

## LEAVES

Leaves are the primary photosynthetic organs of plants, functioning also as the main site of transpiration. Leaves are derived from leaf primordia of the shoot apex, generally dorsiventrally flattened (i.e., with dorsal and ventral sides). A leaf can be gametophytic, in the leafy liverworts and mosses, or sporophytic, in the vascular plants. As mentioned earlier, sporophytic leaves characteristically are associated with **buds**, immature shoot systems, typically located in the axils of leaves. Buds may grow to form lateral vegetative branches or reproductive structures.

## LEAF PARTS

The expanded, flat portion of the leaf, which contains the most of the chloroplasts, is termed the **blade** or **lamina**. Many leaves also have a proximal stalk, the **petiole** or (e.g., in ferns) the **stipe**. A leaf or leaf part (typically at the base) that partially or fully clasps the stem above the node is a leaf **sheath**, such as in the Poaceae (grasses) and many Apiaceae.

A **pseudopetiole** is a petiole-like structure arising between a leaf sheath and blade, found in several monocots, such as bananas and bamboos. As mentioned earlier, leaves contain one to many vascular bundles, the **veins** (also sometimes called **nerves**); similar specialized (although not truly vascular) conductive tissue is present in mosses.

Many leaves have **stipules**, a pair of leaf like appendages, which may be modified as spines or glands, at either side of the base of a leaf. If stipules are present, the leaves are **stipulate**; if absent, they are **exstipulate**. A specialized, scarious, sheath like structure arising above the node in some members of the family Polygonaceae, interpreted as modified stipules, is termed an **ocrea**.

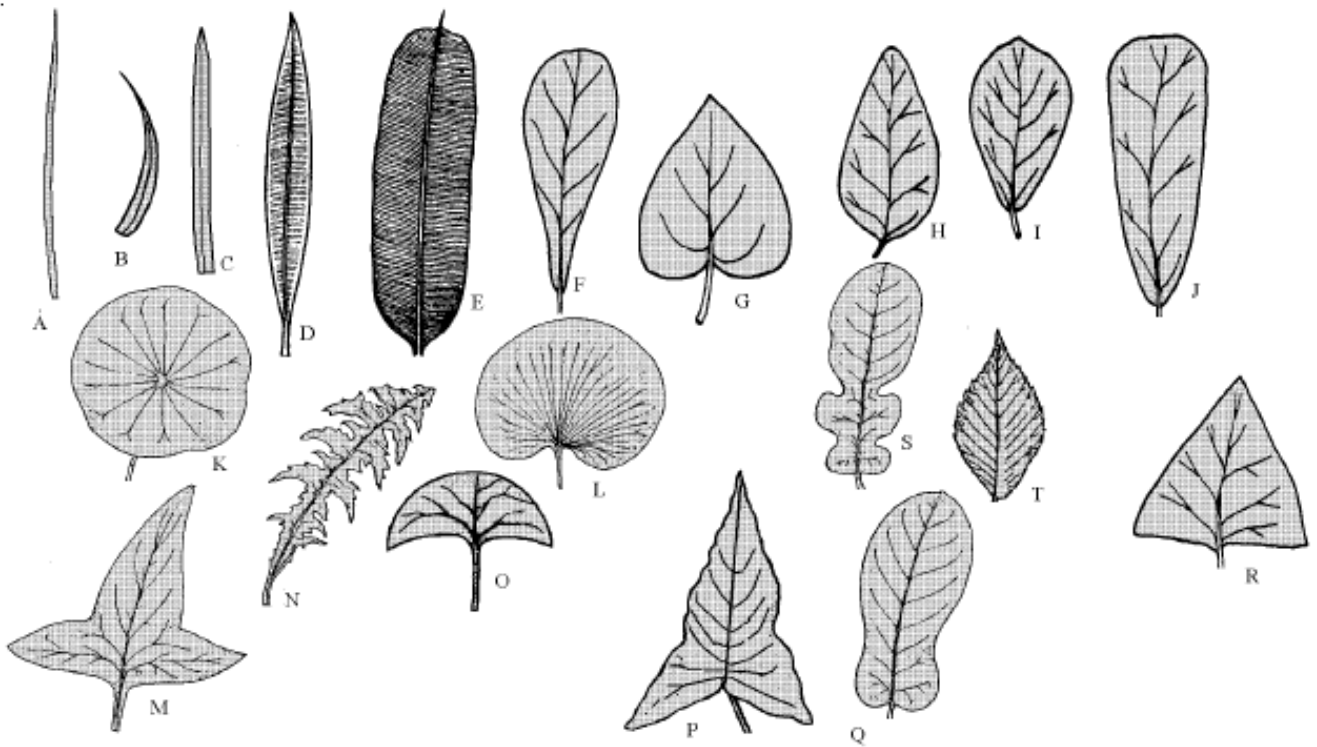
**Stipels** are paired leaf like structures, which may also be modified as spines or glands, at either side of the base of the leaflet of a compound leaf, as in some Fabaceae. If stipels are present, the leaves are **stipellate**; if absent, they are

**exstipellate.** Stipules and stipels may, in some cases, function to protect the young, developing leaf primordia. They often are small and fall off (are caducous) soon after leaf maturation. In some taxa, stipules or stipels may be highly modified into spines or glands. Extreme examples are some African acacias, in which the swollen stipular spines function as a home for protective populations of ants.

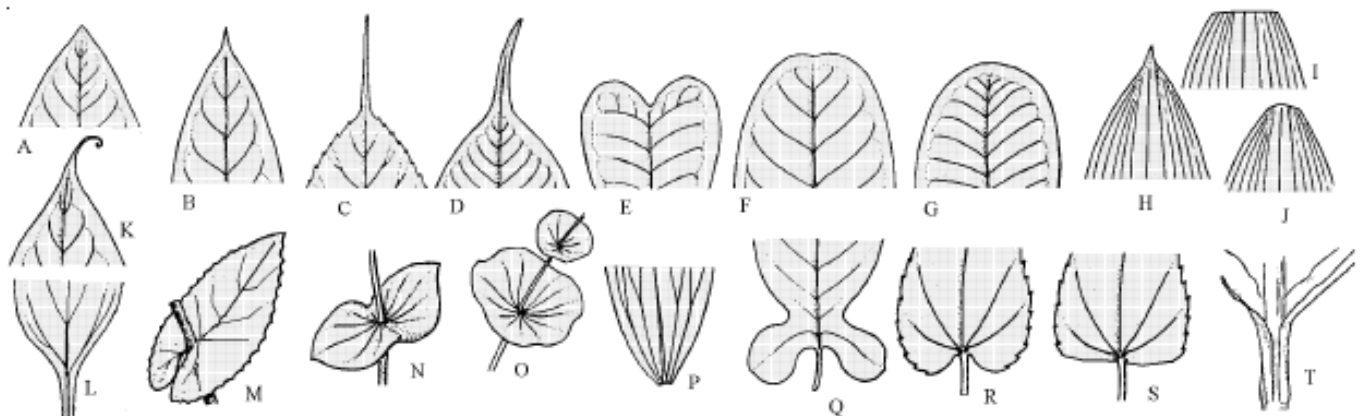
In the Rubiaceae the inner surface of the connate stipules (from opposite leaves) bear **colleters**, structures that secrete mucilage (aiding to protect young, developing shoots). Some leaves are compound, i.e., divided into discrete components called **leaflets**. The stalk of a leaflet is termed the **petiolule**.

**Some other specialized leaf parts, restricted to certain taxa, are:**

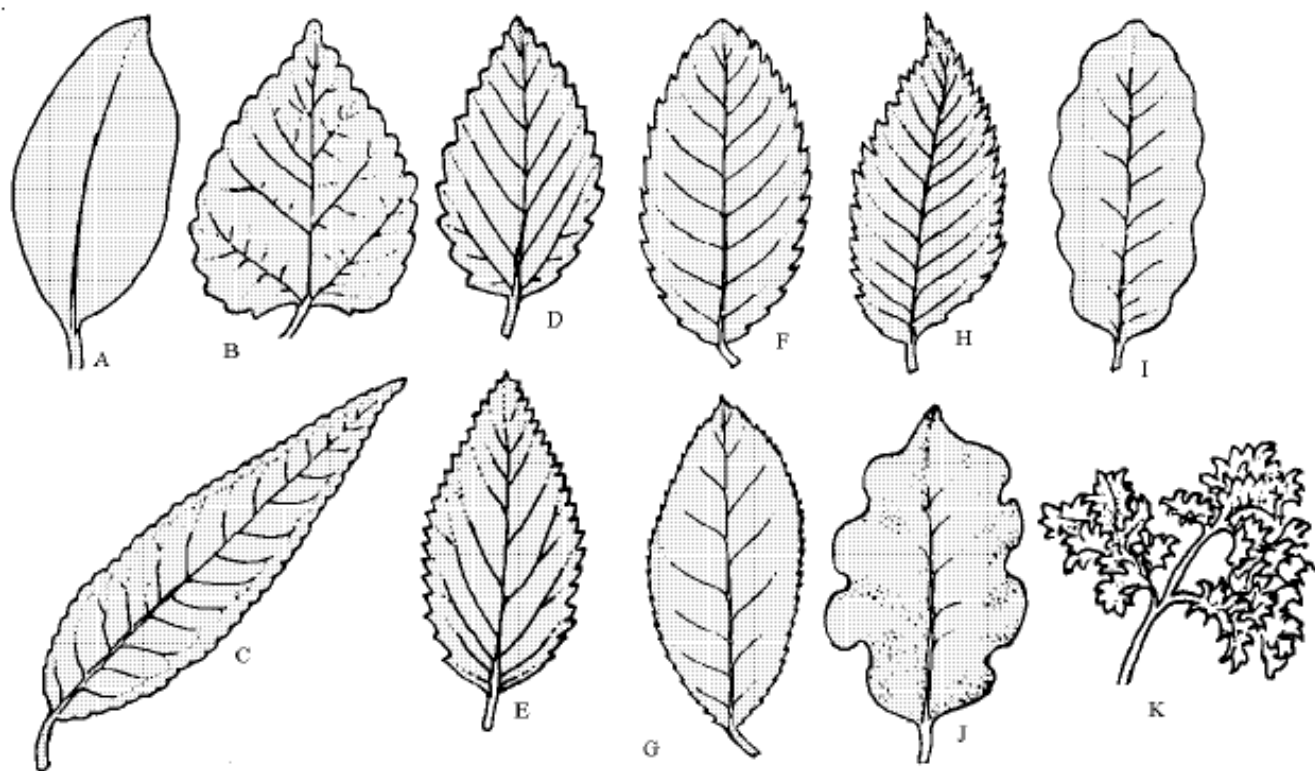
1. **Hastula**, an appendage or projection at the junction of petiole and blade, as in some palms.
2. **Ligule**, an outgrowth or projection from the inner, top of the sheath, at its junction with the blade, as in the Poaceae.
3. **Pulvinus**, the swollen base of a petiole or petiolule, as in some Fabaceae.



**Figure 4.7** Leaf outline. **A:** Acticular; **B:** Subulate; **C:** Linear, common in grasses; **D:** Lanceolate; **E:** Oblong; **F:** Spathulate; **G:** Cordate; **H:** Ovate; **I:** Obovate; **J:** Oblanceolate; **K:** Peltate; **L:** Reniform; **M:** Hastate; **N:** Runcinate; **O:** Lunate; **P:** Sagittate; **Q:** Pandurate; **R:** Deltoid; **S:** Lyrate; **T:** Elliptic.



**Figure 4.9** Leaf apex and leaf base. **Leaf apex.** **A:** Acute; **B:** Acuminate; **C:** Aristate; **D:** Caudate; **E:** Emarginate; **F:** Retuse; **G:** Rounded; **H:** Mucronate; **I:** Truncate; **J:** Obtuse; **K:** Cirrhose. **Leaf base.** **L:** Attenuate; **M:** Amplexicaul; **N:** Connate-perfoliate; **O:** Perfoliate; **P:** Cuneate; **Q:** Auriculate; **R:** Cordate; **S:** Truncate; **T:** Decurrent.



**Figure 4.8** Leaf margin. **A:** Entire; **B:** Crenate; **C:** Crenulate; **D:** Dentate; **E:** Denticulate; **F:** Serrate; **G:** Serrulate; **H:** Bi-serrate; **I:** Undulate; **J:** Sinuate; **K:** Crispate.