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On Line Study Material (e-Content)

- College - S.S. College, Jehanabad.
- Department - Botany
- Subject - Pteridophyta
- Topic - Stele system
- Medium - WhatsApp & College Website
- Date - 20.05.2020
- Time - 10.30 - 11.30
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- Class - B.Sc. Part I
Bot. H & Biotech. S.

Types of Stele System and its evolution in Pteridophytes.

The stele is defined as a central vascular cylinder, with or without pith. Xylem and phloem are components of vasculature and endodermis is the boundary of vascular cylinder. In Pteridophytes the nature and arrangement of xylem and phloem differ in different groups. The stele organisation in Pteridophytes showing their gradual evolution can be discussed as follows —

Stele in Pteridophytes.

1. Protostele: The different types of Protostele are —
a) Haplostele b) Actinostele c) Plectostele
d) Mixed Protostele e) Polystele.
2. Siphonostele: 2 types —
a) Amphiphloic siphonostele, &
b) Ectophloic siphonostele
3. Solenostele: - 2 types —
a) Amphiphloic Solenostele, &
b) Ectophloic Solenostele
4. Dictyostele: - 2 types —
a) simple Dictyostele, &
b) Polycyclic Dictyostele.
5. Eustele: -

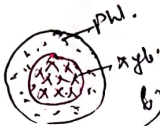
→ P.T.O.

⑦

1) Protostele →

This is the most ~~simp~~ primitive and simplest type of steles. Here, the vascular cylinder consists of central core of xylem completely surrounded by phloem.

a) Haplostele → Most primitive type of Protostele.



Here, the central core of xylem is completely surrounded by phloem. Eg. *Selaginella* sp.

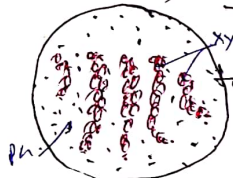
b) Actinostele →



Here, the central core of xylem has radiating ribs or a star shaped appearance surrounded by phloem. It is advanced type than haplostele. Eg. *Psilotum* stem (lower region)

Fig. Actinostele

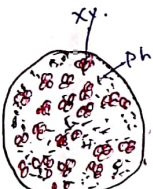
c) Plectostele →



Here, xylem is plate like arranged parallel to each other. Each plate is surrounded by phloem. It is more advanced than actinostele. Eg. *Lycopodium clavatum*.

Fig. plectostele

d) Mixed Protostele →



Here, xylem & phloem remain uniformly distributed. xylem elements break up to small groups and all get surrounded by phloem. It is more advanced among protostele and is considered transitional type between true protostele and siphonostele.

Fig. Mixed Protostele

Eg. *Lycopodium complanatum*, *Gleichenia* spp, *Osmunda* spp.

e) Polystele →



In *Selaginella*, the stem axis has several steles (di-stele or polystelic). Each stele is protostele with xylem core surrounded by phloem with pericycle & endodermis. Eg. *Selaginella* stem.

⑨ D. Dictyostele —

A Siphonostele with overlapping leaf gaps form Dictyostele. Here, more than one leaf gap is present. The portion of vascular tissue which lies in between two gaps is termed as meristele. Each meristele is Protostele in nature.
Eg. fern.

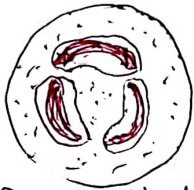


Fig. simple Dictyostele

i) Simple Dictyostele —

Dictyostele arranged in a single ring

ii) Polycyclic Dictyostele —

Dictyostele arranged in two or more rings. It has two or more concentric rings of vascular tissue. Eg. Pteris thyrsoide.

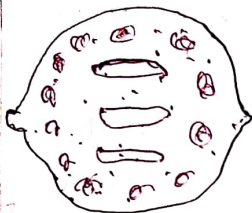


Fig. Polycyclic Dictyostele

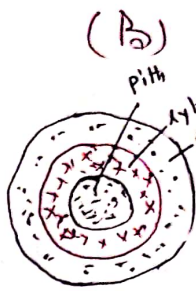
(E) Eustele —

Here, the vascular system consists of a ring of collateral, conjoint vascular bundles situated on the edges of the pith.

Eg. Equisetum stem.



Fig. Eustele in Equisetum stem.



(B) Siphonostele —

i) Simple —

⑤

It is a modified form of Protostele with a central pith generally made up of parenchymatous tissue rarely of sclerenchyma.

Pith formed may be endostelar in origin or exostelar (by invasion of cortical tissues).

a) Ectophloëic Siphonostele —

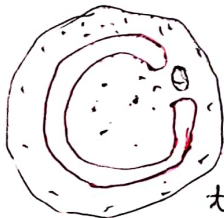
This type of stele has central pith which is surrounded by concentric rings of xylem followed by phloem.
Eg. Psilotum.

b) Amphiphloëic Siphonostele — In this type the centre is occupied by pith and xylem remains surrounded on both external and inner side by phloem rings.

Eg. Marsilea rhizome

C) (ii) Solenostele —

A siphonostele possesses a leaf gap on one point. It may be ectophloëic or amphiphloëic solenostele.



(a) Ectophloëic solenostele —

Here, xylem remains surrounded only on the outer side by phloem. Eg. Osmunda.

(b) Amphiphloëic solenostele —

In this type of solenostele, the centre is occupied by pith. xylem is surrounded on both sides by rings of phloem. Eg. In rhizome of Adiantum and Marsilea.