

6. STEM STRUCTURES (TYPES AND METAMORPHOSES)

2. STEM STRUCTURE

A-GENERAL INFORMATIONS

The **stem** of a plant is one of two structural parts of a vascular plant, the other being the root. The stem is the part above ground which provides support for leaves and buds.

The stem is normally divided into **nodes** and **internodes**. The nodes hold one or more leaves, as well as buds which can grow into branches. The internodes distance one node from another.

The plants that have a distinctive stem structure are called "**caulescens**". A plant that lacks an above-ground stem, other than the inflorescence axis, is called "**acaulescent**". Acaulescent plants bear major photosynthetic leaves only at ground level, often in a basal rosette.

In some condition,

In the majority of flowering plants, the stem is "**orthotroph**", so it rises vertically from the ground, such stem are called "**erect**" or "**upright**".

The stem rises after it have curved from the base, such stem are called "**ascendens**".

Reclining or lying on the ground with the tips ascending, such stems are called "**decumbens**".

Stems that lie on the surface of the ground but not rooted from the nodium are called "**procumbens**" or "**slanted**" bodies.

If the lie stem is rooted from the nodium, such stem are called "**repens**" or "**creeping**".

A **stolon** is a slender stem that grows horizontally along the ground, giving rise to roots and vertical branches at specialized points called "**nodes**". A stolon also called a "**runner**"

For example, *Fragaria vesca* (**strawberry**) can be given.

The stems that have climbing features like leaf stalk and tendrils are also called "**scandens**".

For example, *Vitis* (**grape**) and *Cucurbita* (**pumpkin**)

Stems that have some parts that are more than normally thickened and fleshy, usually to retain water in arid climates or soil conditions.

For example, members of the **Cactaceae** family can be given.

2. STEM BRANCHING TYPES

The distinct and typical arrangements of lateral branches on the stem are called "**branching**".

In high plants, there are two different types of stem branching shapes.

- 1. Monopodial branching**
- 2. Sympodial branching**

1-Monopodial branching: The main stem is dominant and terminal bud continues to grow as a central leader shoot and the lateral branches remain subordinate.

For example; *Picea* (spruce), *Verbascum* (mullein)



2. Sympodial Branching: This is a specialized lateral growth pattern in which the apical meristem (or bud) is terminated and growth is continued by one or more lateral meristems (or lateral branch).

The sympodial branching is divided into **3 groups**.

1. Monochasium: A cyme in which each flowering branch gives rise to one lateral branch, so that the inflorescence is helicoid or asymmetrical.

For example, the *Vitis* and some *Tilia* species can be given.

2. Dichasium: A cyme in which each flowering branch gives rise to two or more branches symmetrically placed.

For example, the *Viscum album* (birdlime) and some *Silene* species can be given.

3. Pleiokazyum: A cyme in which branching is continued by more than two lateral axes.

For example, *Euphorbia* (spurge) and some *Tilia* (linden) species can be given

3- STEM METAMORPHOSES

In many plants in addition to the normal functions mentioned above the stem performs certain additional functions. In these plants they show structural modifications.

A-UNDERGROUND METAMORPHOSES OF STEM

A number of herbaceous plants find it impossible to survive above ground during unfavorable seasons of the year, usually the winter. Thus, they are short living annuals. Many such plants store up food material in the underground parts.

1. Rhizome: It is a modified subterranean stem of a plant that sends out roots and shoots from its nodes.

Rhizome grows horizontally or vertically under the surface of the soil. It is fleshy, non-green underground stem. It has distinct nodes and internodes. The nodes bear dry scale leaves with axillary buds. Terminal buds also present. Adventitious roots arise from the lower side.

For example, member of *Iris* and *Zingiber* (ginger) genera can be given.

2. Tuber: They are enlarged structures in some plant species used as storage organs for nutrients.

Tuber is covered by a number small depressions called eyes'. These eyes are arranged spirally on the tuber. Each eye represents a node, bearing one or more buds subtended by a leaf scar. Adventitious roots are usually absent.

For example, *Solanum tuberosum* (patato), *Helianthus tuberosus* (jerusalem artichoke), and *Cyclamen sp.* species can be given.

3. Bulb: It is structurally a short stem with fleshy leaves or leaf bases that function as food storage organs during dormancy.

The bulbs may be tunicated or scaly. A tunicated bulb is covered by a sheath of dry membranous scale leaves called “**tunic**”. A scaly bulb is without any tunic

For example; *Allium* (onion), *Lilium* (lily), *Muscari*, and *Tulipa* (tulip) genus can be given.

4. Corm: The corm, sometimes called a solid bulb, is really a solid very much condensed vertical rootstock with a large apical bud.

It is more or less spherical with a flattered base. The corm has distinct circular nodes and internodes. There are some scale leaves on its body and adventitious roots grow either from its base or all over its body.

B-AERIAL METAMORPHOSES OF STEM

The aerial stem metamorphoses are divided into four groups which are phylloclade or cladophyll , succulent, tendril and spiny stem.

1. Phylloclade or Cladophyll and Cladode:

This is a very interesting modification met with in the xerophytic plants which have to greatly cut off all water loss.

These are fleshy, green flattened or cylindrical branches of unlimited growth. The leaves are modified into spines or scales to check transpiration. They take part in photosynthesis and store water .

Such flattened or swollen structures are called “**phylloclades**” or “**cladophylls**”.

For example, *Ruscus*, *Ephedra*, and *Opuntia* genera can be given.

Cladode is a type of phylloclade consisting of one internode only. A very beautiful example of this is *Asparagus racemosus* of *Liliaceae*. The ultimate branchlets are of one internode only. These are cylindrical (not fleshy) and are mistaken for leaves. They are cladodes while the leaves are reduced into prickles

2. Succulents Stem: They are fleshy succulent columnar shaped plants which conduct photosynthesis mainly through stems not leaves.

For example, members of *Cactaceae* and *Crassulaceae* can be given.

3. Tendril: It is a specialized stem, leaves or petiole with a threadlike shape that is used by climbing plants for support and attachment.

For example, member of *Vitaceae* and *Cucurbitaceae* family can be given.

4. Spiny stem: In some plants, short shoots are used to protect against external factors.

For example, *Gleditsia*, and *Colletia cruciata* can be given.

Thanks...