Quadrant II – Transcript and Related Materials

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Module Name: Stem and its types

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Name of the Presenter: Mrs. Bhagyashri Laxman Halarnkar

Notes

Stem: Definition, Characteristics, types of branching and functions.

Stem

A typical angiospermic plant is divided into two main parts:

I: Root system

II: Shoot system.

The shoot system constitutes the aerial, epiterranean parts of a plant lying above the soil. The axis of the shoot bearing leaves with buds in their axil is called the **stem**.

Characteristics

1. Stem is the ascending organ of the plant body that develops from the plumule.

2. It is positively phototropic and negatively geotropic.

3. It normally bears leaves, branches and flowers.

4. The stem also bears two types of vegetative buds, the apical bud / terminal bud which is present at the terminal end and the axillary bud present in the axil of the leaf. The axillary bud grows into lateral shoots, inflorescence or flowers.

5. It branches exogenously and it is provided with nodes and internodes. A node may be conspicuous in some plants e.g. Bamboos or may not be distinct at all. **Nodes and internodes**: The place on the stem or branch where one or more leaves arise is known as **node** and the space between two successive nodes is called the **internode**.

6. The surface of the stem is often covered with unicellular or multicellular hair of different kinds.

7. The stem is usually erect but may show the prostrate nature.

8. There are some plants which are stem less having very inconspicuous reduced stem such plants are called **Acaulescent.** The reduced stem may often elongate at the time of flowering into a leafless flowering axis known as **scape** as found in onion**.** The plants with distinct stem are called **Caulescent.**

9. In herbs, the stem is green in colour, herbaceous and photosynthetic throughout the life cycle of the plant. e.g. *Cassia tora*. In shrubs, it is green when the plants are young/ juvenile. As they grow, the stem becomes brown in colour and woody e.g. *Hibiscus rosasinensis* (shoe flower), Rose, etc. In trees, the primary stem is called the **trunk**. It is erect/ upright, rigid, strong, woody, and covered by the bark. The bark of such stem is brown or blackish brown or grey in colour and the texture is either smooth, exfoliating (splitting into large sheets), fissured (split and cracked) or flaky or ringed (with circular fissures). Because of the presence of well developed trunk, the trees are called **Arboreous** plants.

Types of branching in stem

There are two major types of stem based on the branching pattern.

A. Un-branched Stem

B. Branched stem

A. <u>Un-branched Stem</u>:

Stem is un-branched, growing in ascending direction because of the activity of apical bud. It is divided into two kinds:

a) Caudex Stem

The un-branched, erect, cylindrical, stout and strong main stem marked with scars and remnants of fallen leaves is called **caudex** or **columnar stem**. These plants bears the crown of leaves at the terminal end. e.g. Palms like *Cocos nucifer*a (coconut), *Caryota urens* (fish tail Palm), *Areca catechu* (Nut Palm vern. Supari) and *Borassus flabelifer* (Fan palm).

b) **Culm**

The stem is un-branched showing distinct nodes and internodes imparting it a jointed appearance. The nodes in these plants are solid whereas the internodes are hollow. e.g. *Bambusa sp.* (Bamboos).

<u>B. Branched Stem</u> -The mode of arrangement of the branches on the stem is known as **branching**. The branches develop exogenously from the lateral vegetative buds. In branched stem, branching is of two kinds - Lateral branching and Dichotomous branching.

a) **Lateral branching**

The growing point does not get divided. Lateral branching is further divided in to monopodial and terminal lateral branching.

i) Monopodial / Racemose / indefinite branching –

The terminal bud i.e. the main stem grows indefinitely. The lateral branches are borne over it in an acropetal succession, (i.e., older towards the base and younger towards the tip. The older lower

branches are longer than the upper ones). The lateral branches do not compete with the main axis. The trees with monopodial branching shows conical or pyramidal shape and are called **Excurrent** e.g., *Polyalthia sp.* (Ashok Tree), *Eucalyptus sp*.

ii) Sympodial / Cymose/ Definite branching –

The terminal bud, after forming a small portion of the axis, either loses its activity or gets modified into a flower, tendril, thorn, etc. Further growth of the axis is continued by one or more axillary branches.

In case of Mango (*Mangifera indica*) or banyan (*Ficus bengalensis*), the terminal bud loses its activity and axillary buds grow vigorously to form a large spreading tree. These trees appear more or less dome shaped and are called **decurrent or deliquescent trees**.

Cymose branching is of following types:

1. Bichasial sympodial branching: In *Carissa caranda* (Karvand), *Mirabilis jalapa* (Four o'clock), *Plumeria spp*. (Temple tree), etc. two lateral axis develop at a time. The branching is called **biparous or bichasial sympodial** branching. Sometimes it so happens that the terminal bud remains undeveloped and soon falls off, the branching then looks like a dichotomy often called **false dichotomy**.

2. Uniparous sympodial branching: In this type only one lateral branch is produced at a time. It has two distinct forms.

Helicoid or one sided cyme- when successive lateral branches develop on the same side forming a sort of helix. e.g., *Saraca sp*.

Scorpiod cyme-When successive lateral branches develop on alternate sides forming a zigzag. e.g., *Vitis sp*. (Grape vine), *Cissus quandrangularis* (Hadjod)

3. **Multiparous cyme:** If more than two branches develop at a time, the branching is said to be **multiparous or polychasial.** e.g., *Euphorbia tirucali*

b) Dichotomous branching - the terminal bud gets divided into two, producing two branches in a forked manner, e.g., *Pandanus sp.* (Screw pine/ Kevada), *Hyphaene sp*. (Doum Palm).

Chief functions of stem

1. The stem and branches bear leaves, flowers and fruits. The stem spreads these parts on all sides for proper functioning. The leaves to get adequate amount of sunlight for photosynthesis. The flowers to attract the insects for pollination and fruits for seed dispersal.
2. Conduction: The stem conducts the water and dissolved mineral nutrients from roots to the leaves. Similarly the photosynthates from leaves to all the parts of a plant such as roots, flowers, fruits etc.
3. Support: the main stem acts as a sort of pillar supporting the branches which often spread in different direction to push forward the leaves and flowers.
4. Storage: In some plants, the stem acts as a store house of food material as well as water.
5. Food manufacture: the herbaceous stem and the stem of young shoots in shrubs and trees can manufacture food as they are green in colour because of the presence of chloroplast.
6. Stem is used for vegetative propagation.