets or leaf lobes) arising from one point, the adjacent secondary veins parallel to these (e.g., *Washingtonia filifera* ; fan palms).

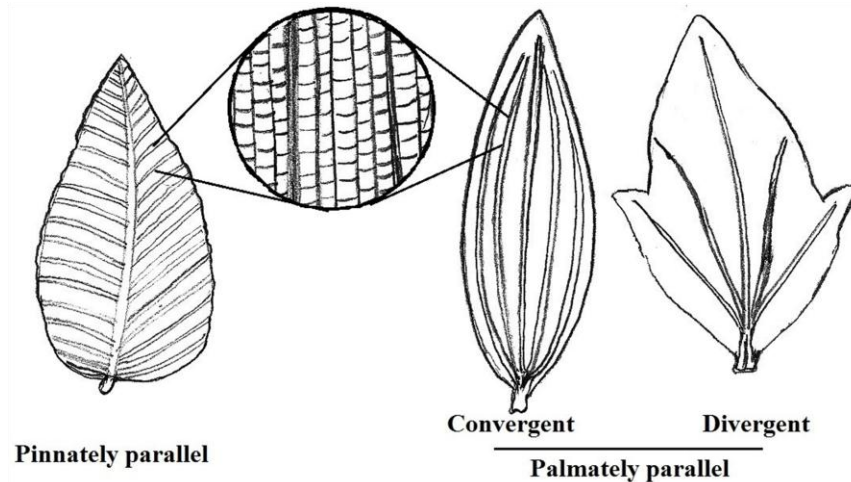


Figure 1.18: Leaf venation types (Parallel)

### 3.8. Leaf surfaces indumentum (The same terms apply to the other plant parts)

The surfaces of leaves, stems, and other plant organs may exhibit a variety of surface indumenta types, the characteristics of which are highly diagnostic in many taxa. The surface may be covered by trichomes (hairs, glands, scales, etc.) arranged variously (figure 1.20):

1. **Ciliate:** With marginal fringe of hairs.
2. **Glabrate:** Nearly glabrous or becoming glabrous with age
3. **Glabrous:** Not covered with any hairs.
4. **Glaucous:** Surface covered with a waxy coating, which easily rubs off.
5. **Glandular:** Covered with glands or small secretory structures.
6. **Glandular-punctate (gland-dotted):** Surface dotted with immersed glands, as in *Citrus*.
7. **Hirsute:** Covered with long stiff hairs.
8. **Hispid:** Covered with stiff and rough hairs
9. **Pilose:** Covered with long distinct and scattered hairs.
10. **Puberulent:** Minutely pubescent.
11. **Pubescent:** Covered with soft short hairs.
12. **Rugose:** With wrinkled surface.
13. **Scabrous:** Surface rough due to short rough points.
14. **Stellate:** Covered with branched star-shaped hairs.
15. **Tomentose:** Covered with densely matted soft hairs, wooly in appearance.
16. **Villous:** Covered with long, fine soft hairs, shaggy in appearance.

The hairs covering the surface may be **unicellular** or **multicellular**, **glandular** or **nonglandular**. The hairs may be unbranched or branched variously. They may bear one row of cells (**uniseriate**), two rows (**biseriate**) or several rows (**multiseriate**).

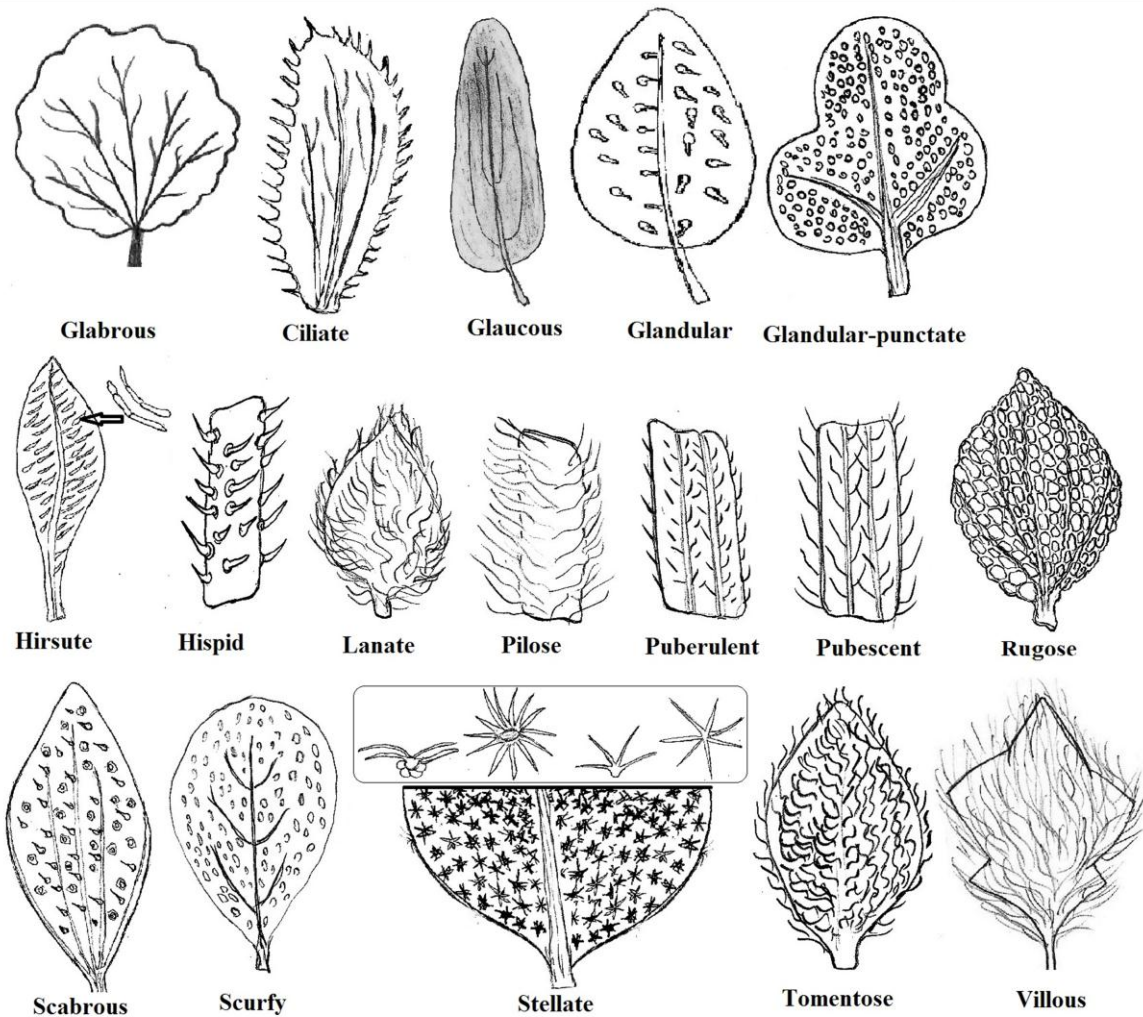


Figure 1.20: Plant indumenta types

#### 4. Buds

**Buds** are immature shoot systems that develop from meristematic regions. In deciduous woody plants the leaves fall off at the end of the growing season and the outermost leaves of the buds may develop into protective **bracts** (modified leaves) known as **bud scales**. The bud of a twig that contains the original apical meristem of the shoot (which by later growth may result in further extension of the shoot) is called the **terminal** or **apical** bud. Buds formed in the axils of leaves are called **axillary** or **lateral** buds.

A given bud may be **vegetative**, if it develops into a vegetative shoot bearing leaves; **floral** or **inflorescence**, if it develops into a flower or inflorescence; or **mixed**, if it develops into both flower(s) and leaves. In some species more than one axillary bud

forms per node. If the original terminal apical meristem of a shoot aborts (e.g., by ceasing growth or maturing into a flower), then an axillary bud near the shoot apex may continue extension growth; because this axillary bud assumes the function of a terminal bud, it is called a **pseudoterminal bud**.

## 5. Bracts

Bracts are axillary buds that are usually born in the axils of the specialized leaves, if bracts bear floral buds these flowers are called **bracteate**, if bracts are absent where flowers are called **ebracteate** (figure 1.21). **Bracteoles** are additional bract-like small and thin structures that are born on the pedicel (or peduncle) between the flower and bracts such flowers are called **bracteolate**. Bracts and bracteoles may be variously modified, thus termed according to their shape and location (figure 1.21).

Bract and bracteoles may be variously modified, such as:

1. **Foliaceous or leafy bract** – bract appears like ordinary green leaf, as in *Capparis* and *Antirrhinum*.
2. **Petaloid bract** – bract becomes brightly coloured (non-Green) and appears like petal, as in *Bougainvillea* and *Euphorbia pulcherrium*.
3. **Epicalyx** – A series (whorl) of sepaloid green bracteols immediately subtends (below) the calyx, e.g. *Hibiscus*, other Malvaceae (as in *Malva* and *Alcea*).
4. **Glumes** – One of usually two bracts occurring at the base of a grass spikelet, as in Poacea (Gramineae), also called **empty glumes**.
5. **Scaly bract** – A scaly bracts found with each individual floret (of a sedge spikelet). as in *Ornithogalum* and *Aloe*.
6. **Spathy bract** – Large, thick boat-shaped bract and called **spathe** covering full of a part of a **spadix** inflorescence, as in *Arum* and *Narcissus* sp; **Cymba**- a woody, durable spathe valve that encloses the inflorescence as in *Phoenix*.
7. **Cupule** – Hard and woody bracts and bracteols found in the base of flower, A structure that fused encloses a cluster of bracteols, with an opening end which fruits entered, as in *Quercus*.
8. **Involucral bract** – These form involucre' as in Asteraceae (Compositae). Involucre of bracts is also found in Umbelliferae (Apiaceae) as in *Daucus carota*. In addition to bracts, there may be smaller involucre round the base of each branch of the inflorescence as in *Daucus* and these are called **involucels**.

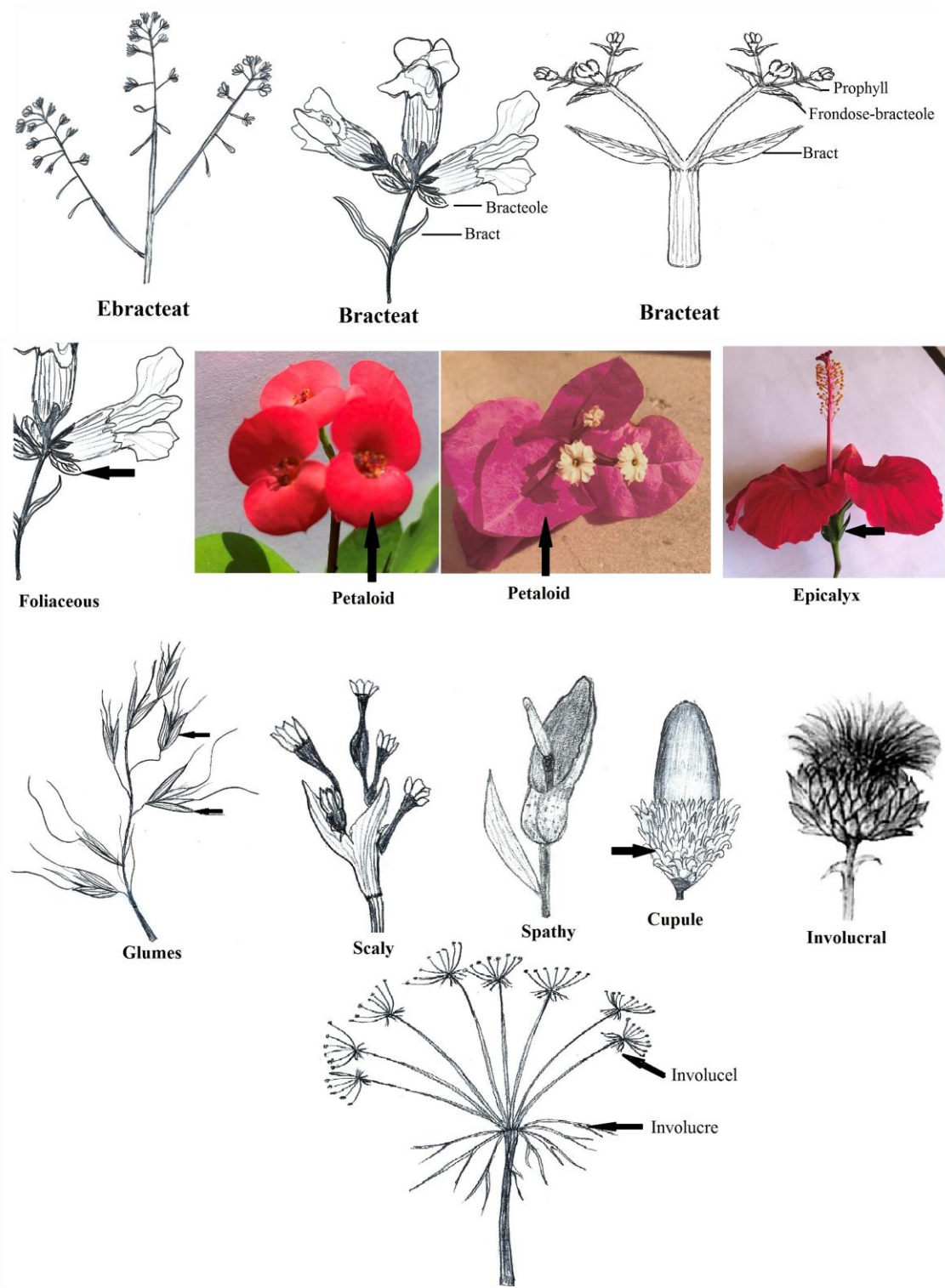


Figure 1.21: Various types of bract and bracteoles