

Ana - 1

## SHOOT APEX ORGANISATION

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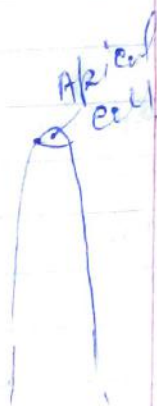
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In the light of recent researches explain the shoot-apex organisation in angiosperms. 1979

The Organisation of shoot-apex i.e. the development and differentiation of meristems in the apices of the plant body of the angiosperms has been a most debatable topic. Ever since the discovery of the importance of the shoot apex in 1759 by Kasper. Friedrich Wolf. Various theories have been put forward <sup>by Friedrich Wolf</sup> regarding the origin and dev. of meristems and their differentiation in the shoot apex of angiosperms but none of them can be wholly accepted. But still they are helpful in understanding the organisation of shoot apices to some extent.

1. Apical Cell Theory :- This theory was proposed by Neigeli (1844) and supported by Hofmeister (1857). According to them there is a single apical cell in every plant which is responsible for growth and dev. of that plant. Hence it is the structural and functional unit of apical meristem governing the entire process of growth and differentiation.

In most of the phanerogams there are more than one apical cell therefore apical cell theory of Neigeli is applicable only to Thallophytes and vascular Cryptogams and not to the angiosperms and Gymnosperms.



2. Histogen Theory This theory was developed by Hanstein (1868-70) on the basis of extensive study of angiosperm shoot apices and embryos. According to this theory :-

- (a) The main body of the plant arises not from the superficial cell but from a mass of meristems of considerable depth.
- (b) This mass consist of three parts :- the histogens which may be differentiated by their origin and course of development.

(i) Dermatogen - It produces epidermis which is generally single layered.

(ii) Pereblem - It produces the ~~apex~~ cortex

(iii) Pleurome - It constitute the entire inner mass of the axis

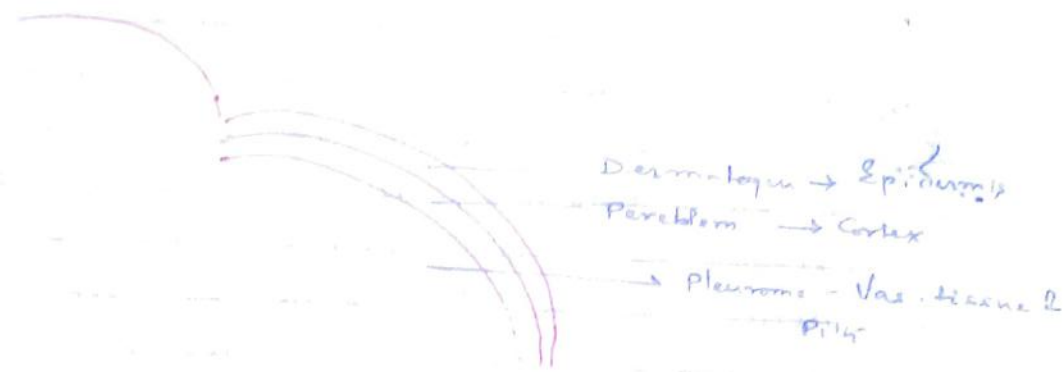


Fig:- Hanstein's histogen theory indicating the initials of the histogen.

It is applicable in case of root apices but has been found to be inadequate as regard shoot apex of angiosperm due to the following two reasons :-

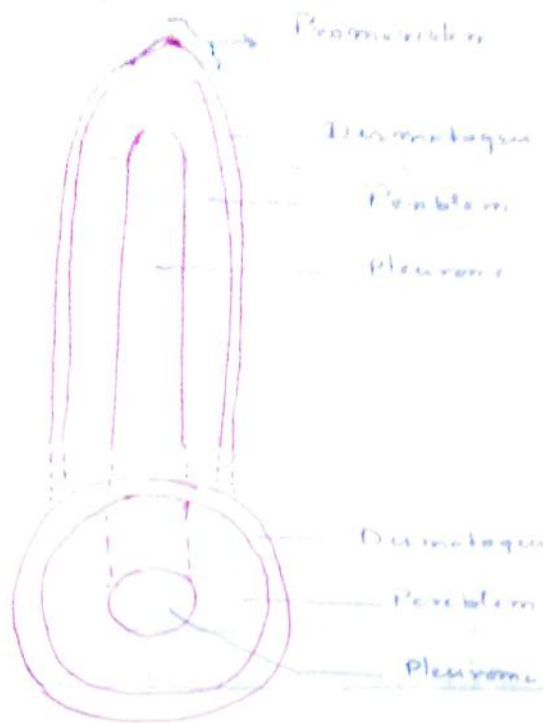


Diagram of the axis of tip to show histogen regions L.S & T.S.

- (i) There is no sharp distinction between periblem & pleurome.
- (ii) The origins of different regions from the sharply defined histogens cannot be demonstrated.

The apical cell & histogen theory have been developed with reference to both root and shoot apex but the third theory was an outgrowth of development of angiosperm shoot apices.

3. Tunica - Corpus theory - This theory was proposed by Schmidt (1924) and supported by Foster (1939, 1941) and Gifford (1954). According to this theory the apical meristem is composed of two zones (i) Tunica & (ii) Corpus.

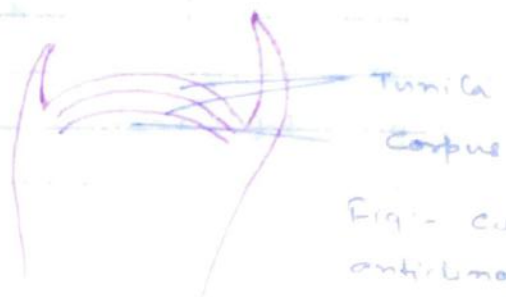


Fig - Cells of the tunica layer divide antimeridially (Gifford 1954)

to add  
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treatment

(4)

The tunica may be one or many layered and Corpus consist of a mass of cells enveloped by the tunica. The demarcation between the two zones occur by cell division. The tunica divide anticlinally hence own growth of an area and but Corpus divide irregularly hence the growth is in volume. Each layer of tunica arises from separate ~~arises from separate~~ initials while Corpus has arises from 'its own initial present beneath the initials of tunica'. Although the epidermis usually arises from the outer most tunica layer and underlying tissues may have their origin in the tunica or the Corpus or the both, depending upon the plant species and a number of tunica layers. Tunica Corpus theory got much support by the work of Foster and Gifford.

with further studies this theory under gone some modifications specially the definition of tunica.

(i) According to one view the tunica should include only those layers that never show any periclinal division in median position.

(ii) Acc. to this view the tunica is treated more loosely and described as fluctuating a no. of layers, one or more inner layers of tunica may divide periclinal and thus become part of the Corpus (Clowes 1961). Here tunica was called as "mantle" and Corpus as "Core" by Popham & Chan (1950). Gutterberg (1960) rejected this.

theory entirely because it does not relate the apical activity to the origin of tissues.

#### 4. Arneau initial and meristome d'attente (Initiating ring & waiting meristem)

This theory of apical meristem was put forward by Buvat (1952, 55) and supported by many French and Belgian workers. It differs from this interpretation of apical organization and growth primarily in attributing the main histogenic role to a lateral ~~and~~ ~~sub~~ initiating ring and subterminal meristem. The Arneau initial or initiating ring, the Central Cell of the apex, the meristome d'attente or waiting meristem are considered to without histogenic function during the vegetative phase of development. These Central Cells supposedly become active on the formation of terminal flower or inflorescence apex where this is present. Buvat (1952) postulated 4 main genes on the vegetative shoot apex. These can be correlated with the Tunica and Corbus as follows:

Tunica → { Arneau initial  
spontaneous meristem

Corbus → { Receptacular Promeristem  
Pith meristem

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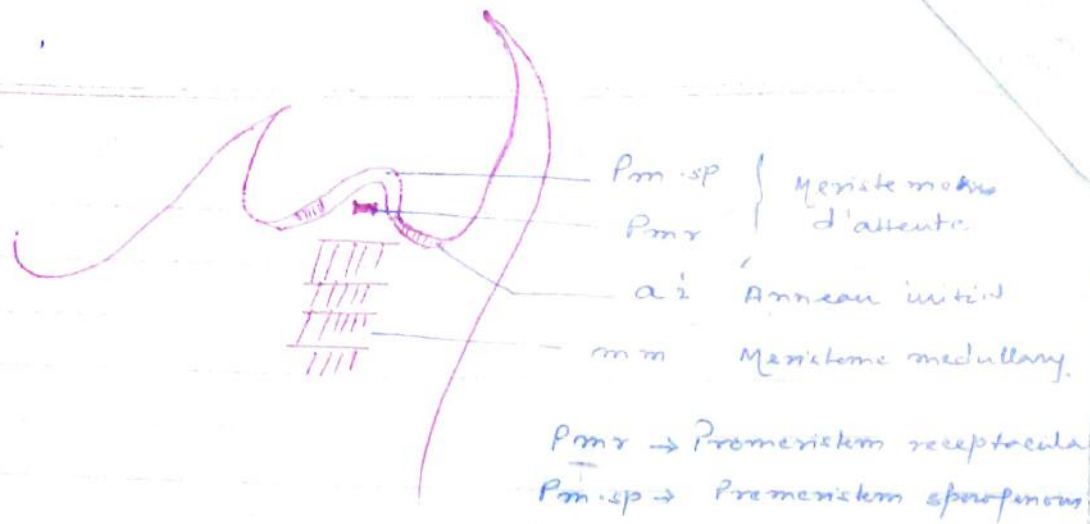


Fig: Shoot apex of cheiranthus cheris interpreted acc. to the concept of Buvat from Gifford after Buvat (1952.)

### Recent Concept :-

During the last 16 years a no. of workers have studied the shoot apex of angiosperms.

① Newman (1961) - Recognise three types of shoot apex in angiosperms

(i) Monoplex

ii Simplex

(iii) Duplex

Acc. to him the Duplex type of shoot is found in angiosperms. It consists of two successive layers, the surface layer divide anticlinally and the inner layer divide irregularly.

② Other workers like Fahrer (1966), Tepper (1966) East and Gumket (1968), Trivedi (1969) suggested that shoot apex of angiosperms have four types.

③ On the surface of apex there is a tunica

Zone consisting of one to four layers.

- b) Next to the Promeristem or metameristem
- c) A flanking zone on the side of the apex
- d) Rib meristem below the promeristem. The promeristem includes the corpus zone and its division irregularly where as tunica cells divide anticlinally.