

## Theories of shoot apex organization

Different theories have been given:

1. **Apical cell theory** : This theory was given by **C. Nageli (1858)**. According to this theory, there is a single apical cell with three cutting faces in the shoot apex. This theory is applicable only to some higher algae, bryophytes and vascular cryptogams (pteridophyta) and is not applicable to gymnosperms and angiosperms.

2. **Histogen concept** : This concept was given by **Hanstein (1870)**. According to this concept, there are **3 groups of initials** in the shoot apex :

(a) **Dermatogen** (outermost) : Gives rise to **epidermis**.

(b) **Periblem** (middle) : Gives rise to **cortex** including endodermis.

(c) **Plerome** (innermost) : Gives rise to **vascular tissue** including **pith**.

## Shoot apex organization

According to Foster, Gifford and Clowes, "shoot apex is portion of shoot above the youngest primordium".

### Plastochron

Time gap between two successive primordia is called **plastochron**, e.g., if 1st primordium is formed at 7 am and 2nd at 7 pm, the time gap is 12 hrs and hence **plastochron** is 12 hrs.

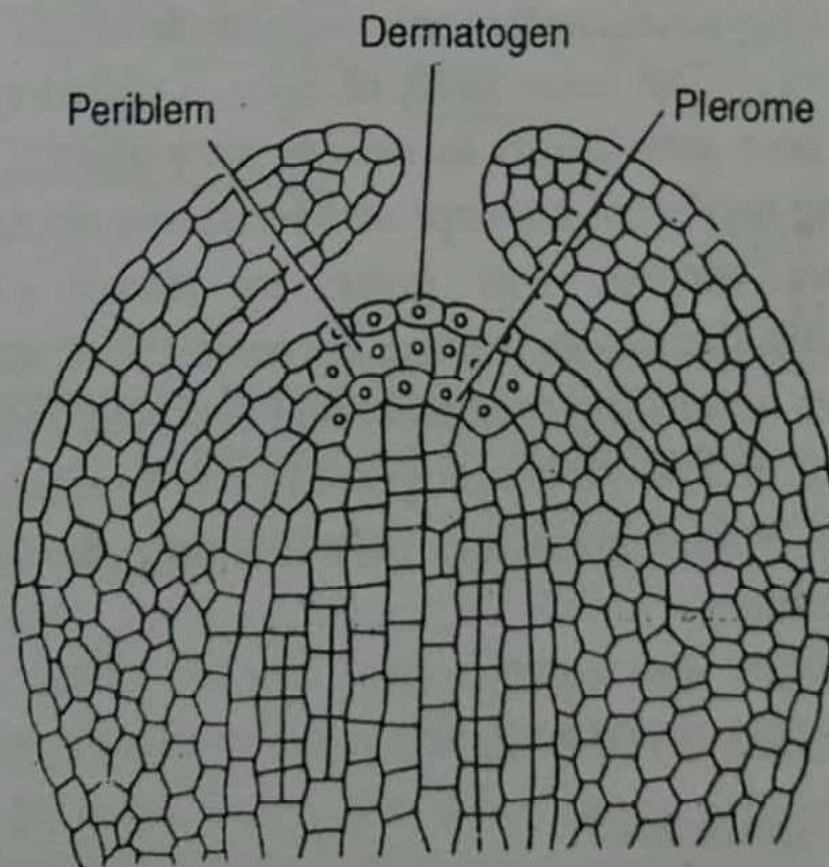
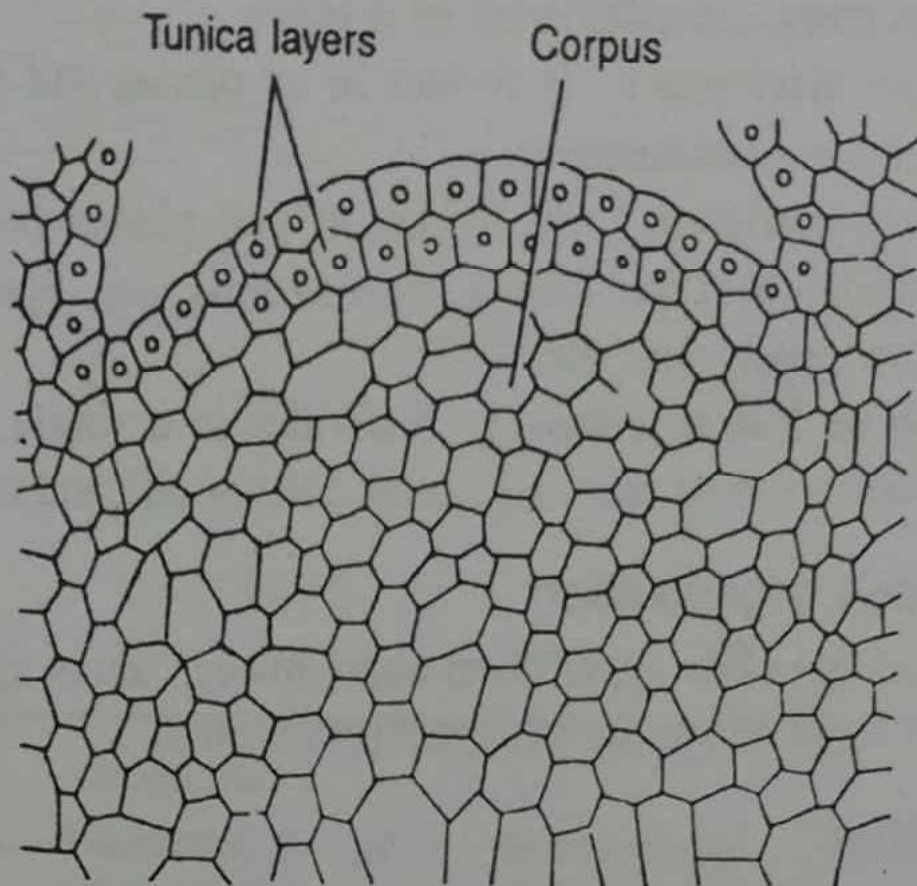


Fig. 18.2. Shoot apex organization according to histogen concept (Diagrammatic)

3. **Tunica corpus concept** : This was given by Schmidt (1924). According to this concept, there are two portions in the shoot apex:



**Fig. 18.3.** Tunica corpus organization of shoot apex organization (Diagrammatic)

(a) **Tunica** : It is generally single layered outer region and it divides only **anticlinally** (only vertical division).

(b) **Corpus** : The inner mass of cells is called **corpus** and it divides both **anticlinally** as well as **periclinally**.



**4. Waiting meristem concept or Meristeme de Attente concept :** This concept was given by **Buvat (1952)**. According to this, there is an inactive centre in the shoot apex which is known as **waiting meristem** and it acts as reservoir of active initials and on induction gives rise to **reproductive apex (flower)**. Waiting meristem or **meristeme de attente** consists of 2 regions:

- (a) **Meristeme sporogene.**
- (b) **Meristeme receptaculariae.**

## Root apex organization

Root apex is having simple organization as compared to shoot apex. Further root apex is **subapical** or **sub-terminal** in position because there is present **root cap (calyptragen)** at the apex.

Different theories of root apex organization have been given as:

### 1. Apical cell theory

Given by **C. Nageli** (1858). According to this, there is single tetrahedral apical cell in the root apex. This is applicable to pteridophytes and gymnosperms and not to angiosperms.

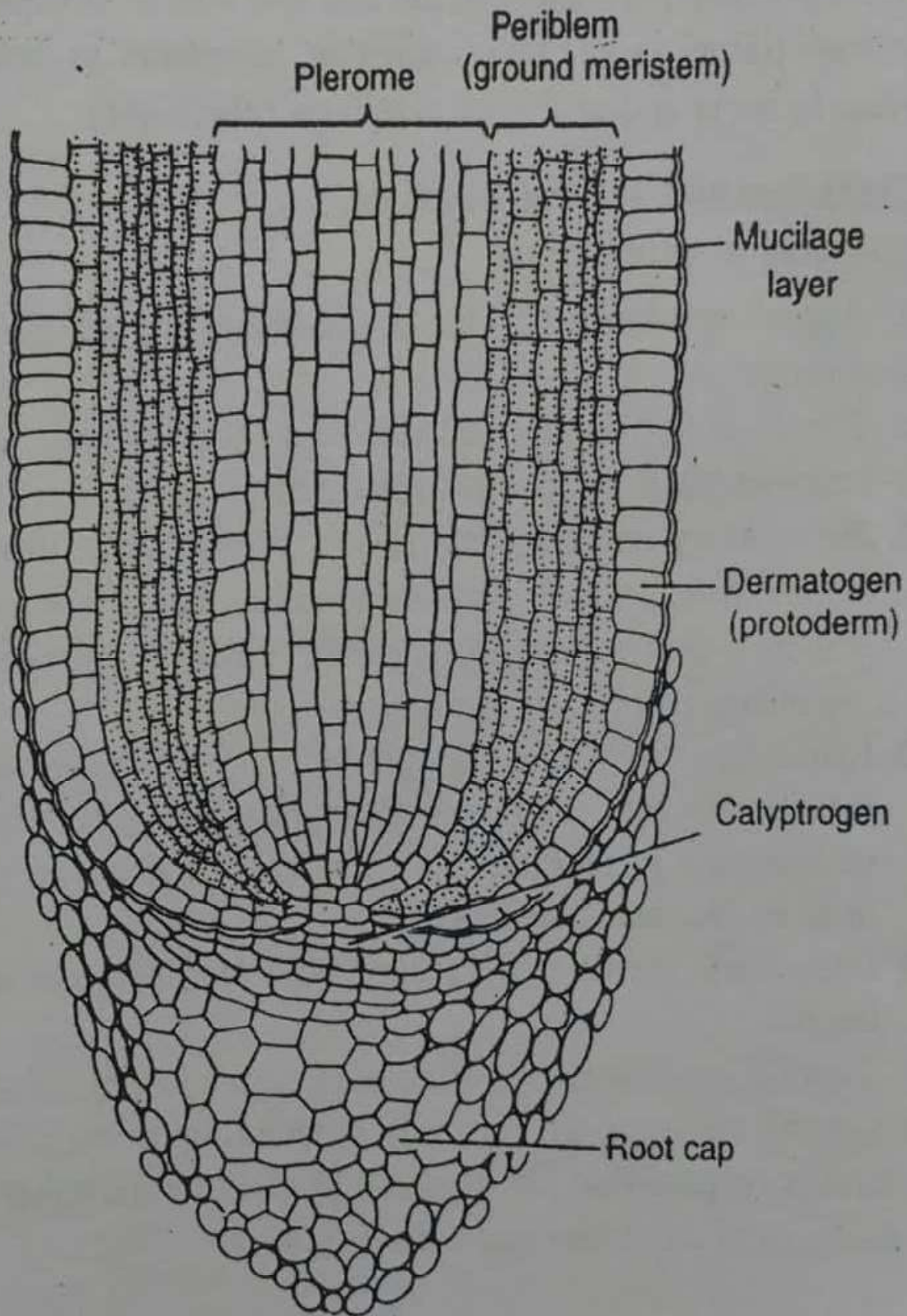
### 2. Histogen concept

Given by **Hanstein** (1868). According to this concept, there are 3 groups of initials in the root apex, *i.e.*,

(a) **Dermatogen** : It gives rise to **epiblema** or **piliferous layer** or **rhizodermis**.

(b) **Periblem** : It gives rise to **cortex** including **endodermis**.

(c) **Plerome** : It gives rise to **vascular tissue including pith.**



**Fig. 18.4.** Root apex organization according to histogen concept (Diagrammatic)



### 3. Quiescent centre concept

This was given by **Clowes** (1956) in **maize**. According to this, there is an inactive centre in the root apex which is called quiescent centre (having low DNA, RNA and proteins) and it acts as reservoir of active initials.

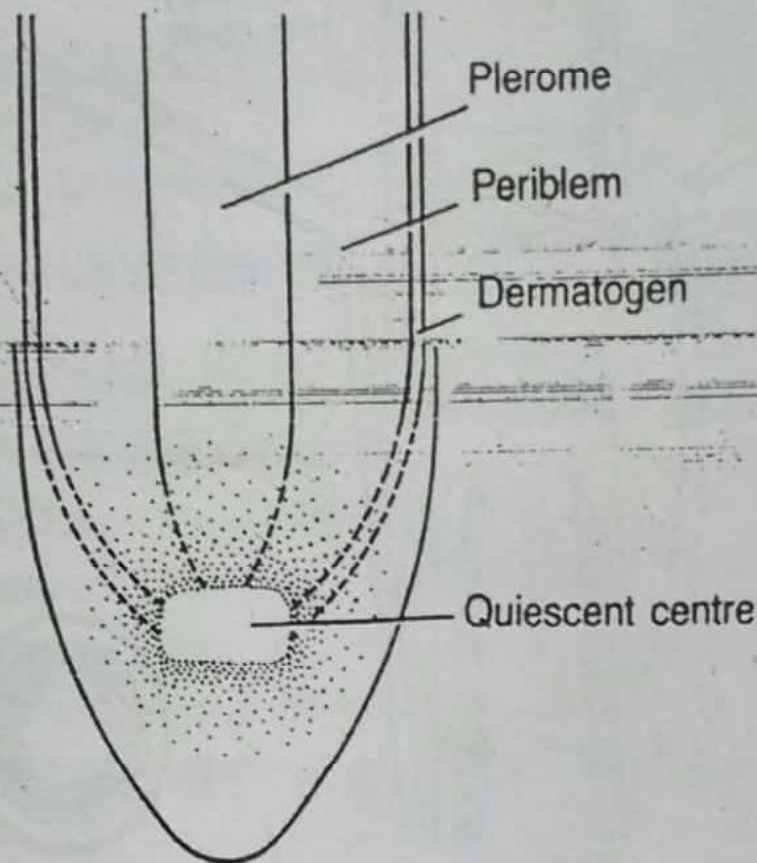


Fig. 18.5. Root apex organization according to quiescent centre concept (Diagrammatic)

#### 4. **Korper-Kappe concept**

This theory of root apex organization was given by **Schuepp** (1917). According to this concept, the cells of root apex divide first by transverse wall and then one of the cell divides by vertical wall. So some cells form **inverted T** called **Korper** (cap) and some cells form **straight T** called **Kappe** (base).