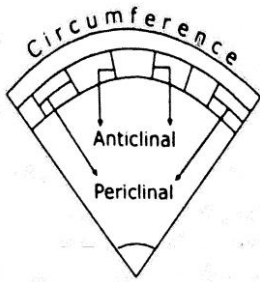


Tunica Corpus Theory:

After the rejection of apical cell theory and Histogen theory (by Hanstein, 1868, 1870), **A. Schmidt (1924)** proposed the Tunica-Corpus theory based on the observations on angiosperm shoot apex.

According to this theory- the initial region of apical meristem consists of -

- (i) **The Tunica**- one or more peripheral layers of cell that divide in planes perpendicular to the surface of meristem (*i.e.* **anticlinal divisions**) and
- (ii) **the Corpus**- a body of cells several layers deep in which the cells divide in various planes.



Tunica:

Tunica as defined previously is the peripheral tissue zone of shoot apex which are characterised by anticlinal divisions as a result tunica grows as a sheet (surface growth) comprising of smaller and more regularly arranged cells.

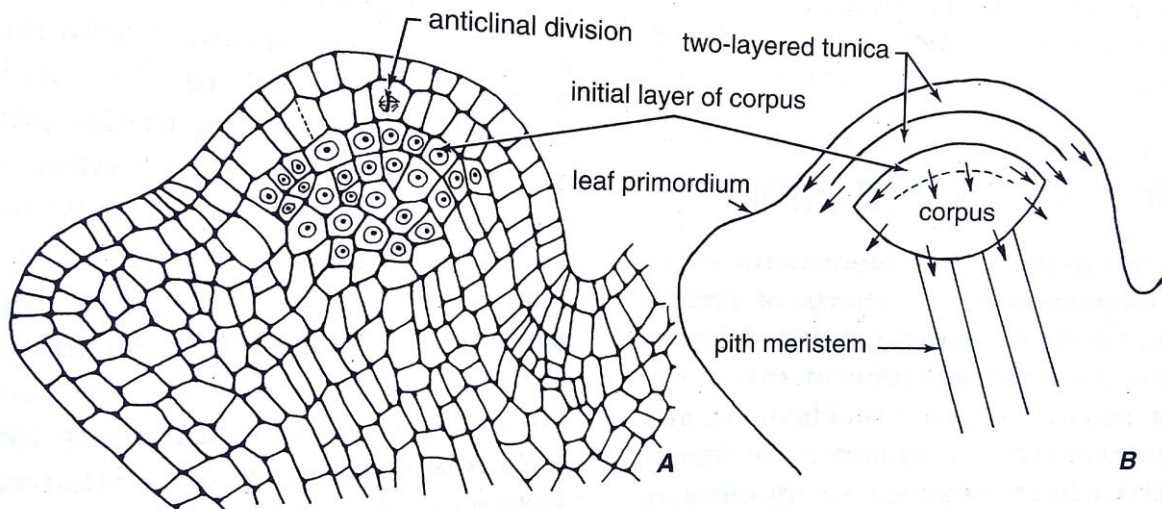
No. of layers: Tunica may be one layered (*i.e.* called *monostratose tunica*) or many layered (*i.e.* *multistratose tunica*, as seen in *Xanthorrhoea media* which shows 10 – 18 layered tunica), but most often 1-9 layered in angiosperms (1-5 in dicot and 1-4 in monocots). Although majority of angiosperm exhibits two layered tunica (L1 and L2) overarching the Corpus (L3).

Initial cells: Each layer of tunica arises from a small group of separate initial cells *i.e.* the number of tiers of initial cells is equal to the number of layers of tunica.

Divisions: Periclinal division normally absent in tunica except at the point of origin of leaf primordium and axillary bud. However, *Zea mays*, *Agropyron repens*, *Chlorogalum pomeridianum* shows periclinal divisions in tunica. Therefore some anatomist use the term Tunica strictly to address the layers undergoing anticlinal division only, and some use tunica in loose sense where they suggest it may undergo periclinal division periodically.

Cytohystological zonation: There are two cytologically recognisable zones in tunica- (a) Central apical zone- consisting of one or few initials which are larger cells with enlarged nucleus and vacuoles therefore lightly stained and (b) the region on sides of apex between initials and leaf primordia.

Functionality: The main function of tunica is to give rise epidermis, sometimes the inner layers of tunica may form cortex and even vascular tissue.



Corpus:

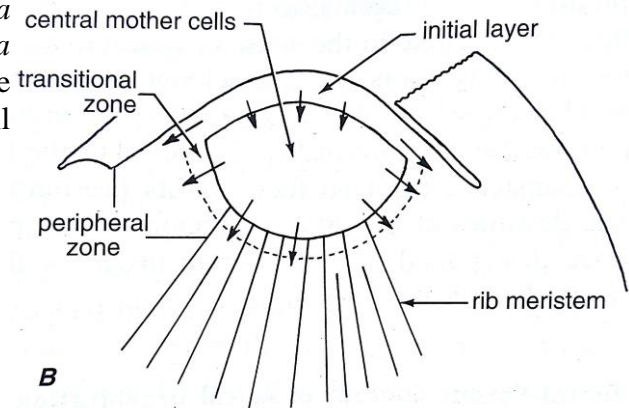
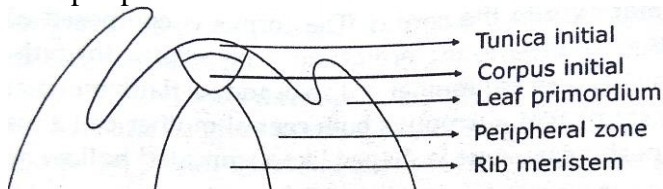
The inner zone of cells which comprising of larger and haphazardly arranged cells undergoing cell divisions in various planes referred as corpus.

Initial cells: The initial cells of Corpus arranged just below the tunica which arises independently and undergoes periclinal division first and then the resulted derivative cells undergoes cell division in various planes.

Cytohystological zonation: Popham (1952) illustrated several zonation in corpus layers of angiosperms, commonly referred by Fahn as

A) Usual angiosperm type: which refers to 3 zones- (a) Zone of Central mother cells- the uppermost zone *i.e.* corpus initials; (b) Pith-rib meristem- below the central mother cells; (c) Peripheral meristem (flank meristem): that surrounds the abover two. Another type named as-

B) *Opuntia* type- which is seen in *Opuntia cylindrica*, *Phoenix dactylifera*, *Bougainvillea spectabilis* etc., an additional cambium like transitional zone is seen between central mother cell and peripheral meristem.



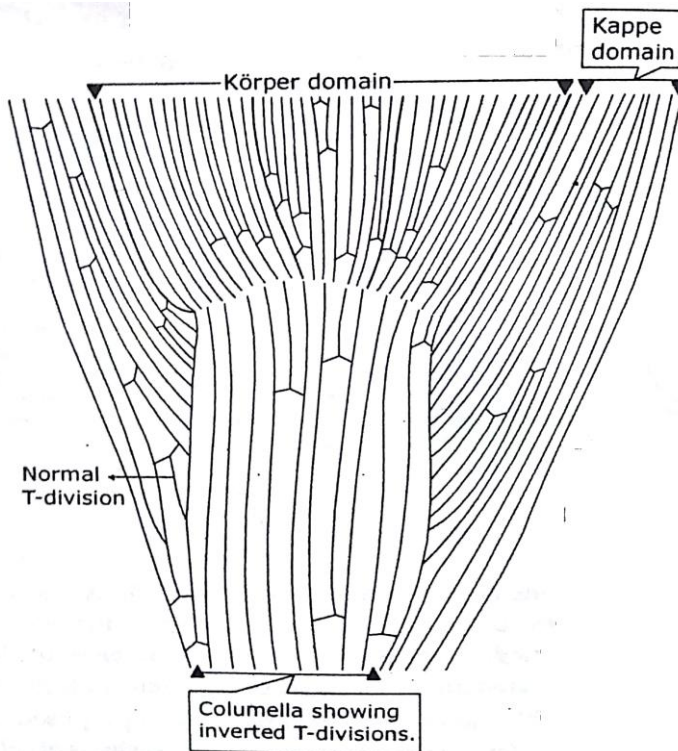
Functionality: Central mother cells being composed of initial cells are precursor of two other zones. The rib meristem usually becomes pith after additional meristematic activity has occurred. Peripheral meristem (flank meristem) is the most active meristem (hence also called Eumeristem) which forms leaf primordia.

Körper-Kappe Theory:

Excepting apical cell theory (by Nageli) [which is confined to vascular cryptogams only] and Histogen theory (by Hanstein, 1868, 1870) by which root apical meristem can be explained, Schüepp (1917) proposed the Körper- kappe (body-cap) theory which explains the growth of root tips recognising the two system of cell seriation with refernce to the planes of cell division in its parts.

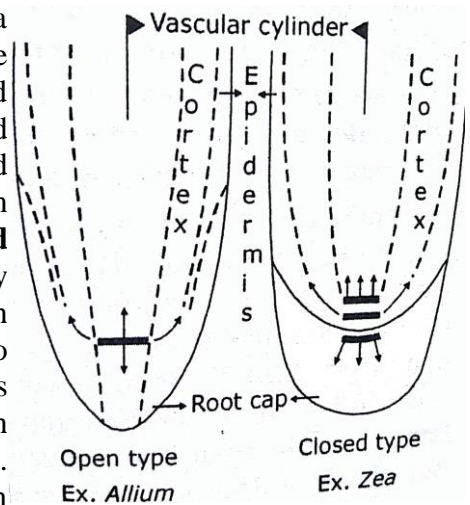
The theory emphasised the planes of cell divisions that are responsible for the increase in number of vertical cell files in meristematic region of roots. Many of the cell divides in two where a cell divides transversely; then one of the two new cell divides longitudinally and each daughter cell of this division becomes the source of a new file. The combination of the transverse and the longitudinal divisions results in an approximately T- (or Y-) shaped wall pattern and hence known as T divisions. The direction of the top stroke (horizontal bar) of the T varies in different root parts. In the cap it is directed toward the base of the root (inverted T), in the body toward the apex (T).

Körper(body): In the Körper the initial cell first divides by transverse partition and forms two cells. The daughter cell which faces the base of the root, *i.e.* away from the apex inherits the initial function. It divides longitudinally and two daughter cells thus formed have the potentiality of cell division. The daughter cells divide by transverse partitions followed by longitudinal partitions. When transverse and longitudinal partitions are viewed together the cell wall from a configuration resembling an inverted 'T'.



Kappe (cap): In the kappe the initial cell first divides transversely and forms two cells. The daughter cell that faces the root apex inherits the initial function. It divides longitudinally. The two cells thus formed have the capability of cell division. When transverse and longitudinal partition are viewed together the combined cell wall appears as T that is right-way-up. When such division continues it is observed that a single rowed region is left behind a double rowed region.

There are two types of apical organisation in angiosperms, the closed and open. In open type all tissues of root except the central cylinder generated from a common meristematic group of cells that are situated on the periphery of the abovementioned central group of cells. In closed type there are **three tiers or layers of initial cells** (*i.e.* called temporary initials in contrast to the central cells which is called permanent initials). One group of such layer gives rise to meristem of vascular cylinder in all cases. Depending on plants the **second layer of temporary initial** gives rise to meristem of **cortex** only and **third layer into meristem of protoderm and root cap** as seen in *Brassica* or in other cases the **second layer** gives rise to **meristem of cortex and protoderm** and **third only root cap** as seen in *Zea*. So in the later case root cap arises from its own initials that constitute root cap meristem called *Calyptrogen*. Whereas in the first type root cap and epidermis have common origin, and the concerned cell layer called *dermatocalyptrogen*.



The Körper-Kappe zones exhibit clear boundary when they originate from separate initial, *e.g.* root with calyptrogen. The sharp demarcation is absent when they originate from same initial cell. In root with dermatocalyptrogen the cap extends into protoderm.

In some roots the central part of root cap is distinct from the peripheral part where the cells are arranged in longitudinal files. These cells seldom divide. When division occurs the partition walls form the configuration of an inverted 'T' that is observed in Körper. The 'T' has normal configuration in the peripheral region of root cap. If conspicuous enough, such a core is referred as **Columella**.