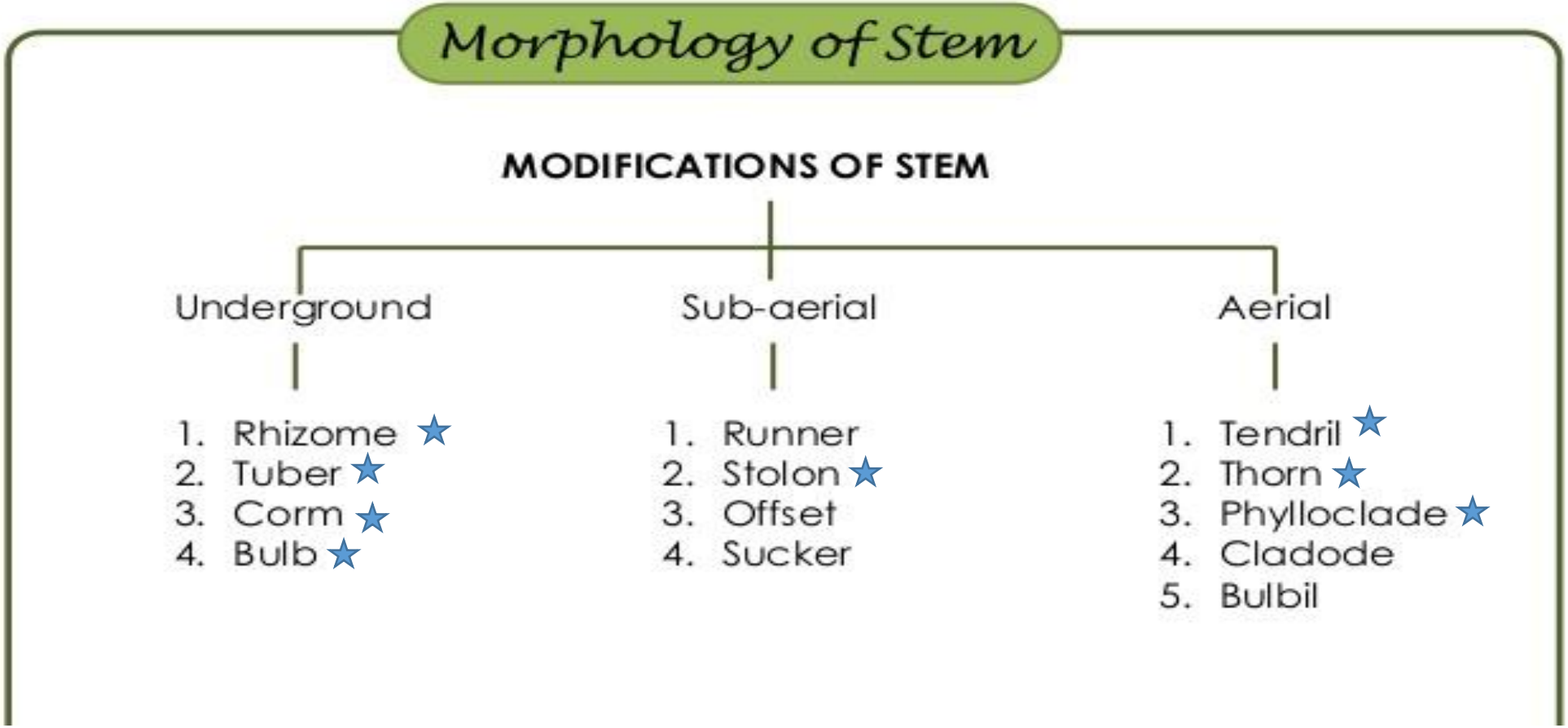
# 2019-2020
# PLANT MORPHOLOGY LAB.

**Dr. Aydan ACAR ŞAHİN**

**4th week**

# STEM MODIFICATIONS



# Morphology of Stem

## UNDERGROUND MODIFICATIONS

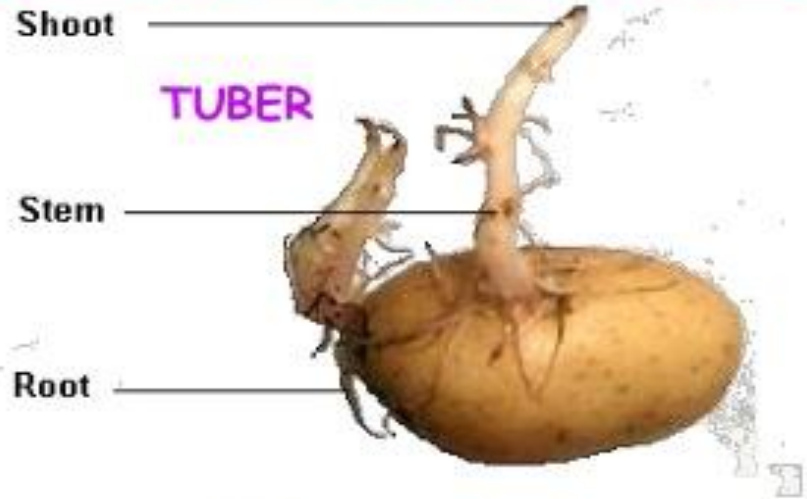
- In many herbaceous plants, stem develops below the soil and is called underground stem.
- Such stem remains dormant during unfavorable conditions and gives off aerial shoots under favorable conditions.
- These underground stems often store food and become fleshy.
- Underground stem perform three functions-
- storage of food, perennation and vegetative propagation.

They can be differentiated from roots by

- stem like internal structure,
- exogenous branching,
- presence of nodes and internodes,
- occurrence of foliage leaves or scale leaves at the nodes with axillary buds
- absence of root cap

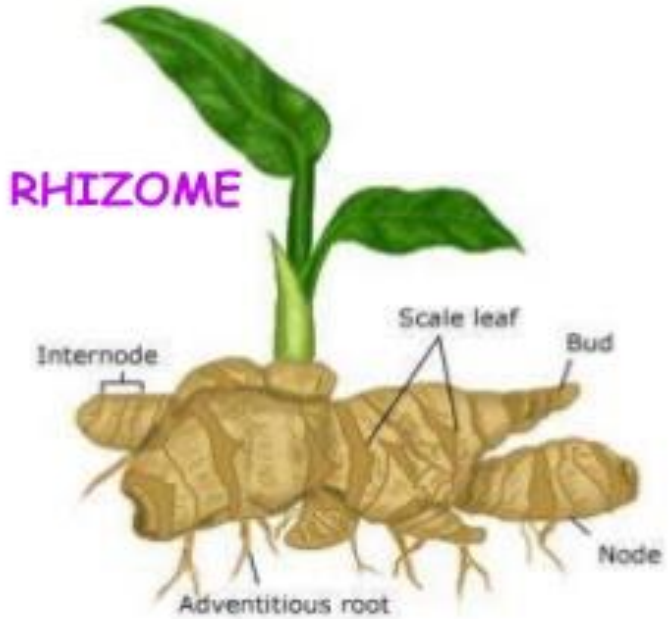
# MODIFICATION OF STEMS :

## I) UNDERGROUND MODIFICATIONS :





A. Tunicated bulb of onion B. L.S. of bulb

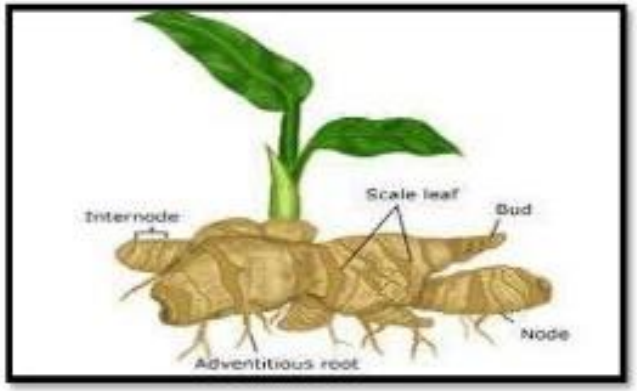



# Morphology of Stem

## UNDERGROUND MODIFICATIONS

**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.



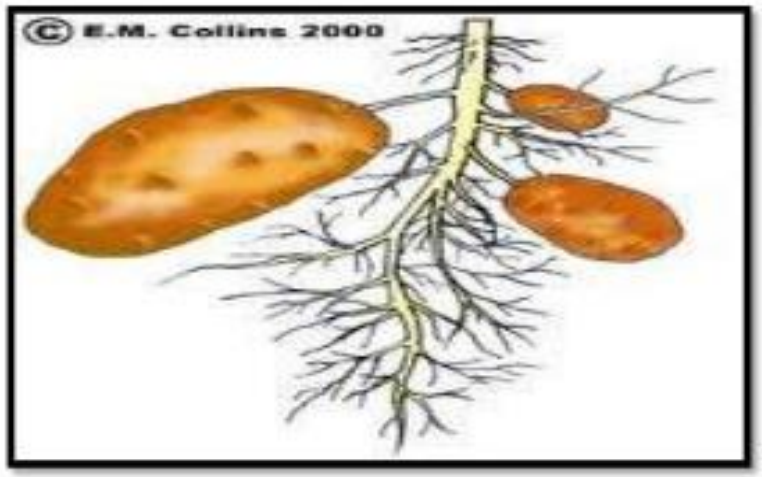

Iris (süsen)

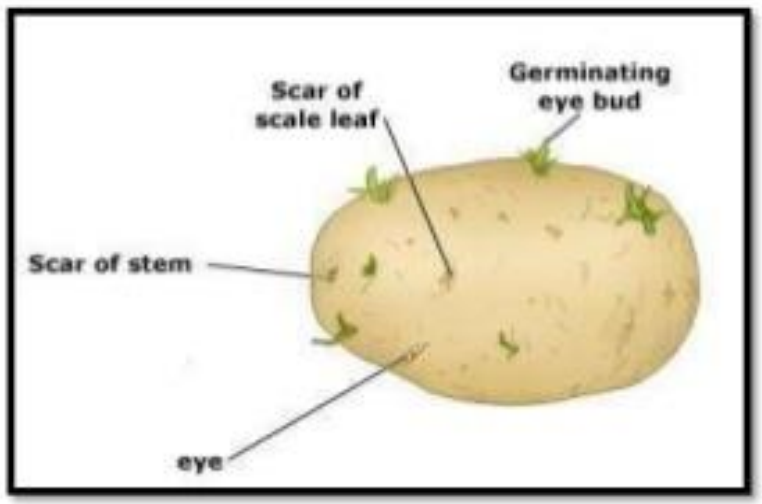
# Morphology of Stem

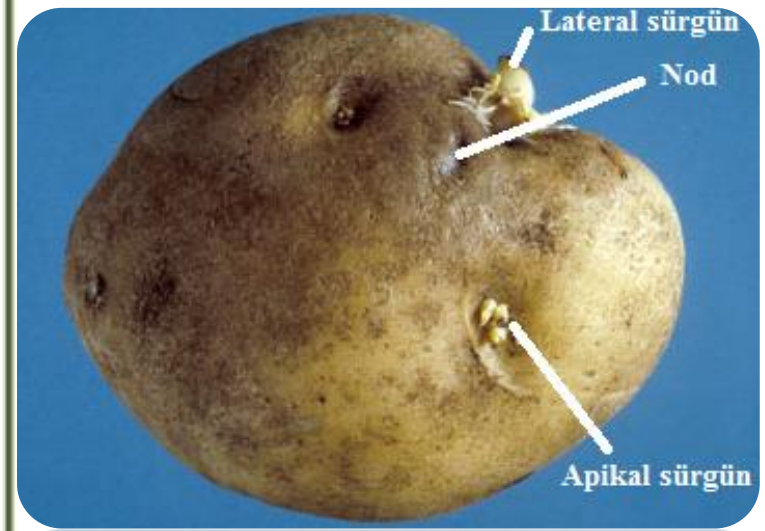
## UNDERGROUND MODIFICATIONS

**TUBER :**

- Tubers are actually the swollen ends or tips of **special swollen underground branches**, due to the storage of food (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)***



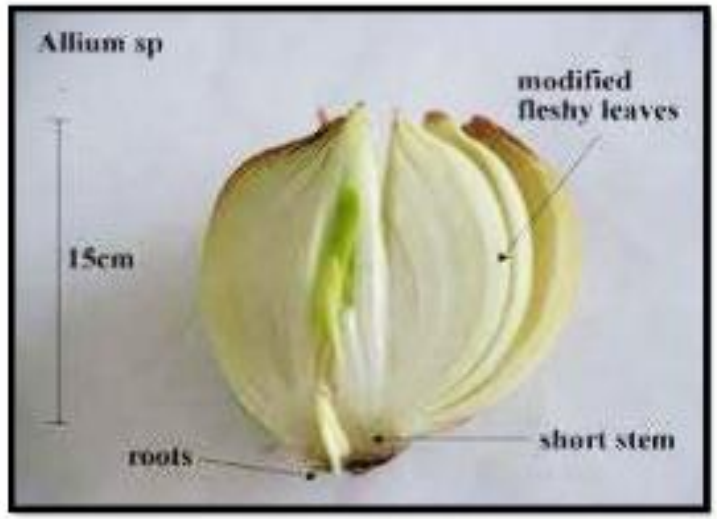

example; ***Solanum tuberosum*** **(potato)**

# Morphology of Stem

## UNDERGROUND MODIFICATIONS

**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**.





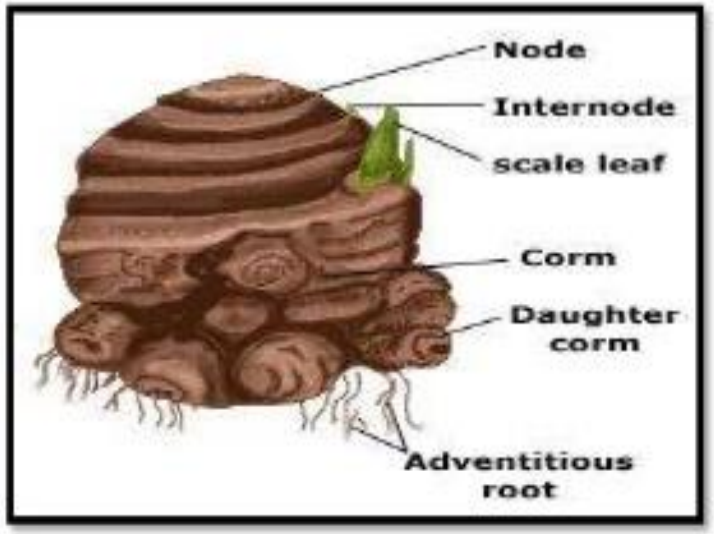
**example; *Allium cep*a (kurusoğan).**

# Morphology of Stem

## UNDERGROUND MODIFICATIONS

### 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.)*



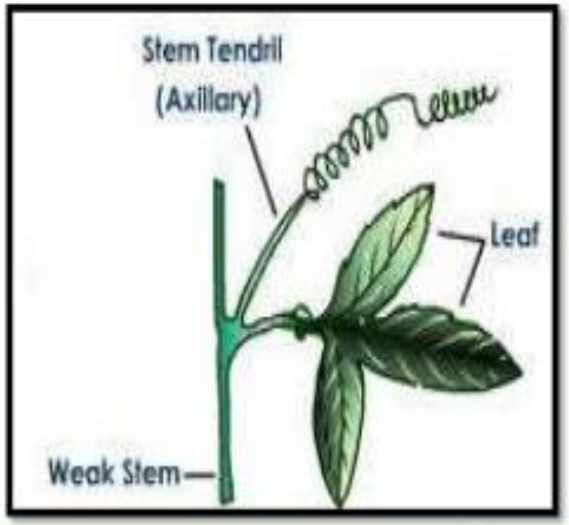

**example; Muscari sp.**

# Morphology of Stem

## AERIAL MODIFICATIONS

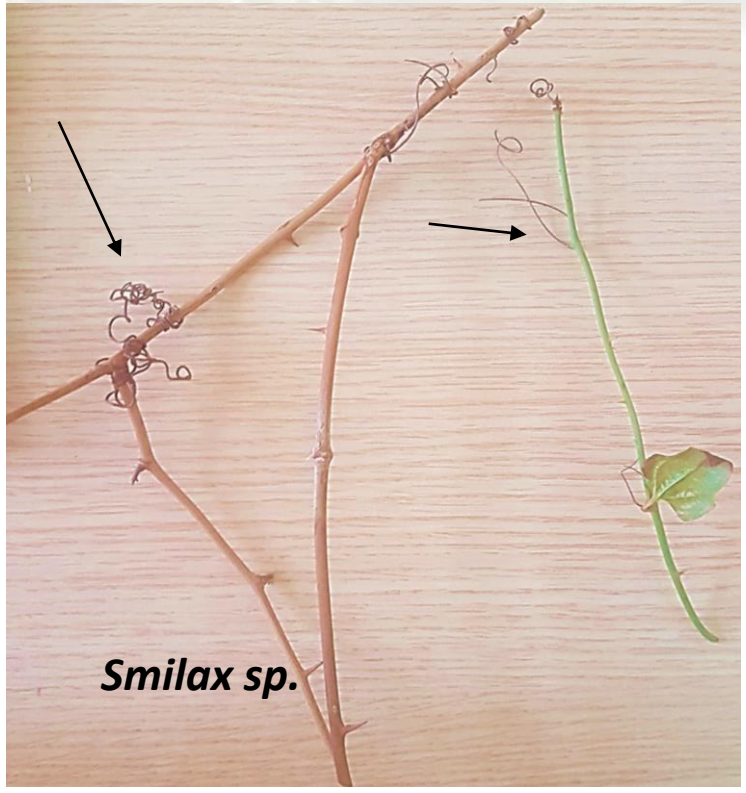
### STEM TENDRIL:

- 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** 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.





***Vitis vinifera* (Asma)**



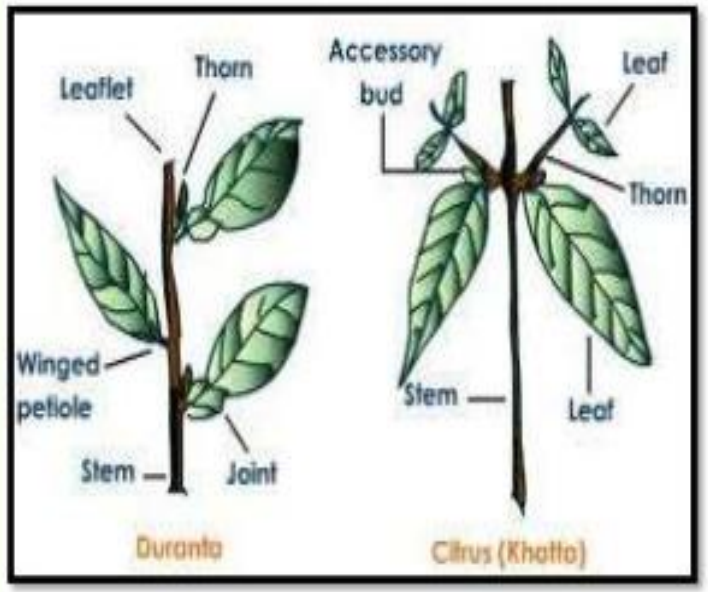
***Smilax sp.***

# Morphology of Stem

## AERIAL MODIFICATIONS

### 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.



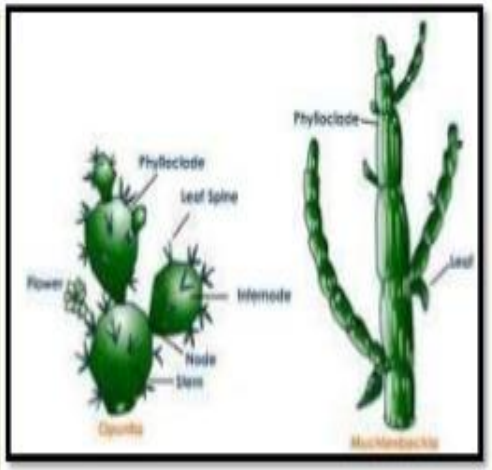

*Pyracantha*

# Morphology of Stem

## AERIAL MODIFICATIONS

### 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**.




This is a green, flattened rounded stem, usually found in the plants of dry and arid habitats. This stem structure has taken on the general appearance and functions of a leaf. Usually the phylloclades represent lateral branches.

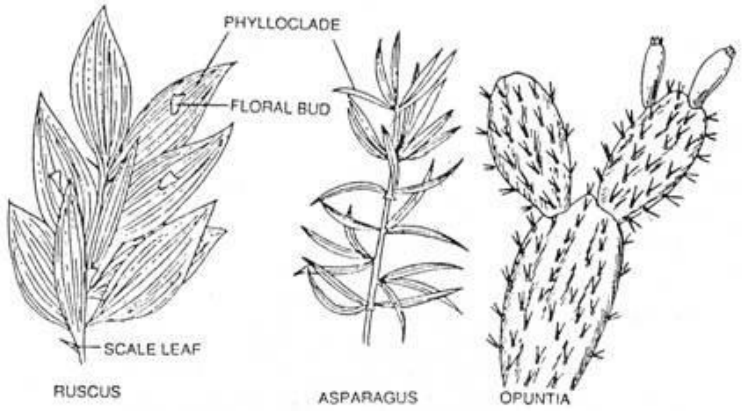
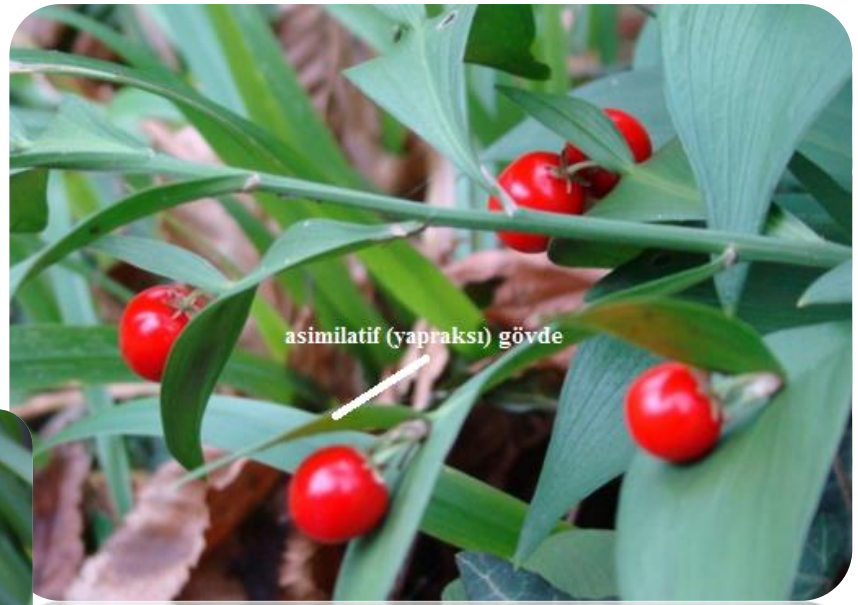



**Fig. 34. 31.** Stem modifications, Cladodes of *Ruscus*, *Asparagus* and phylloclade of *Opuntia*.

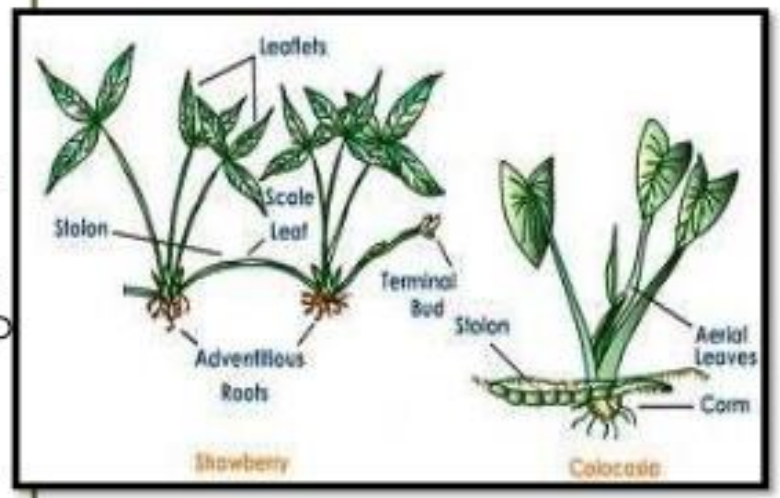


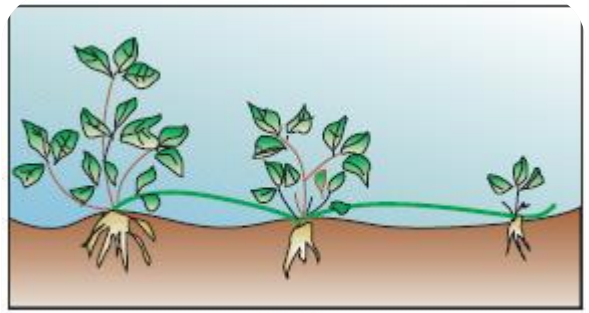
# Morphology of Stem

## SUB - AERIAL MODIFICATIONS

**STOLON**:

- Stolon is a slender **lateral** branch that arises from the base of the main axis.
- Initially stolon **grows upwards** like an ordinary 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, strawberry and Colocasia.*



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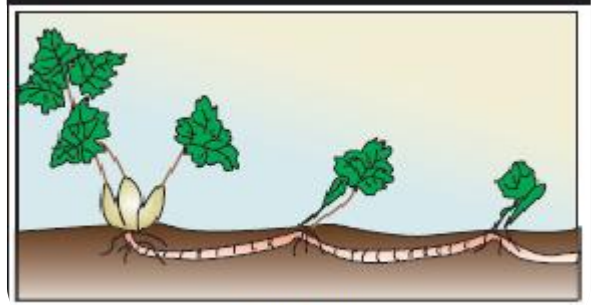

Ayrık otu