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CLASSIFICATION OF MERISTEMS

Meristems are classified according to their method of development, their origin, their position in the plant body, their function and their plane of division.

CLASSIFICATION OF MERISTEM ACCORDING TO THEIR STAGE OR METHOD OF DEVELOPMENT

Promeristem

It is the region of new growth in plant body where the foundation of new organs or their parts is initiated. It is also known as primordial meristem, embryonic meristem etc. This part comprises the apical initials and their immediate derivatives. Promeristem is composed of all young thin-walled cells which are alike in shape, full of non vacuolate or vacuolate active cytoplasm, and large nuclei, intercellular spaces are absent or minute.

CLASSIFICATION OF MERISTEM ACCORDING TO ORIGIN

Meristems are classified into primary and secondary according to the nature of the cells that gives origin to such meristems.

Primary meristem

Primary meristem are those whose cells originate directly from the embryonic cells and thus constitute a direct continuation of the embryo. Such meristems practically consists in part of promeristem. In primary meristems, promeristem is always the earliest stage and transition stage to permanent tissue constitute the remainder of the meristem. Primary meristems continue to divide or retain the power of division and build up the fundamental that is primary part of the plant. The main primary meristems are the apices of stems, roots and the primordia of leaves and similar appendages.

Secondary meristem

Secondary meristems may be defined as those meristems that develop from mature that is permanent tissues which have already undergone differentiation. Secondary meristems are so called because they arise as new meristems in permanent tissue which is not meristematic.

Like primary meristems, they have no typical promeristem, though their initiating layers may often resemble such tissue. Examples of the secondary meristem are the phellogen that develop from permanent tissues i.e. parenchyma and collenchyma that have already gone differentiation, and callose tissue which develops in tissue cultures made from permanent tissues.

The secondary meristems add new cells to the primary body forming supplementary tissues during secondary growth or serve in protection and repair of wounded regions.

CLASSIFICATION OF MERISTEMS ACCORDING TO THEIR POSITION IN THE PLANT BODY.

Meristems are classified in to three different types -apical, intercalary and lateral.

Apical meristems

This type of meristem occurs at the apices of the main and lateral shoots and roots, and often of the leaves of vascular plants and thus represent their growing points. Apical meristem includes the promeristem and the meristematic zone behind it, that is, primary meristem in which three basic system example the protoderm, the procambium and ground meristem of the tissue system can be distinguished.

Increase in length of the axis is mainly due to activities of the apical meristems. Apical meristems are also called growing points. A single apical cell is found in the apical meristem of pteridophytes but in case of higher plants that is the spermatophytes, a group or groups of cells constitutes the apical meristem, called apical initials or apical cells. Such apical initials may occur in one or more tiers.

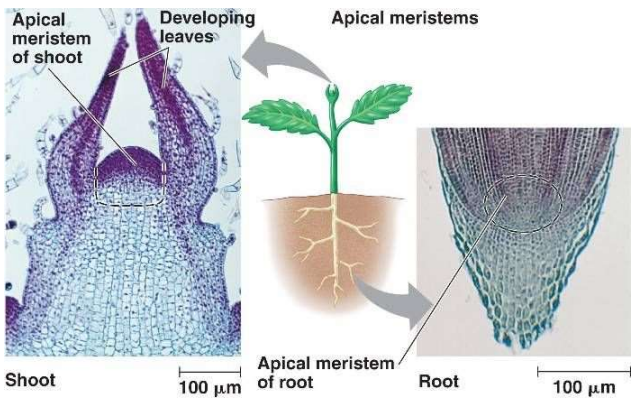


FIG: Apical meristems of shoot and root.

Intercalary meristems

As the name indicates, these meristems are inserted between the permanent tissues. Their origin takes place when actively growing primary tissue regions get detached from the apical meristem due to the growth of organs as a result they finally remain embedded between masses of permanent tissues.

Intercalary meristems are found in different organs of plants example at the leaf base as in *Pinus* sp., or at the base of the internode as in the stem of many grasses of monocot and *Equisetum* species of pteridophyte or at the base of the node as in *Mentha* species of dicot etc. Increase in the length of the axis and its branch is the main function of this type of meristem. Intercallary meristems are short-lived, either they merge with the neighbouring tissues or are converted into the permanent tissue.

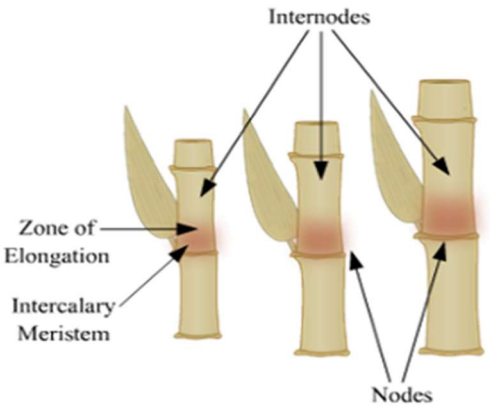
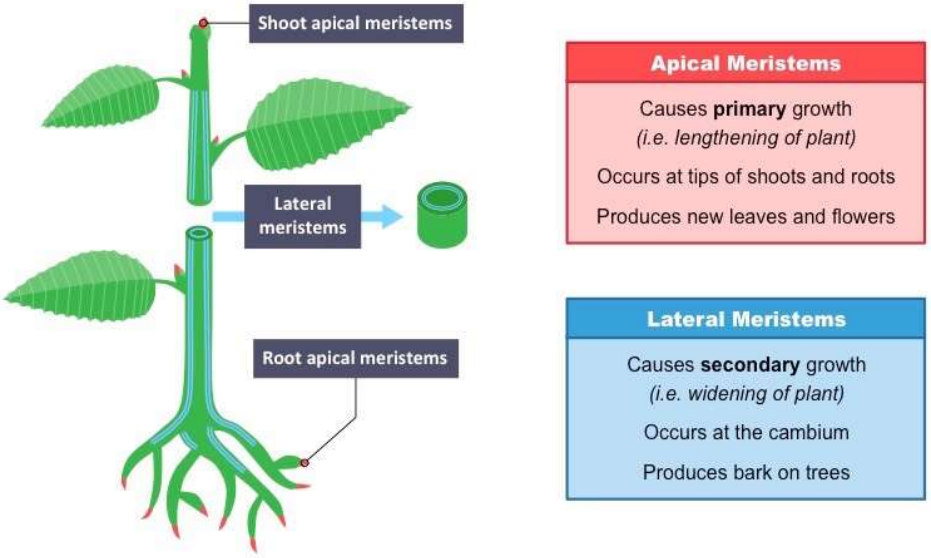


FIG: Intercallary Meristem

Lateral meristems

Lateral meristems are situated laterally that is parallel to the circumference of the organs (the root and the stem of gymnosperms and dicotyledons) in which they occur. This meristem is known as lateral due to its lateral position. Lateral meristem is always composed of a single layer of rectangular cells which divide mainly in one plane that is periclinally and gradually produce new that is secondary permanent tissues. The vascular cambium (fascicular cambium) and the cork cambium (phellogen) are the examples of lateral

meristems. Increase in diameter of the plant organs is a main function of the lateral meristem.



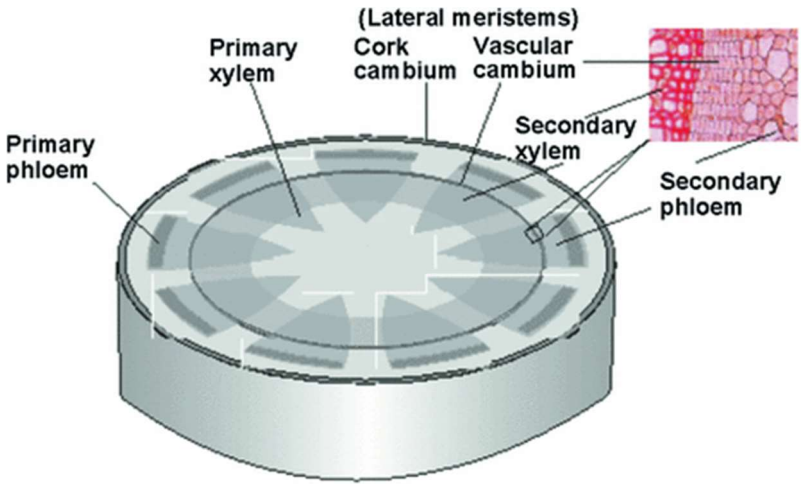


FIG: Lateral meristem in T.S

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CLASSIFICATION OF MERISTEM ACCORDING TO THEIR FUNCTION

In physiological plant anatomy, this functional classification of the meristem has been followed and accordingly meristems are classified into-

- Protoderm
- Procambium
- Fundamental or ground meristem

Protoderm - the outermost cell layer. Cells after radial division gives rise to epidermis. In *Ficus*, multiple epidermis is formed due to tangential division.

Procambium - the elongated tapering cells of the growing region constitute procambium. Procambium strands occur in a ring in case of dicotyledonous stem. The ring is separated into a number of isolated strands each of which develops into a vascular bundle constituting of xylem, phloem and cambium. The strands are scattered in monocotyledonous stems. In roots only one procambium strand is found in the centre. The procambium stands gradually increase giving rise to pericycle in some stems.

Fundamental or ground meristem - the rest of the meristematic tissue other than the protoderm and procambium forms the ground meristem. It is gradually differentiated into cortex, medullary rays and the pith.

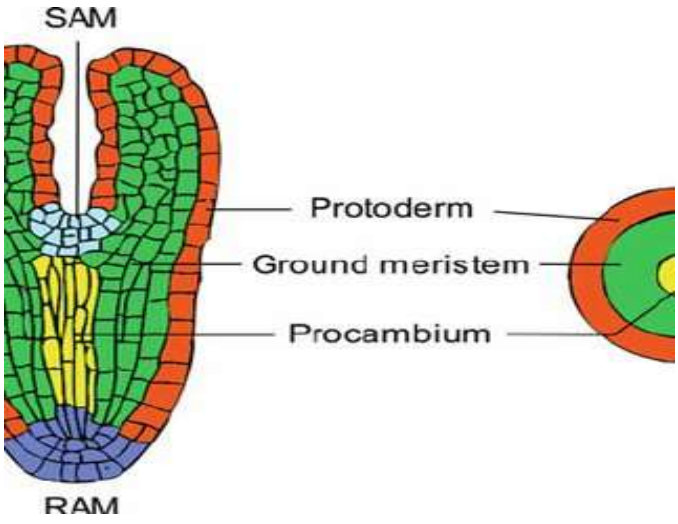

FIG: Position of meristems according to their function.

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CLASSIFICATION OF MERISTEMS ACCORDING TO THE PLANE OF DIVISION

On the basis of plane of division, mass, plate and rib meristems have been distinguished as growth forms of meristems.

Mass meristem or block meristem- in this type, growth is by three plane or all plane and produces increase in mass. Early stages of many embryos, developing sporangia, the endosperm of many plants, young pith and cortex of most plants are the examples of mass meristems.

Plate meristem - here division occurs mainly anticlinally in two planes, so that there is plate like increase in area. One layered plate meristem forms epidermis and two several layered and contribute in the leaf development. Example: the growth of flat leaf bade, uniseriate epidermis etc.

Rib meristem or file meristem - here division occurs continuously in one plane as a result columns or rows of cells are produced. Increase in length of organs takes place as a result of this type of division. Example formation of young roots and of the pith and cortex of young stems.

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