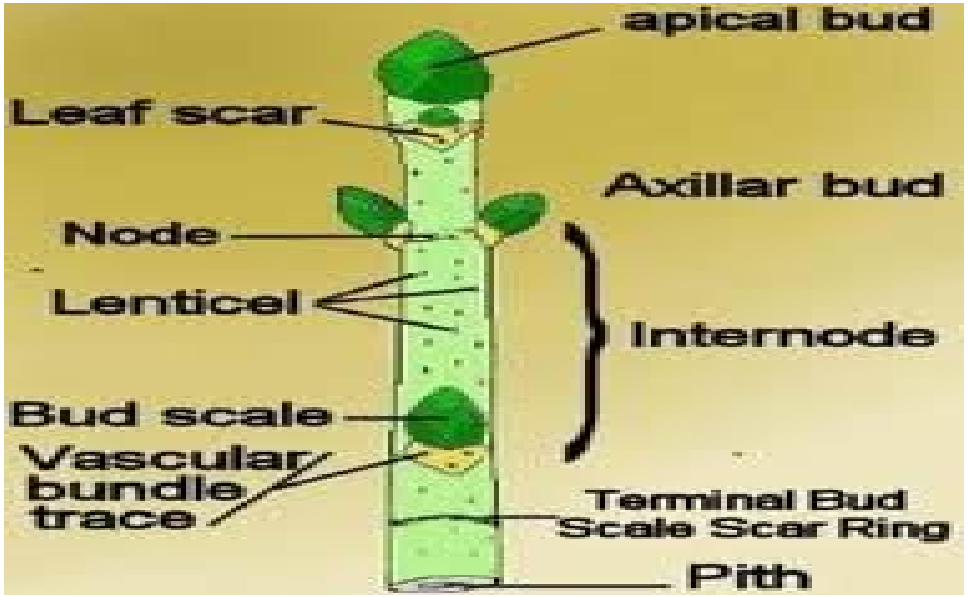
MORPHOLOGY OF FLOWERING PLANTS (STEM)



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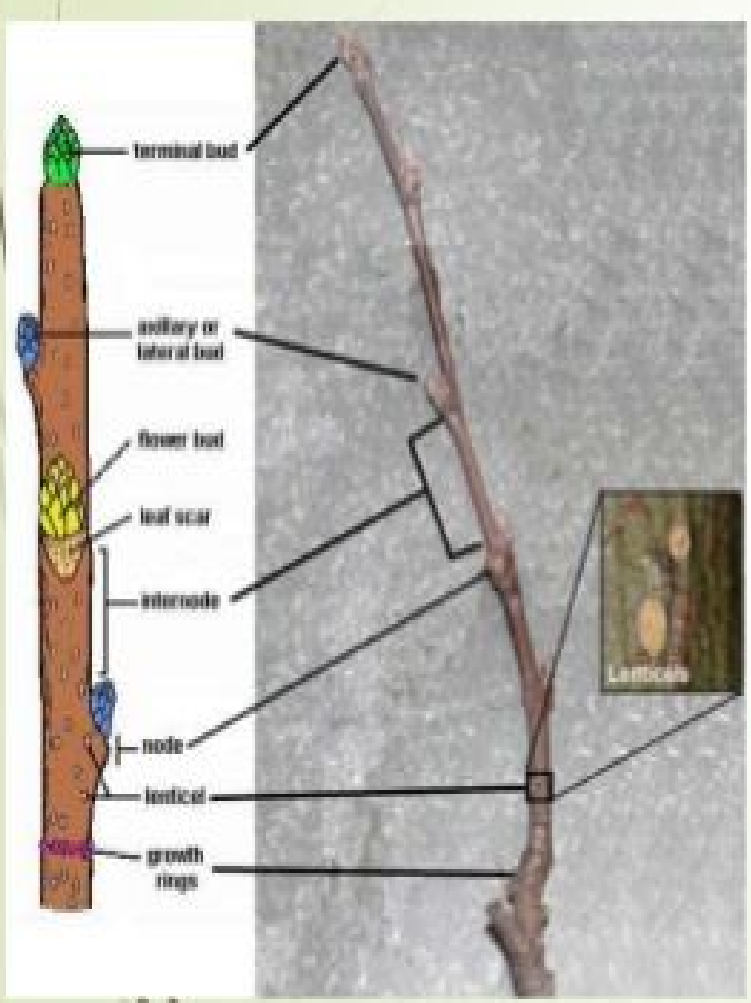
Morphology of Stem



Characteristics :

- Stem is a part of plant which lies above from surface of soil.
- **(-) geotropic.**
- **(+) Phototropic.**
- It has nodes and internodes.
- Branches, leaf, flower bud and bracts are developed from nodes.
- Stem arises from plumule.
- The young stem is green and is capable of performing photosynthesis.

Functions of Stem :

- The primary functions of stem are to produce and support lateral appendages such as **branches, leaves, flowers** and **fruits**, conduction of **water** and **minerals** to different parts of shoots and transport **food** to all plant parts.
- Stem may, however, get modified to perform additional or functions such as
- **storage** of food and water,
- proliferation and **propagation**,
- procuring **support** for climbing,
- **perennation** i.e. to tide over unfavorable conditions
- Synthesis of food **(photosynthesis).**

MODIFICATIONS OF STEM

Underground

1. Rhizome
2. Tuber
3. Corm
4. Bulb

Sub-aerial

1. Runner
2. Stolon
3. Offset
4. Sucker

Aerial

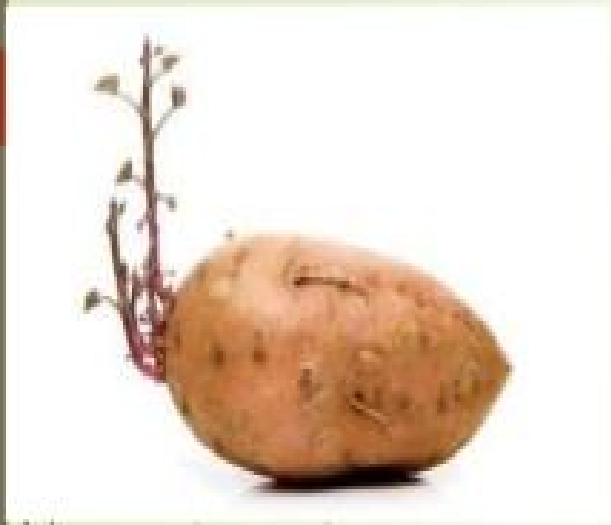
1. Tendril
2. Thorn
3. Phylloclade
4. Cladode
5. Bulbil

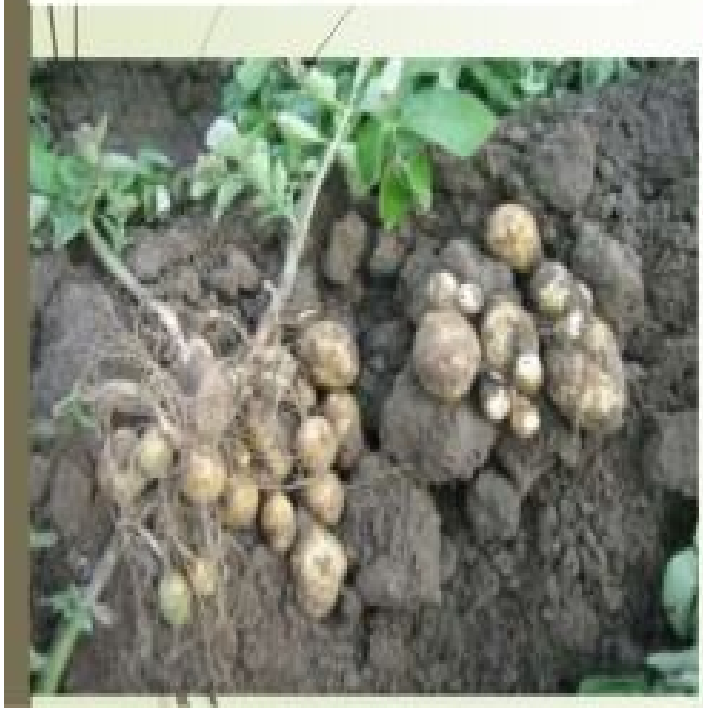
Underground modification : (for storage and vegetative propagation)

1. **RHIZOME:**

- **prostrate**, **dorsiventral** thickened **brownish** stem, which grows horizontally **under** the surface of the soil.
- It shows distinct **nodes** and **internodes**. It possesses a **terminal** bud and **axillary** buds in the axil of each **scale leaf** present at the node.
- Rhizome remains **dormant** under the soil and at the onset of favorable conditions; the **terminal** bud grows into the aerial shoot which **dies** at the end of the favorable season.
- Growth of rhizome takes place horizontally with the help of the **lateral bud** This type of rhizome is called **sympodial rhizome** - e.g. *ginger (Zingiber officinale), turmeric (Curcuma domestica), Canna*
- In some plants, growth of rhizome occurs with the help of **terminal bud.** These are called **monopodial rhizomes** - e.g. *Lotus, Pteris (a*

2. TUBER :





- Tubers are actually the swollen ends or tips of **special swollen underground branches**, due to the storage of foo (carbohydrate like starch).
- The tubers show nodes and internodes bear scale leaves with axillary buds, commonly called as **eyes**.
- Under favorable conditions these eyes sprout and produce aerial shoots.
- Thus tubers helps in **vegetative propagation.** Tubers do not produce adventitious roots, thus they differ from rhizomes e.g. ***potato (Solanum tuberosum).***

3. BULB :

- It is a condensed; **disc** like underground stem, which itself **does not store food** material.
- The **upper** surface of disc like stem is slightly conical and bears centrally placed apical bud and many concentrically arranged overlapping scale leaves.
- **Inner scale leaves** or leaf bases **store food** and are thick and fleshy, while **outer** few **scaly** leaves remain thin and dry and are **protective** in function.
- **Lower** surface of disc-like stem produces **adventitious roots**.
- The discoid stem with compactly arranged fleshy **leaves above** and fibrous **roots below** is commonly called bulb.
- It is almost spherical. When the fleshy scale leaves surround the apical bud in the form of **concentric rings**, it is called **tunicated bulb** e.g. *onion*.
- Sometimes they may **partially** overlap each other by their **margins** only, such bulbs are called **scaly bulbs** e.g. *garlic*.

4. CORM :

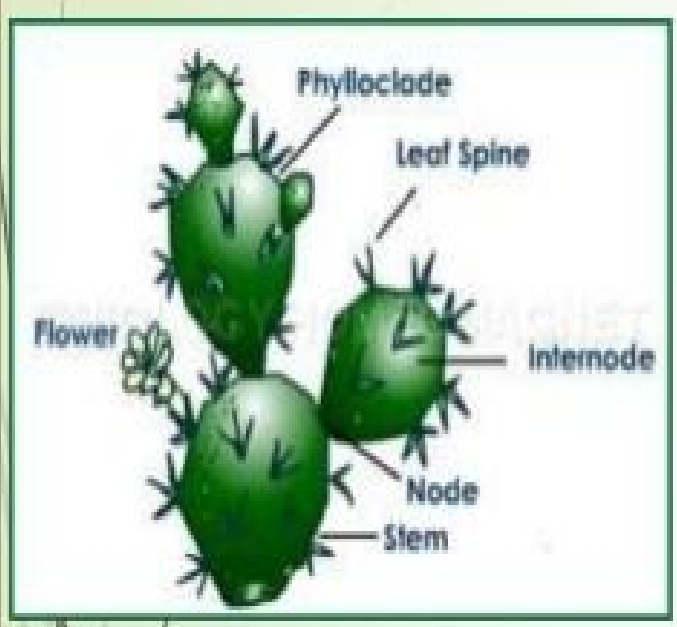
- Corm is a short, stout, fleshy, upright and thickened underground stem.
- It bears many **buds** in the axils of **scale** leaves which develop into **daughter** corms.
- At the bases or even from sides of stem **adventitious roots** develop.
- Corm is a condensed form of **rhizome growing vertically**, e.g., *Arbi (Colocasia), zaminkand (Amorphophallus etc.)*

Aerial modification (Epiterranean stem) :

1. STEM TENDRIL:

- It is a modification of stem in which **axillary bud** modifies to form a **thin, wiry**, and highly **sensitive** structure called tendril.
- Tendrils help the plant to attach itself to the **support** and **climb**. They are found in plants with weak stem. The tendrils are **leafless, coiled** structures with sensitive **adhesive glands glands** for fixation.
- An example of axillary tendril is *Passiflora (Passion flower).*
- In *Vitis* **apical bud** is modified into tendril and further growth is resumed by axillary bud.
- In *Cucurbita,* extra **axillary bud** is modified into tendril, while in *Antigonon,* **floral bud** is tendrillar.

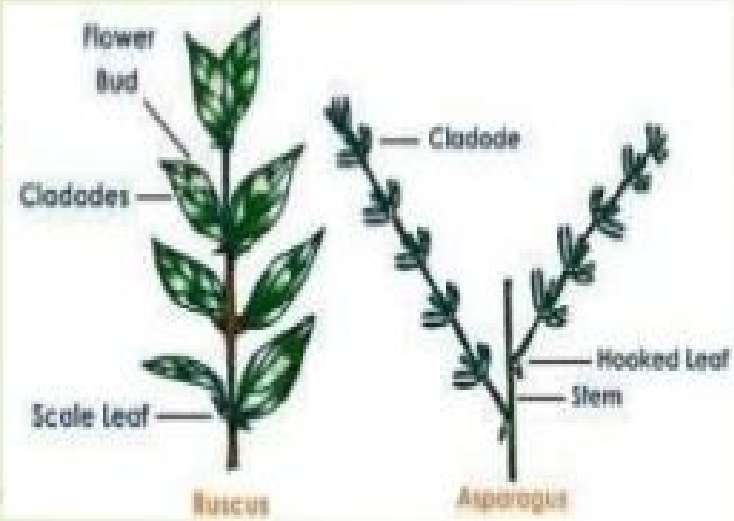
2. THORN:



- Thorn is a **hard, pointed** usually straight structure produced by modification of **axillary bud**.
- Leaves, branches and flowers are developed on thorns at the nodes, indicating that it is a modified stem.
- It provides **protection** against **browsing animals**. - e.g. *Citrus, Bougainvillea, Duranta* etc.
- In *Carrisa*, **apical bud** is modified into thorn.

3. PHYLLOCLADE:

- The phylloclade or **cladophyll** is a stem which gets transformed into **leaf** like structure.
- The phylloclade is **green**, flattened structure with distinct nodes and internodes.
- It is thick, fleshy and **succulent**, in *Opuntia* or *Nagphani*, cylindrical in *Casuarina* and *Euphorbia tirucalli* and ribbon like in *Muehlenbeckia*.
- In **xerophytes**, **leaves** get modified into **spines** or get reduced in size to check the loss of water due to transpiration and thus **stem** takes up the function of leaf, i.e. **photosynthesis**.



4. CLADODE:

- These are **green branches** of limited growth (usually one internode long) which have taken up the function of photosynthesis.
- **True leaves** are reduced to **scales** or **spines**, e.g. *Asparagus*

5. BULBILS:

- When axillary bud becomes fleshy and rounded due to storage of food, it is called bulbils.
- It gets detached from the plant, falls on ground and develops into a new plant, e.g. Dioscora.

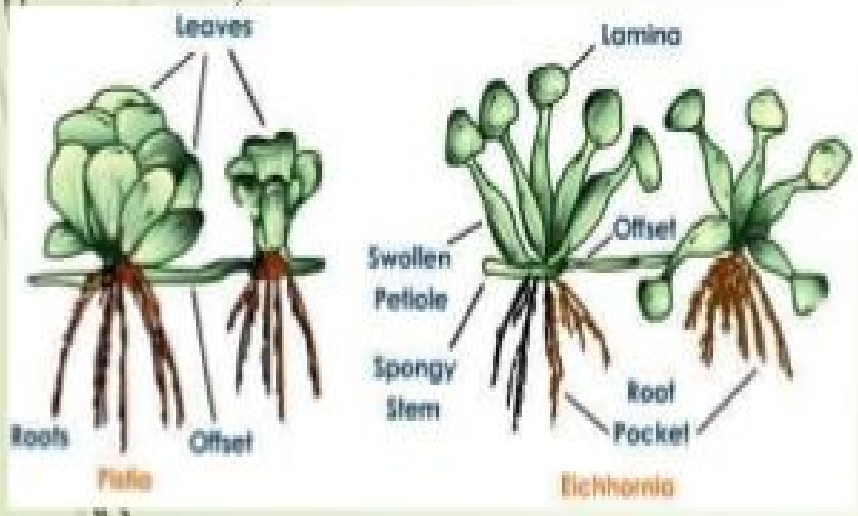
Sub-aerial modification :

1. RUNNER:

- These are special, narrow, **green**,**horizontal** or prostrate branches which develop at the base of erect shoots called **crowns**.
- **Many** runners arise from each erect shoot. They spread in **different directions** and bear new **crowns above** and and tufts of adventitious **roots below** at certain intervals.
- Each runner has one or more **nodes**. The nodes bear scale leaves and axillary buds,- e.g., *Doob grass (Cynodon dactylon), Hydrocotyl (Centella asiatica), Oxalis, etc.*

2. STOLON:

- Stolon is a slender **lateral** branch that arises from the base of the main axis.
- Initially stolon **grows upwards** like an ordinary branch branch and then **bends down** and touches the soil where its **terminal bud** gives rise to a new **shoot** and adventitious **roots**. - e.g., *jasmine, Mentha, and Colocasia.*

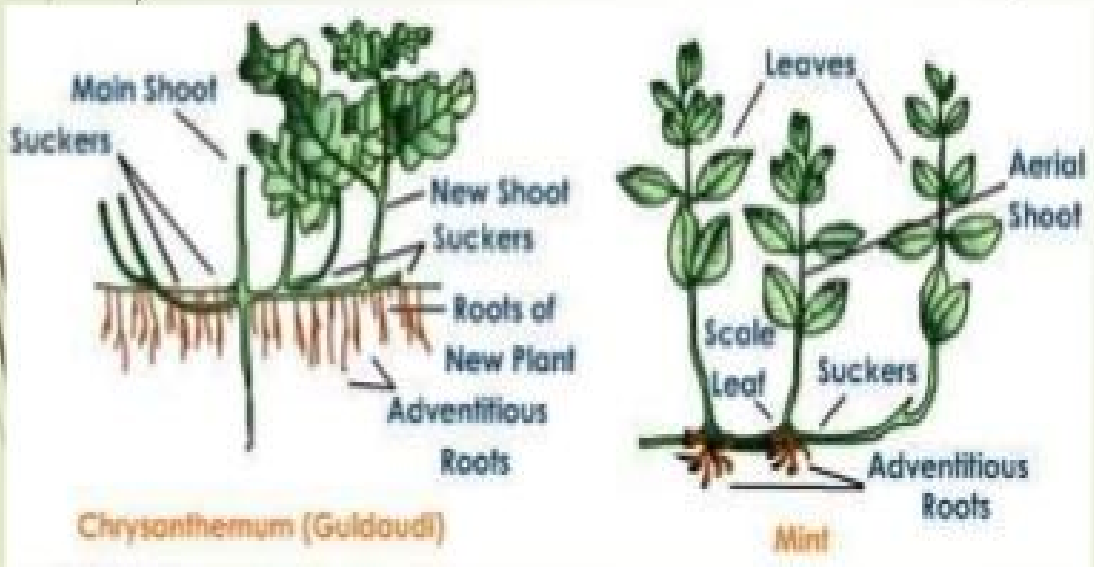


3. OFFSET:

- It is commonly called the **runner of aquatic plants**.
- It is shorter and thicker than runner.
- It helps in the **vegetative propagation** in aquatic plants, e.g. *water hyacinth or jalkumbhi (Eichhornia) and Pistia.*

4. SUCKER:

- Sucker is a runner like non-green branch which develops from the **axil of scale leaf** in the underground part of stem.
- It grows horizontally **below the soil** for some distance and comes **above** the soil obliquely and produces **green leaves** to form aerial shoots.
- The sucker can, therefore, be called **underground runner**, - e.g., *Chrysanthemum, mint (Pudina).*




THANK YOU