8. Give a detail account of the evolution of stelar organization and evolution in Pteridophyta.

INTRODUCTION → Vascular plants have a cylinder of xylem and phloem. It is called stele. The concept of stele as the fundamental unit of vascular system was put forward by Van-Tiegham & Dauliod (1886). It formed the basis of a theory known as the stelar theory. According to this theory the primary bodies of the stem and root are basically alike in gross anatomy. The stele consists of the vascular tissues, the pericycle and the pith. It is of different types which is due to elaboration of plant system. The leaf gaps and leaf traces play important role in the evolution of different kind of stele. The entire ~~margin~~ subject has been delt with great care by workers like Jeffrey (1897), Philipson (1949), Wardlaw (1950), Wetmore (1953) and others.

DEFINITION → The central vascular system with or without pith has been refered as stele. In simple words the entire structure covered by the endodermis has been named as stele.

Stele is a Greek word which means "Pillar". The word stele

was proposed by the first time Van Tieghem and Douliot (1886).

DIFFERENT TYPES OF STELE & THEIR EVOLUTION → The simplest type of stelar organization consist of a central solid core of xylem surrounded by a peripheral layer of phloem followed by pericycle. This is the most primitive type of stele. It was called protostele by Jeffery (1897). It is the fundamental stelar type for the Pteridophyta in general. This occurs in many living forms such as Lycopodium, Gleichenia, Lygodium and others. It may undergo modification to form steles named as actinostele, Plectostele or the mixed protostele.

The protostele can serve the needs of small shoots. But when the shoot becomes bulky, there is an increase in size and internal differentiation of the stele. The first step is the formation of parenchyma in the centre. The protostele having a central pith has been named as siphonostele or medulated protostele.

The siphonostele can be of two types namely the ectophloic and amphiphloic siphonostele. In ectophloic siphonostele the xylem cylinder lies next to the pith and is surrounded by the phloem cylinder on the outside as in

Psilotum. But in amphiphloic siphonostele, there are two cylinder of phloem, lying external and internal to the xylem cylinder. This has been reported in Marsilea.

There are two views regarding the origin of pith.

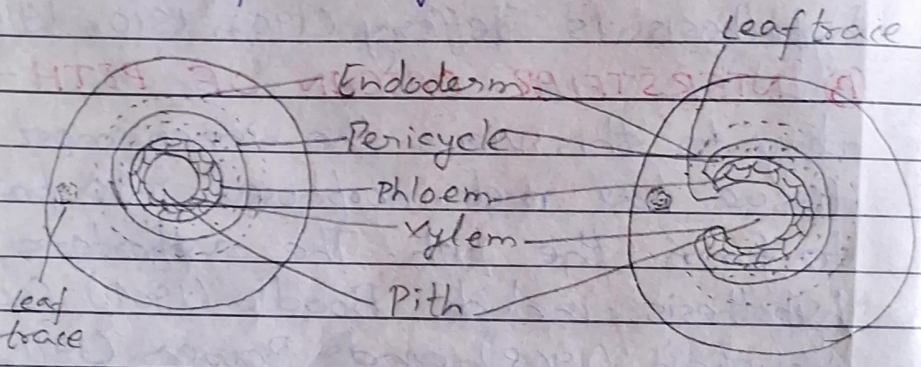
(A) EXTRASTELAR ORIGIN OF PITH → This suggest that there has been invasion of the cortical parenchymatous tissue from outside of the stele in its phylogenetic evolution. The chief supporter of this hypothesis is Jeffery (1902, 1910, 1917).

(B) INTERSTELAR ORIGIN OF PITH → According to this view the inner most vascular tissue has metamorphosed into parenchyma to form the pith. The supporters of this hypothesis include Boodle (1901), Gwynne-Vaughan (1908) and Bower (1911).

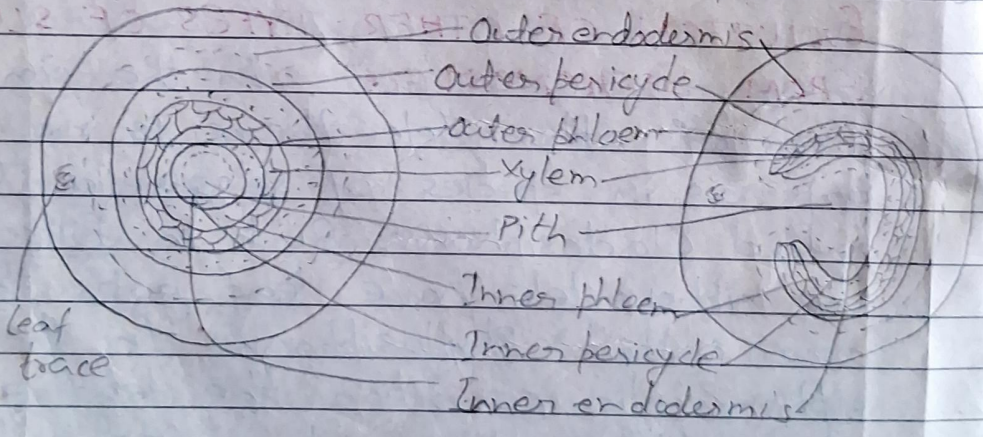
EVOLUTION OF OTHER TYPES OF STELE FROM SIPHONOSTELE → In the simplest form of siphonostele there is no leaf gaps as in species of Selaginella. This is called Cladosiphonic. But in Filicophyta the siphonostele have leaf gaps. They are called Phyllosiphonic. In the simplest siphonostelic condition the leaf gaps do not are smaller and successive leaf gaps do not overlap each other. This result in formation of holes in xylem

cylinder. The siphonostele with perforation by scattered leaf gaps is known as solenostele or perphorated siphonostele. It may be ectophloic or amphiphloic.

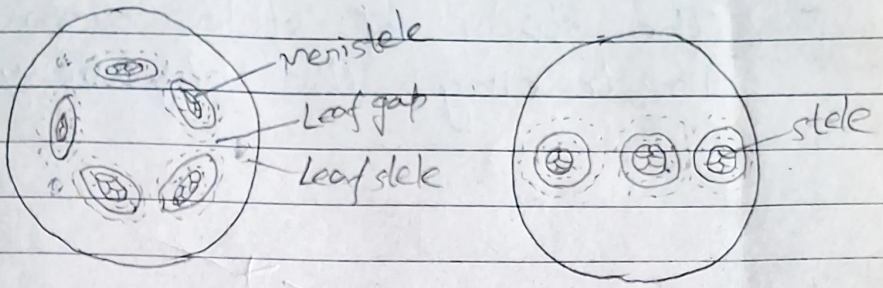
But in many Filicales the shoot axis bears leaves in close succession. This results in overlapping of the leaf gaps and breakage of the xylem cylinder. The siphonostele with broken xylem cylinder has been called dictyostele or desected protostele. The unites of dictyostele are called Meristele



Ectophloic Siphonostele Ectophloic Solenost



AMPHIPHLOIC SIPHONOSTELE AMPHIPHLOIC SOLENOSTELE



DICTYOSTELE POLYSTELIC

The final elaboration of the stelar organization in the Pteridophytes consist in the development of a number of seperate stele arranged in regular cycle. This condition is known as Polycyclic It occurs in Pteridium, Matonia and others.

Another highly evolved stele has being named as Polystele in which several stele lie within a common endodermis as in Selaginella.

CONCLUSION → Stele in the fundamental part of vascular plants. They consist of stands of vascular tissue with or without pith and surrounded on the outside by layers of pericycle and endodermis. The simplest and most primitive kind of stele is the protostele. It occurs in all primitive plant and in all plants in seedling stage. It is the mother stele from which other stele have evolved

The study of stelar organization h
in tracing the phylogeny of flow