

# TELOME CONCEPT



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## Telomes ?????

- ❖ The name telome has been given to the simple ultimate terminal portions of dichotomously branched axis .
- ✓ These axes are undifferentiated and single nerved.
- ✓ Two telomes of a dichotomizing axis are united below the point of dichotomy to form a fused structure, called **mesome**.

There are two types of telomes on the basis of their function

**Vegetative or sterile telomes**-These telomes are without sporangia and they are also called phylloids.

**Fertile telomes**- Those telomes which bore terminal sporangia are called fertile telomes.

- During the time of evolutionary development, telomes become grouped together and form a more complex structure, called syntelome or telome truss.
- When a syntelome consist of only sterile telomes is called phylloid truss and a fertile truss if it consisted of only fertile telomes and a mixed telome truss or mixed syntelome when it consisted of both sterile and fertile telomes.

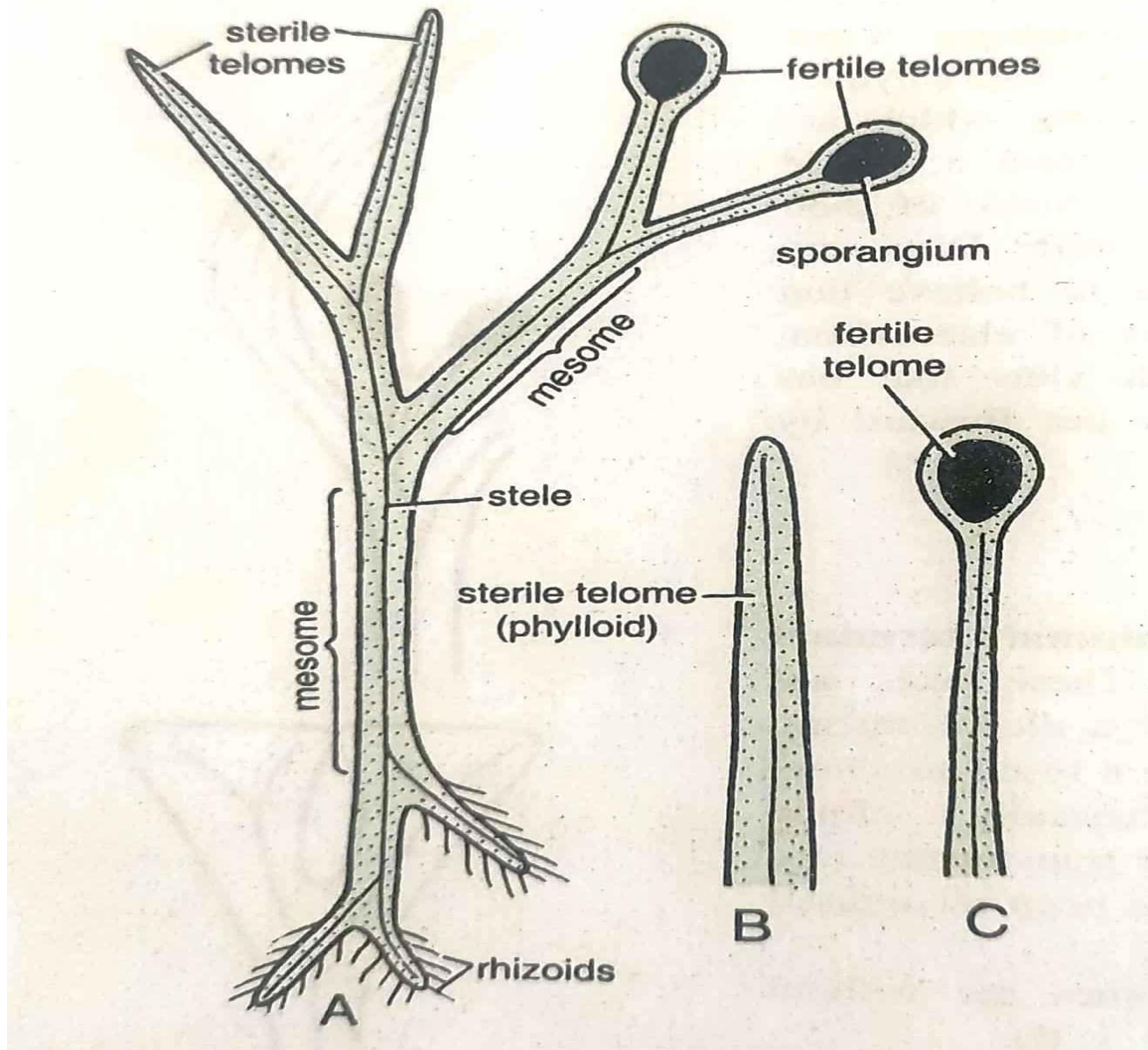


Figure: (A) Diagrammatic representation of a hypothetical primitive vascular plant (B) A sterile telome (C) A fertile telome

## Telome and the origin of higher land plants

- According to **Zimmermann**, the primitive vascular land plants have originated from unicellular green algae.
- ✓ Repeated divisions in unicellular forms resulted in the development of large undifferentiated forms with parenchymatous thalli.
- ✓ Further development and differentiation led to the establishment of meristematic tissue which gave rise to erect branches.
- ✓ It was followed by the appearance of heteromorphic alternation of generation.
- ✓ The branches of sporophyte were dichotomously branched and had a central mechanical strand .
- ✓ Zimmermann visualized such green algae as the immediate ancestors of the primitive vascular cryptogams (e.g. Rhynia, Horneophyton, Psilophyton, etc.) which evolved during the upper silurian lower and middle devonian.
- ✓ The sporophyte of these primitive vascular plants was relatively undifferentiated: the aerial telomes developed stomata and the basal telomes rhizoids. Internally the axis was undifferentiated with an axial typically protostelic vascular strand.

❖ Zimmermann suggested that the following five elementary processes were responsible for the development of higher vascular plants from the early vascular cryptogams.

(1) Overtopping

(2) Planation

(3) Syngeneses

(4) Reduction

(5) Curvation

### **(1) Overtopping**

➤ In this process one of the two dichotomizing branches of an axis becomes larger, stronger and grows vertically upward as the main axis. The shorter dichotomy is displaced laterally and it serves as a precursor of megaphylls.

➤ Thus in this process the weaker branch is overtopped by the stronger branch. It resulted in the development of monopodial branches from equal dichotomies. Evolutionary studies have also shown that dichotomous branching is frequent in primitive pteridophytes and monopodial in advanced forms.

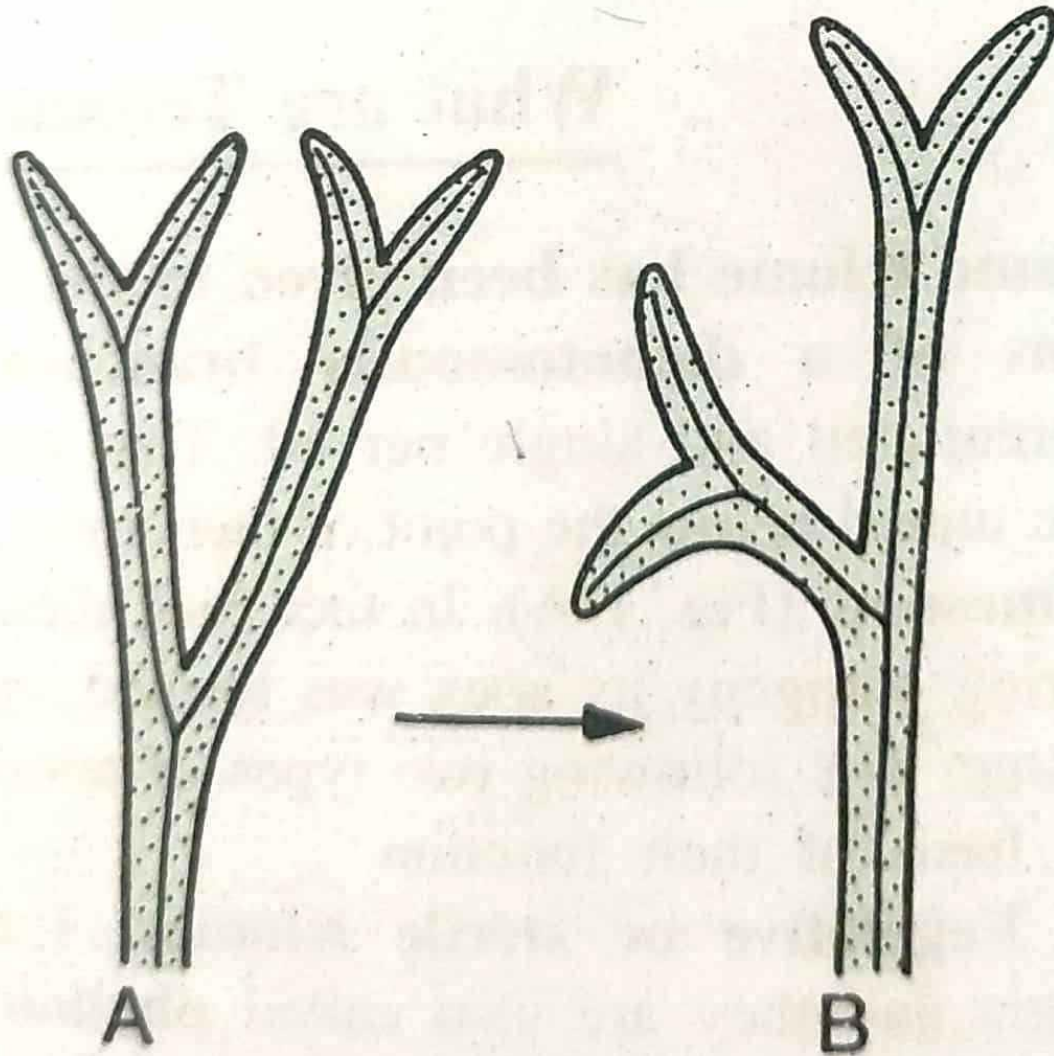


Figure: Overtopping of telomes

## (2) Planation

The equal dichotomies of a system, which were in more than one plane (cruciate dichotomy) come to lie in a single plane (fan-shaped dichotomy).

This process, known as planation, helps in the interpretation of the development of organs of bilateral symmetry from those of radial symmetry.

Thus, planation must have led to the evolution of leaf.

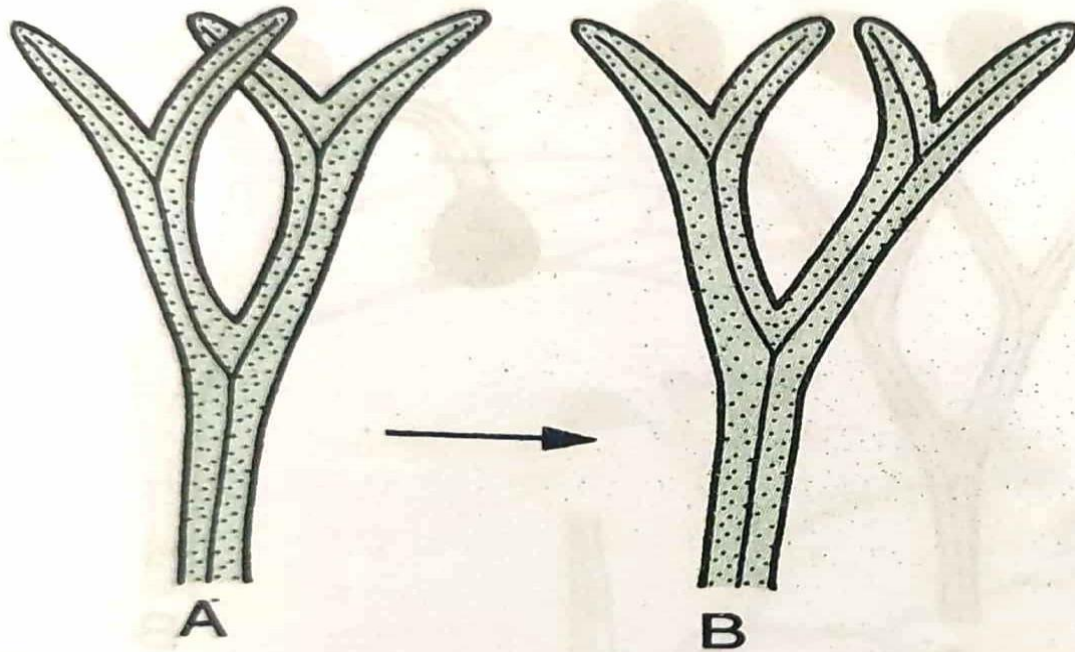


Figure: Planation of telomes

### (3) Syngenesi

- In this process, telomes and mesomes came to lie within a common parenchymatous tissue.
- This process is also known as **fusion or webbing**. Syngenesi also involves the fusion of vascular strands of telomes.
- It is an important process which explains the formation of (i) leaves with open dichotomous, pinnatifid and reticulate venation and (ii) polystelic condition found in *Selaginella* and some fossil members of the Devonian and Lower Carboniferous period (e.g. *Cladoxylon*, *Steloxylon*).

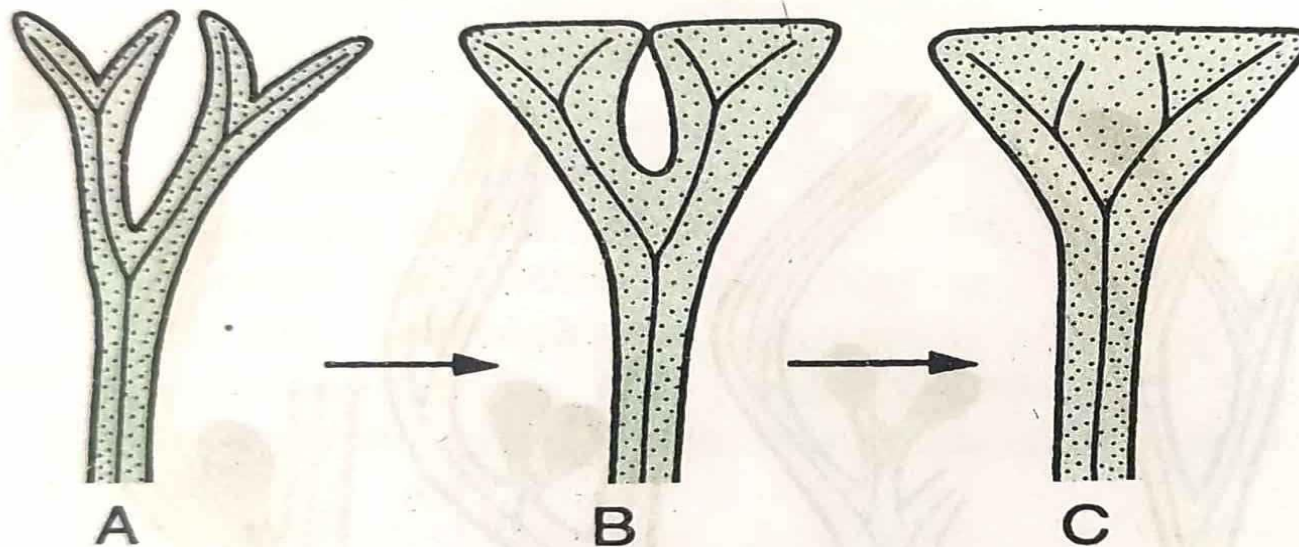


Figure: Webbing of telomes



#### (4) Reduction

It involved transformation of a syntelome into a single needle like leaf. This process thus accounts for the evolution of simple microphyllous leaves of the lycopods.

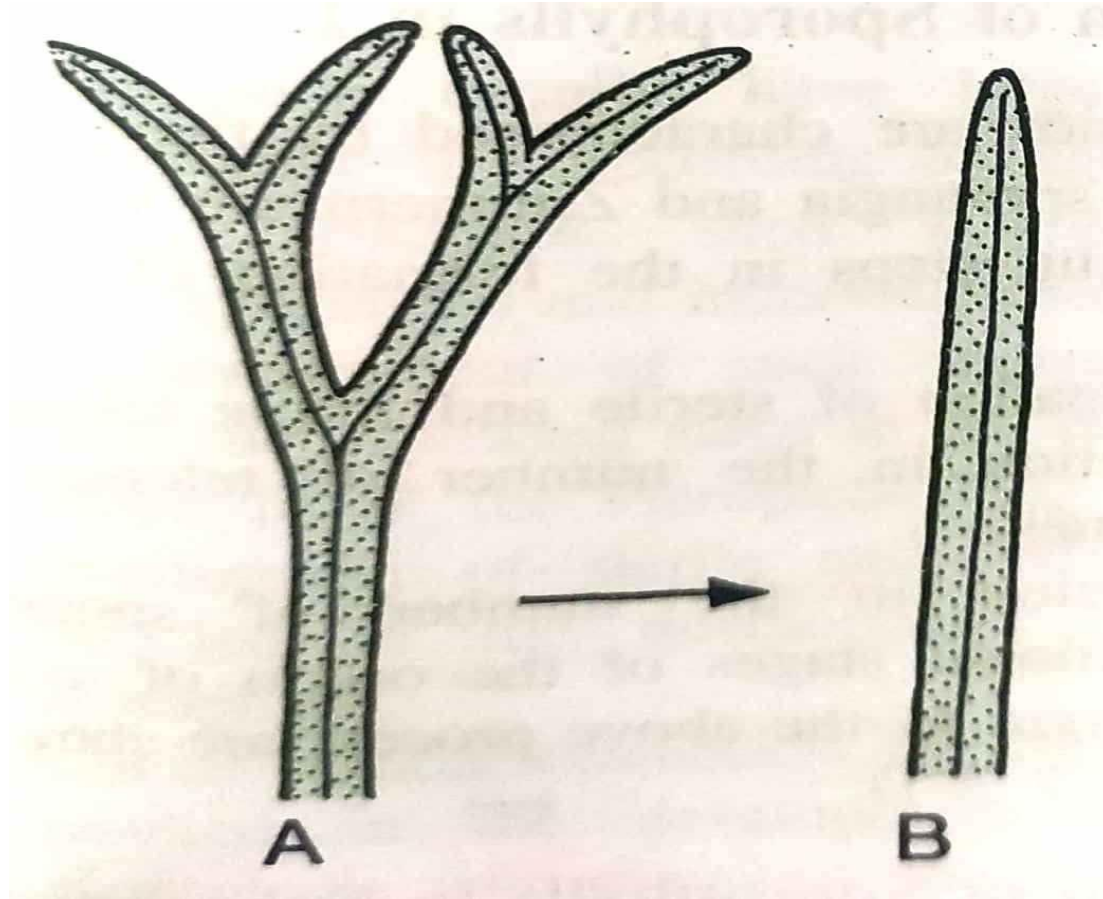


Figure: Reduction of telomes

## (5) Curvation

It is brought about by unequal growth of tissues on two opposite flanks of the telome. There are two types of curvation process have been recognized.

**Recurvation:** When telomes bent downwards, it is called recurvation. It is believed that recurved position of sporangia in the Sphenopsida is the result of this process.

**Incurvation:** This process accounts for the shifting of sporangia to the ventral surface of the leaf in ferns.

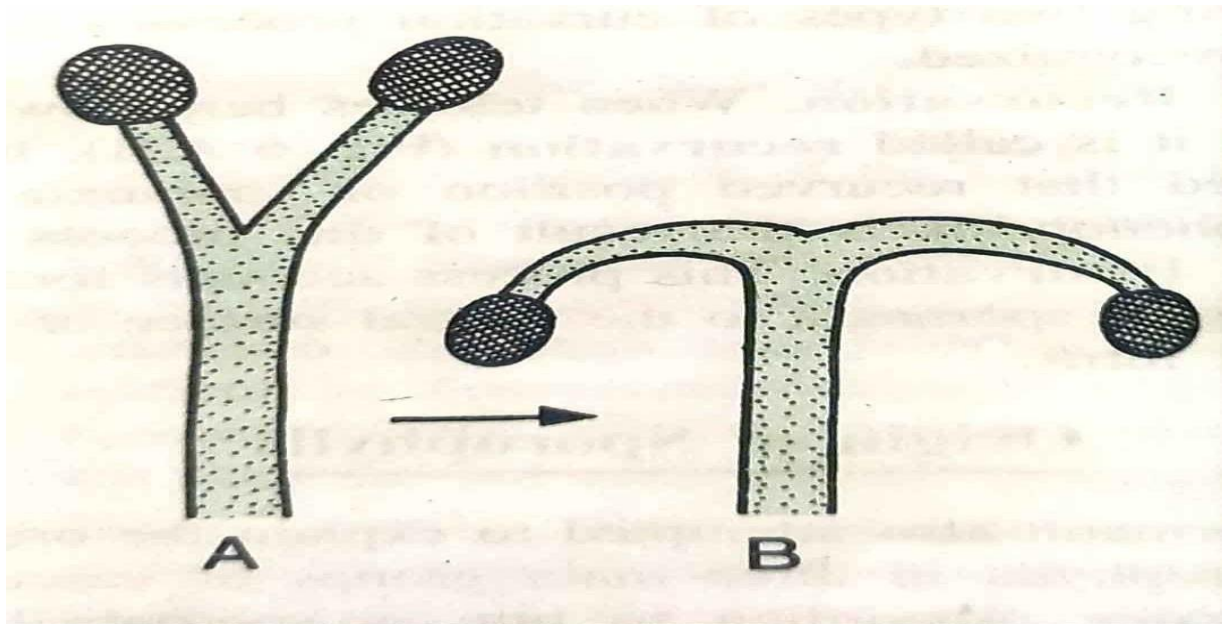


Figure: Recurvation of telomes

## Merits of Telome Theory

- Telome theory provides an excellent interpretation of the origin and evolution of sporophyte of land plants.
- It is based on phyletic relationship between the various groups of plants, both living and fossils.
- The Elementary processes proposed by **Zimmermann** provide a basis of interpretation which remove outstanding morphological difficulties in the lower vascular plants.
- According to **Eames** (1936), though the theory is built upon structure in the lowest known vascular plants, higher plants can also be safely interpreted in this way.
- **Bierhorst** (1971) is of the view that the theory is too simple and too easily applicable but unfortunately its excessive use has greatly diminished its value.

## Demerits of Telome Theory

- An important drawback of the telome concept is that Zimmermann has taken telome as a ready-made structural unit, without explaining as to how such a structure really came into existence.

- Although this problem was later realized by Zimmermann himself and he put forward several other elementary processes, but they do not satisfy plant morphologists .
- Many fossil plants of much greater complexity than *Rhynia* have been discovered in the beds of the same age. They bore whorled or lateral sporangia instead of terminal sporangia. The telome theory does not explain such arrangements of sporangia.
- According to the telome theory ,all leaves in plants are telomic in nature. But **Bower** (1935) considered that microphyllous leaves are simply outgrowths of the stem, i.e, they are not the end product of reduction.
- According to the telome theory, the polystelic condition , such as found in the stem of *Selaginella*, has developed due to syngeneses and siphonostelic and actinostelic conditions are supposed to be the products of tangential or radial fusion of vascular systems of polystelic axis. Such an explanation is opposed to the widely accepted concept of stellar theory.

Note: Figures are taken from the A text book of Botany by Singh, Pandey, Jain (Fifth edition ) and internet source.

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**Thank You!!!**