General Botany

Lecture (8)

INTERNAL & EXTERNAL PLANT PARTS

2. **Shoot system**
1. **Stem**
2. **Origin of stem;**
3. **Part of a stem**
4. **Stem habit types**
5. **Aerial (Terrestrial) stem**
6. **Modified stems;**
   - **A. Aerial modifications**
   - **B. Underground modifications (Subterranean stems)**
7. **Plant habit types**

All Groups (1- 8)

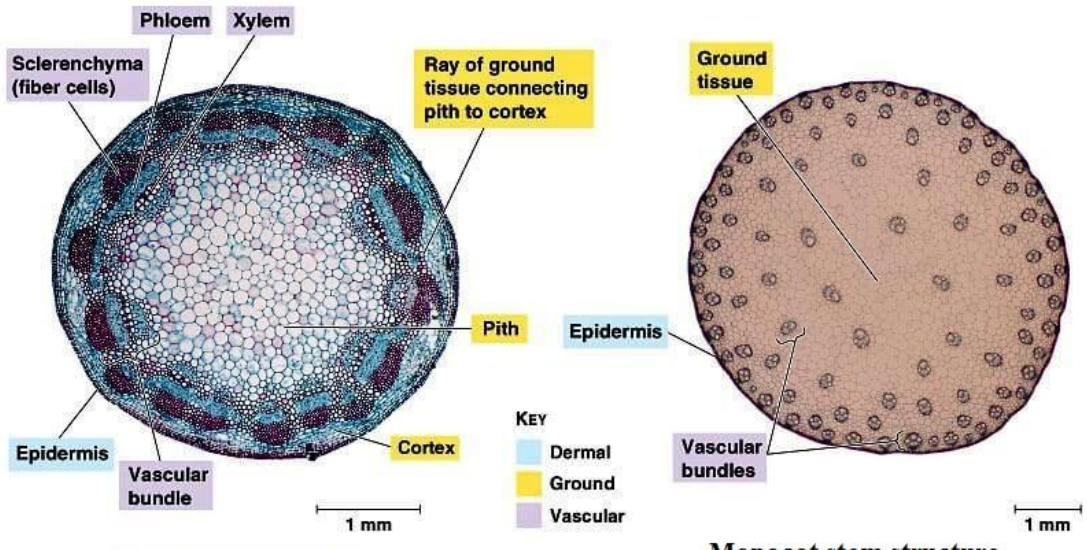
Shoot system:

Stems:

Support buds and leaves and act as a conduit for carrying water, minerals, and food from photosynthesis. They may be above or below ground. The vascular system inside the stem forms a continuous pathway from the roots to the leaves.

Vascular System: consists of xylem, phloem, and vascular cambium (in secondary plant body). Xylem: conduct water and dissolved minerals. Phloem: carries food such as sugars. Cambium: is a layer of meristematic tissue that separates the xylem and phloem and produces new xylem and phloem cells (in roots and stems of dicots). The vascular cambium is important in grafting, because they need to line up or the graft will fail.

In dicots-the vascular system is said to be continuous because it forms rings inside the stem. The ring of phloem is near the bark and eventually becomes part of the bark. The xylem forms the inner ring and is often called the sapwood and heartwood.



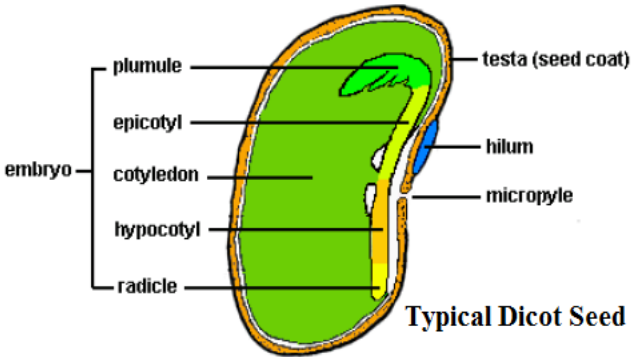
Dicot stem structure

Monocot stem structure

Stems may be long with great distances between leaves and buds (branches of trees) or they may compress like crowns of strawberry plants, fruit spurs (short shoots in Rosaceae).

Origin of stem;

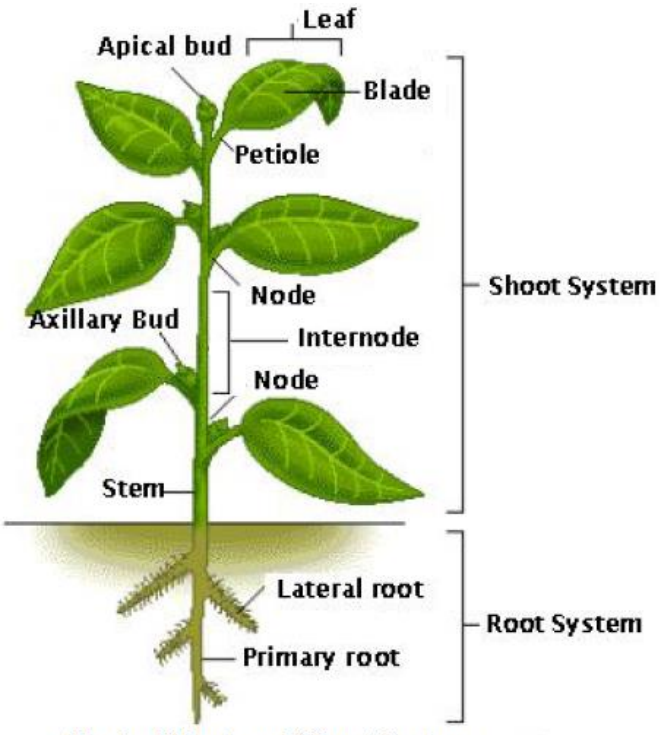
The first shoot of a seed plant develops from the epicotyl of the embryo. The epicotyl elongates after embryo growth into an axis (the stem) that bears leaves from its tip, which contains the actively dividing cells of the shoot **apical meristem**. Further cell divisions and growth results in the formation of a mass of tissue that develops into the immature leaf, called a **leaf primordium**.



Typical Dicot Seed

Part of a stem;

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



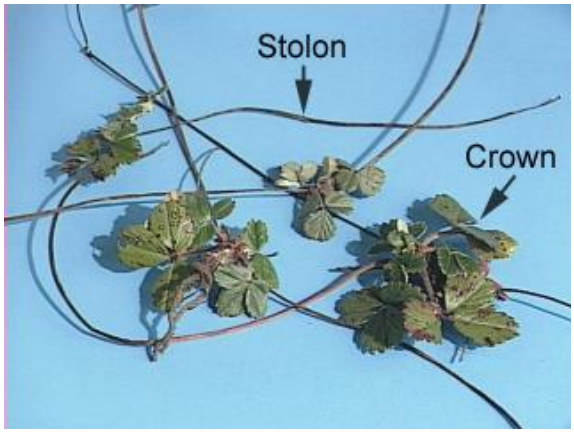
Typical Root and Shoot System

Stem habit types;

Aerial (Terrestrial) stem:

Stems function both as supportive organs (supporting and usually elevating leaves and reproductive organs) and as conductive organs (conducting both water/minerals and sugars through the vascular tissue between leaves, roots, and reproductive organs).

Above ground stems-crowns, spurs or stolons:
Stolons are fleshy or semi-woody, elongated, horizontal stems that often lie on the soil surface, leaves and roots are develop from the nodes (spider plants: *Saxifraga flagellaris*). Crowns are compressed stems with leaves and flowers on short internodes (strawberries, *Fragaria* sp.).



Modified stems;

1- Aerial modifications;

Many modified types of stems that are aerial (aboveground) also have specific functions. For example, a **cladode** is a flattened, photosynthetic stem that may resemble and function as a leaf, found, e.g., in prickly-pear cacti, *Asparagus*, and *Ruscus*.

2- Underground modifications (Subterranean stems) ;

Rootstocks function as storage and protective organs, remaining alive underground during harsh conditions of cold or drought. When environmental conditions improve, rootstocks serve as the site of new shoot growth, sending out new adventitious roots and new aerial shoots from the apical meristem or from previously dormant buds. **It is sometimes difficult to distinguish between roots and underground stems, but one sure way is to look for nodes. Stems have nodes, roots do not.**

Under-ground stems:

1. **Tubers (potatoes):**

The eyes in potato tubers are actually nodes, and each eye has a cluster of buds. When growing potatoes from separated pieces, it is important that each piece contain at least one eye and be about the size of a golf ball.

2. **Rhizomes:**

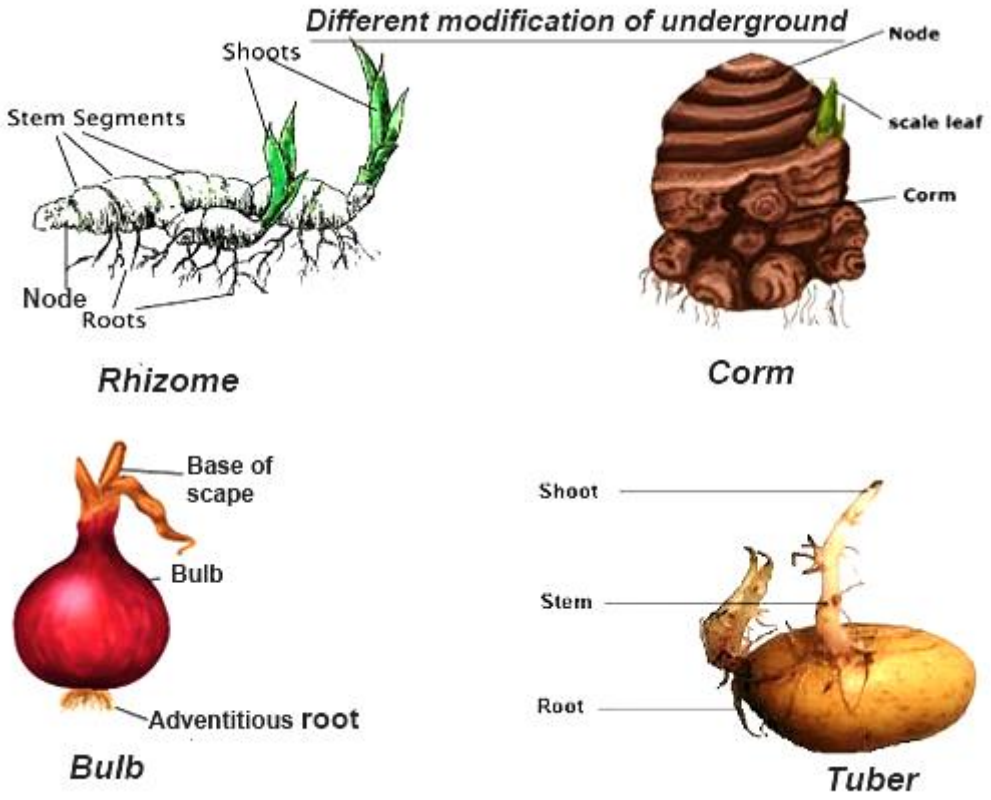
They grow horizontally from plant to plant, some are fleshy compressed (*Iris*), while others are slender and have long internodes as Johnson-grass (*Sorgam halepense*) is a particularly bad rhizomatous weed.

3. **Bulbs**

Tulips, lilies, and onions produce bulbs, which are shortened, compressed underground stems surrounded by fleshy scales (leaves) that envelop a central bud at the tip of the stem. When the bulb begins growing in the spring, it utilizes the stored food.

4. **Corms:**

Corms are another kind of below ground stem. A corm is a solid mass of stem tissue with a terminal bud on top. In additional to the terminal bud, axillary buds are produced at nodes. It is protected against injury and water loss by dry leaf bases similar to the tunic in true bulbs (*Gladiolus*, *Arum*, *Fritillaria*).



Plant habit types:

1. Trees have one main trunk and are usually taller than 3.5 m.

2. Shrubs, while **shrubs** have many main stems and are usually less than 3.5 m. tall. Both have large amounts of hardened xylem in the core.

3. Herbaceous or **succulent stems** contain less amounts of sapwood - may only live a year or re-grow from the crown.

4. Weak stem habits:

Weak stems also called Vines-have long trailing stems. Some vines grow along the ground while others need a structure to grow on as:

1. **Twining vines** circle a structure for support, such as; *Humalus*, *Lonicera* and *Phaseolus coccineus*.
2. **Climbing vines** are supported by either aerial roots as *Hedera helix*, or by slender tendrils that encircle an object e.g. *Vitis vinifera* and *Cucurbita* sp., or by tendrils with adhesive tips e.g. *Parthenocissus quinquefolia*.