

Pteridophytes

1-Introduction:

Pteridophytes are part of the archaeoniate phylum. They are cormophytes.

The gametes are formed in the gametangia. Pteridophytes are vascular cryptogams because they have scalariform wood vessels.

Morphologically, they have a stem, leaves and roots. The sporophyte is the predominant chlorophyllous, rapidly autonomous from the gametophyte. The gametophyte is often thalloid and lacks conducting vessels.

Pteridophytes generally live in damp environments, and some are aquatic (e.g. Azolla).

(e.g. Azolla). Numerous species of fossil pteridophytes have been found, providing evidence that they flourished during the Carboniferous Period. during the Carboniferous and Permian periods (the remains form coal).

2- Classification of Pteridophytes:

There are four classes of pteridophytes: Psilophytinae, Lycopodinae, Equisetinae and the Filicinae.

2-1: The Filicinidae class, with *Dryopteris Filix Mas*: This is also known as the "male fern".

A- The sporophyte or vegetative apparatus:

This is a leafy plant consisting of an underground stem (**rhizome**) bearing a bunch of leaves at its upper end, **a petiole**, **a rachis** (the central axis) and leaves (pinnae) divided into pinnules.

1- Roots:

They are adventitious, with a stele (or central cylinder) with two woody poles differentiating centripetal differentiation as well as two liberal poles.

2- The rhizome:

This is the central cylinder. It is made up of an epidermis, a sub-epidermis (in layers of cells), parenchyma with starchy reserves (with starch), and two concentric circles of steles. The outer circle contains the leaf traces that give rise to the leaves. The inner circle provides the rhizome's own blood supply.

3- Leaves:

They are chlorophyllous with stomata.

4-Sporangia:

These are on the underside of the pinnules. The sporangia develop in clusters (or sori) consisting of a central column to which the sporangia are attached and protected by a membrane (this is the indusia). The sporangium originates from a single superficial cell. The head of the sporangium is made up of an archepore and parietal cells (around the archepore), which then divide. Two layers of cells are obtained. The outer layer gives the mat which is the inner layer produces the mother cells of the tetraspores. 18 Filicophytes.

5-Chromatic reduction, spore formation:

The mother cells undergo chromatic reduction and each gives 64 spores with N chromosomes. The spores are surrounded by a thick membrane consisting of three layers. The spores are released by the opening of the sporangium and germinate in damp weather. They will give a gametophyte or prothallus.

B- The gametophyte, with N chromosomes:

1- The vegetative apparatus:

The spores give filaments of 5 or 6 cells bearing colourless rhizoids: this is the prothallus. When it develops, it produces a flattened, heart-shaped blade.

This lamina is composed of a single cell layer 19 except in the cushion (the medial region) bearing the rhizoids.

The prothallus is chlorophyllous, autotrophic and autonomous.

2- Antheridia:

Numerous antheridia appear on the lower part of the prothallus.

Each cell originates from an epidermal cell. The antheridia consist of a wall (four or 5 cells) and a cover (2 or 3 cells). Inside, the cells give 32 ribboned antherozoites with a bunch of flagella and vesicles that are resorbed.

These antherozoites are then released by opening the lid.

3- The archegonium:

It appears later, from a superficial cell. This is located on the underside of the prothallus (on the ground, like the "male"). Beneath the neck, made up of 7 or 8 cells, are the the oosphere and cells of the cervical canal. The species is monoecious and homothallic.

4- Fertilisation :

The apex of the cell opens and the cells of the cervix gel, producing a mucilage. The male cells are attracted by chemotaxis and penetrate and fertilise the oosphere. This will give a 2N zygote. This is zoidogamy (which is different from oogamy).

5- The return of the sporophyte:

The zygote transforms into an embryo that develops a root, a stem and a leaf, plus a sucking foot that attaches itself (not for long) to the thallus. It quickly becomes independent.

2-2: The lycopodine class, with Selaginellasp.

A- The sporophyte:

1- The vegetative apparatus :

This is a leafy plant of the herbaceous type. Its stems are vascularised, branch in a dichotomous manner

and bear small leaves (lanceolae) in a spiral or opposite arrangement. On the upper surface, near the stem insertion, there are four ligules (small tongues). The roots are not attached directly to the stem but to rhizophore axes.

2- The sporangium:

This develops in the axils of so-called fertile leaves: the sporophylls. They are grouped in spikes spikes. Lycopsides There are two types of sporangia on the same plant:

- megasporangia, which produce four large tetraspores.
- Microsporangia, which produce numerous microspores. The sporangial spikes carry megasporangia at their base and microsporangia at their apex.

3- Chromatic reduction:

In microsporangia, the mother cells undergo chromatic reduction and give rise to microsporangia. In megasporangia, all the mother cells abort, except one, which undergoes chromatic reduction and gives rise to four large tetraspores.

A- Prothalli.

1- The male gametophyte:

or microgametophyte. Once the microspores have been released from the microsporangia, two prothalli are obtained, one of which is the origin of the antheridia (the antheridia, after multiple divisions, is formed by a wall surrounding four spermatogenic cells : the gametogenes. The spermatogenic cells give rise to several biflagellate antherozoites, released after rupture of the spore.

2- The female gametophyte:

Development begins in the megasporangium. The nucleus divides

several times to form a coenocytic prothallus (one nucleus in one cell), followed by the appearance of cells at one of the poles. The adult prothallus is chlorophyllous at the opening and bears rhizoids. On the side opposite the opening, there is a zone rich in starch. The upper part of the reduced archegonium consists of a neck of 2 or 3 cells. (on each side). The oosphere is surrounded by prothallial cells and by two cells of the cervical canal. The species is dioecious.

3- Fertilisation:

The released antherozoites swim in the water towards the archegonia (they are attracted by chemotaxis). This results in the fertilisation of one or more oospheres, which results in the development of a zygote. Fertilisation is a zoidogamy in an external liquid environment.

4- Development of the new sporophyte at 2N :

The egg divides in two, giving rise to an upper cell and a lower cell which, on dividing, will give rise to an embryo. The embryo divides to give an embryo with a stem, a root and a foot, attached at the start, the embryo to the prothallus. The embryo and the young seedling remain attached to the prothallus for a while and then become autonomous. We have a cycle with two types of spores: it's a heterospore. This leads to the formation of two types of gametophyte, hence heterothallism. There is a reduction of the gametophyte and its reproductive organs. It is a haplodiplophasic, digenetic species whose spores are a form of resistance and of dissemination of the species.

2-3- Class of equisetinae (Equisetum (Horsetail):

This class is characterised by an underground rhizome from which emerge vertical stems divided into successive joints. fluted, hollow, bearing at each node reduced leaves arranged in a circle (whorled). The sporangia are borne by special organs in the terminal spike of a fertile stem. The equisetinae comprise 7 orders.

2-4- The Psilophytinaceae or Psilophytes (Psilotum.) class:

The most primitive class, it has no true roots and only a few species have microleaves (microphylls). It is certainly the oldest, represented today by three species Psilotales-Rhyniales, and Psilophytales. These plants grow in both dry and damp locations.