

✍ Compiled by Dr. Priyanka Chatterjee, Asst. Prof. Botany, RDS College, Muz, BRABU

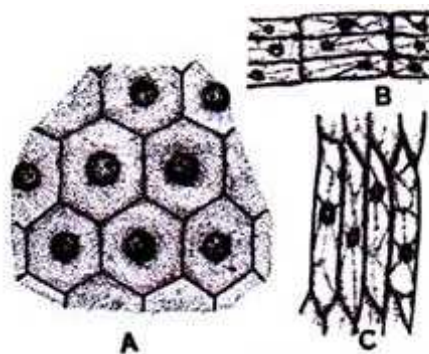
™ Meristem Tissue: -

Meristem is the short form of meristematic tissue. It is a group of cells which are in a continuous state of division or a group of cells which retain their power of division.

The meristematic tissues have cells with following characteristics features:-

1. They may be rounded, oval, polygonal or rectangular in shape.
2. The cells have their walls made up of cellulose. These have no intercellular spaces between them.
3. These do not store reserve food material and are in an active state of metabolism. These have plastids present in proplastid stage.
4. The cells have abundant protoplasm with numerous small vacuoles. Sometimes the vacuoles are all together absent.
5. They have large nuclei.
6. The cells have a small amount of endoplasmic reticulum and a less elaborate internal structure in their mitochondria than the cells of permanent tissue.
7. The cell wall is thin and homogenous.

According to Kaplan the meristematic cells having structural features as mentioned above are termed as Eumeristem or true meristem.



Meristematic cells. A. Typical meristematic cells. B. Cambium cells in transverse view. C. Same in longitudinal view.

It has been stated that meristems are the formative regions where new cells are added to the body. Besides, the meristems perpetuate themselves.

The cells which remain meristematic and thus continue cell division are called initiating cells; whereas the cells formed by them, the so-called derivatives, gradually change their shape, enlarge, lose the power of cell division and ultimately become mature cells with some definite characters and functions.

These changes involving enlargement and specialisation represent the process which may be referred to as differentiation. The differentiation of a particular tissue has been characterised as “a progressive loss of embryonic features of meristematic cells and the progressive attainment of the state of maturity” by a well-known authority.

The derivatives of the initiating cells gradually differentiate into mature cells and lose the power of cell division, at least temporarily. These completely differentiated cells are called permanent ones. Some permanent cells may get back the meristematic nature, a phenomenon which has been referred to as dedifferentiation by some workers. That shows that though cells have attained permanent form, but they have retained the power of cell division.

The living parenchyma cells and the epidermal cells are common reversible permanent cells. In fact, all living cells retain the potentialities of division and growth, though they have become permanent. Strictly speaking, permanent cells are those which have completely lost the capacity of division, as for example, irreversibly specialised cells like the sieve tube elements and the dead elements like tracheids and cork cells.

Various systems of classification of meristems have been proposed, based on characters like origin and nature of initiating cells, stages of development, topography and function. No system is exclusive and rigid.

Types or Classification of Meristem:-

Meristems are classified variously depending upon different basis. These are classified according to their position in the plant body, their origin, their method of development as well as on the basis of their function.

Classification of meristem based upon position in the plant body: -

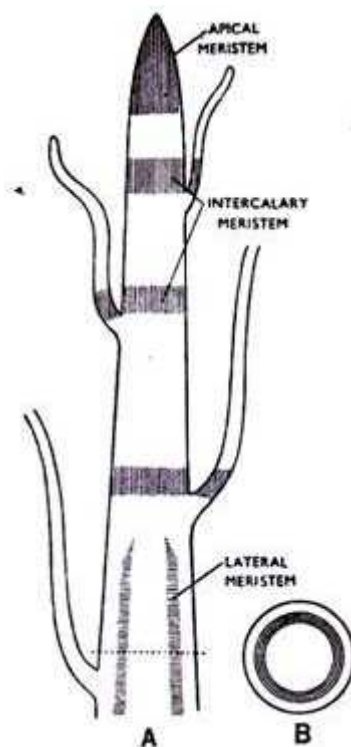
On the basis of position in the plant body, meristems are classified into three distinct types:-

i) **Apical meristem:-** This type of meristem occurs at the apices of shoots and roots. They occupy the apex of both the main axis as well as the lateral branches. It includes the promeristem and the meristematic zone behind it.

The activity of apical meristem increases the length of the axis therefore these are also called the growing points. In case of higher plants the apical meristem includes a group of cells while in case of pteridophytes the apical meristem is represented by a single apical cell.

ii) **Intercalary Meristem:-** These are the meristems which are inserted between permanent tissues. Their origin takes place when actively growing primary tissue region gets detached from the apical meristem due to the growth of organs as a result they finally remain embedded between masses of permanent tissues. These may be present either at the base of internode as in case of various grasses or at the base of node as in *Mentha* species. Its activity results in to the increase in length of the plant or its organ.

The intercalary meristems are short lived and either they merged with the neighboring tissue or become converted into permanent tissue.



A-Diagram showing the position of meristem in the plant body

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iii) **Lateral Meristem:-** These are the meristems situated laterally to the longitudinal axis of the plant. It means they are present or situated parallel to the circumference of the organ in which they occur. It is always composed of a single layer of rectangular cells which divide mainly in one plane i.e. periclinally. Their activity results in to increase in thickness of the plant body. These are responsible for the development of secondary permanent tissues. Examples of such tissues are various types of cambia.

Classification based upon origin: -

On the basis of their origin meristems can be classified in to three different categories:-

i) **Promeristem:-**It is also known as primordial meristem or embryonic meristem. It is the region of new growth in the plant body where the foundation of new organs or their parts is initiated . It is composed of all young thin walled cells which are alike in shape and full of non-vacuolate or vacuolate active cytoplasm and large nuclei. The intercellular spaces are absent among them.

- ii) **Primary Meristem:-** These are the meristem whose cells originate directly from the embryonic cells or the promeristem. These constitute a direct continuation of the embryo. These meristem continue to divide and build up the fundamental or primary part of the body. The apical meristems, the fascicular cambium and intercalary meristem are primary meristem.
- iii) **Secondary Meristem:-**These are the meristems which develop from mature or permanent tissue. Sometimes the permanent tissues have to perform division due to the demand of the situation. These do not have any association with promeristem and are responsible for the growth in thickness of the plant body. Examples of such meristems are Phellogen and interfascicular cambium.

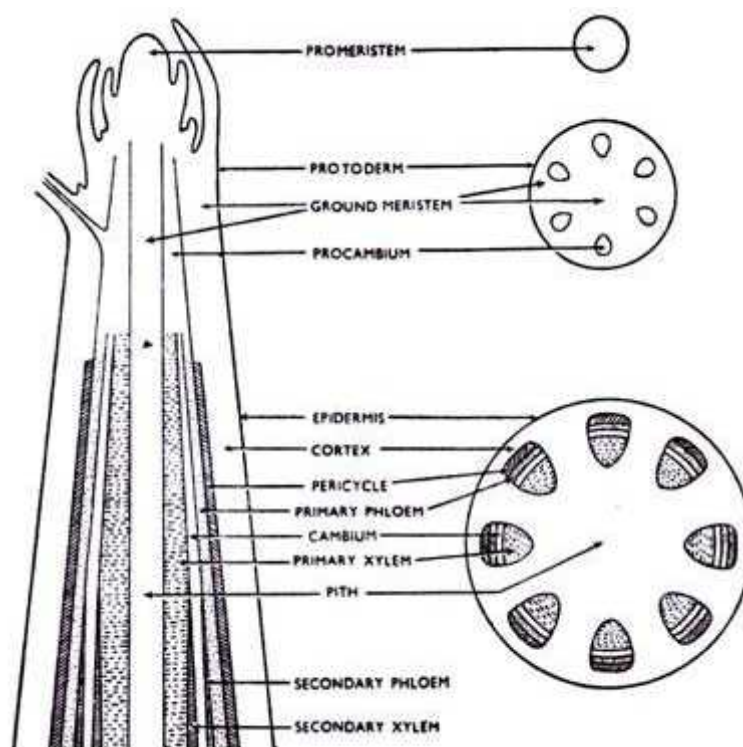


Figure of meristem showing different Histogen layers in stem with longitudinal (left) view and transverse (right) view