

# CLASS I : FILICINAE

The members of this class include ferns.

## FRONDS

Ferns have the prostrate plant body that bears numerous sporangia on the leaves called fronds.

The leafy branch of the fern is usually called a frond. The small leaflets that make up the whole frond are called pinnae.

## HABITAT

They are mostly found in moist and shady places.

# STEM

Fern stems are often referred to as "rhizomes" even though they grow underground only in some of the species.

# LEAVES

The green, photosynthetic part of the plant is technically a megaphyll (they have branched veins) and in ferns, it is often referred to as frond. Leaves or fronds are simple with a petiol or compound with a central axis or rachis. The immature and young frond is coiled, one of the important character of this group.

## TYPES OF LEAVES

Leaves are divided into two types; a trophophyll and a sporophyll.

### i) TROPOPHYLL FROND

A trophophyll frond is a vegetative leaf which donot produce spores but only produce sugars by photosynthesis.

### ii) SPOROPHYLL FROND

A sporophyll frond is a fertile leaf that produces spores borne in sporangia that are usually clustered <sup>on the under surface of leaves</sup> to form sori. In most ferns, fertile leaves are morphologically



very similar to the sterile ones, and they photosynthesize in the same way. In some groups, the fertile leaves are much narrower than the sterile leaves, and may even have no green tissue at all. Most of the plants are homosporous (produce spores that are all the same).

## ROOTS

Roots are developed from the base of rhizome. They are the underground, non-photosynthetic structures that take up water and nutrients from the soil. They are always fibrous and structurally are very similar to the roots of seed plants.

## GAMETOPHYTE OF FERNS

The gametophyte of ferns typically consist of:

1. Prothallus
2. Antheridia
3. Archegonia
4. Rhizoids

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### 1. PROTHALLUS

Prothallus is a green, photosynthetic structure that is one cell thick, usually heart or kidney shaped. The prothallus produces gametes by means of antheridia and archegonia.



## 2. ANTHERIDIA

Antheridia are small spherical structures that produce flagellate sperm.

## 3. ARCHEGONIA

Archegonia is a flask-shaped structure that produces a single egg at the bottom, reached by the sperm by swimming down the neck.

## 4. RHIZOIDS

Rhizoids are root-like structures that consist of single greatly elongated cells, water and mineral salts are absorbed over the whole structure. Rhizoids anchor the prothallus to the soil.

## DIVERSITY

The class Filicinae comprises nearly 10,000 species, which are widely distributed.

## IMPORTANCE OF FERNS

Ferns are not as important economically as seed plants but have considerable importance in some societies.



## 1. USED AS FOOD

Some ferns are used for food. Fern tubers were used for food 30,000 years ago in Europe. Ferns are generally not known to be poisonous to humans. Licorice fern rhizomes were chewed by the natives of the Pacific northwest for their flavor.

## 2. BIOLOGICAL FERTILIZER

Ferns of the genus *Azolla* are very small, floating plants that do not resemble ferns. Called the mosquito fern, they are used as a biological fertilizer in the rice paddies of Southeast Asia, taking advantage of their ability to fix nitrogen from air into compounds that can be used by other plants.

## EXAMPLES

Common examples of this class are *Adiantum*, *Pteris*, *Dryopteris* and *Pteridium*.

## ADIANTUM (MAIDEN-HAIR FERN)

### \* VEGETATIVE STRUCTURE

*Adiantum* is a common fern, growing wild in places along the walls of wells and water courses. It is a small



herb; consisting of a stem, roots and leaves.

They generally prefer humus-rich, moist, well-drained sites, ranging from bottomland soils to ventrival rock walls. Many species are especially known for growing on rock walls around waterfalls and water seepage areas.

## STEM

The stem is a short, thick rhizome, lying horizontally in the soil. It is usually unbranched and is covered by persistent leaf bases.

## RAMENTA

The stem and the petiole are covered with numerous brownish scales known as ramenta.

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## ROOTS

The roots are fibrous adventitious and arise from the lower side of the rhizome.

## LEAVES

The leaves or fronds are large and compound. They arise from the upper side of the rhizome. Each leaf consists of leaflets or pinnae. The pinnae are further divided into pinnules. Each leaf consists of a stalk like portion, the ~~stipe~~<sup>stipe</sup>, which is continued above into the rachis.

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# \* LIFE CYCLE OF ADIANTUM

## SPOROPHYTE

Adiantum is sporophyte, bearing asexual reproductive organs called sporangia, arranged in groups called sori. The sori occur on the under surface of the margins of pinnules.

## SPORANGIUM

The sporangium is a flattened, biconvex capsule borne on a multicellular stalk. The capsule contains a mass of small asexual reproductive bodies called spores.

## SPORE

Each spore is a simple cell, consisting of cytoplasm and nucleus, surrounded by two-layered cell wall. The inner thin cellulose layer is called intine or endosporium, while the outer thick cutinised layer is called exine or exosporium. The spores are small and light, and are liberated from the sporangia in dry weather.

## PROTHALLUS

When a spore falls on a suitable soil, it begins to germinate in about a week's time and produces a haploid gametophyte called prothallus. The prothallus is green, small, flat and



heart shaped structure. From the under surface of prothallus arise a number of long, brown rhizoids which pass down into the soil. The rhizoids fix the prothallus to the soil and absorb water and mineral salts from the soil. The prothallus manufactures its own food with the help of its chloroplasts. Thus the prothallus is an independent plant. The prothallus is hermaphrodite, bearing both the antheridia and archegonia on its under surface.

## ANTHERIDIUM

Each antheridium is a spherical capsule which contains many cells ~~are~~ called sperm mother cells or spermatocytes. Each spermatocyte gives rise to a male gamete or sperm. Each sperm is spirally coiled body with two tuft of fine cilia at one end.

## ARCHEGONIUM

Each archegonium is a flask shaped body consisting of a tube like neck and a basal swollen venter. The venter contains a single long naked cell called egg or oosphere.

## FERTILIZATION

Fertilization occurs when the soil is thoroughly wet with water. A number of sperms cluster round the open mouth of the



archegonium. Finally one of them enter the archegonium and passes down to the venter. Here its nucleus fuses with that of the oosphere to form oospore or zygote. The fertilized oosphere becomes oospore by secreting a wall around itself. Soon after fertilization the oospore begins to divide to produce an embryo which develops into a young sporophyte of Adiantum.

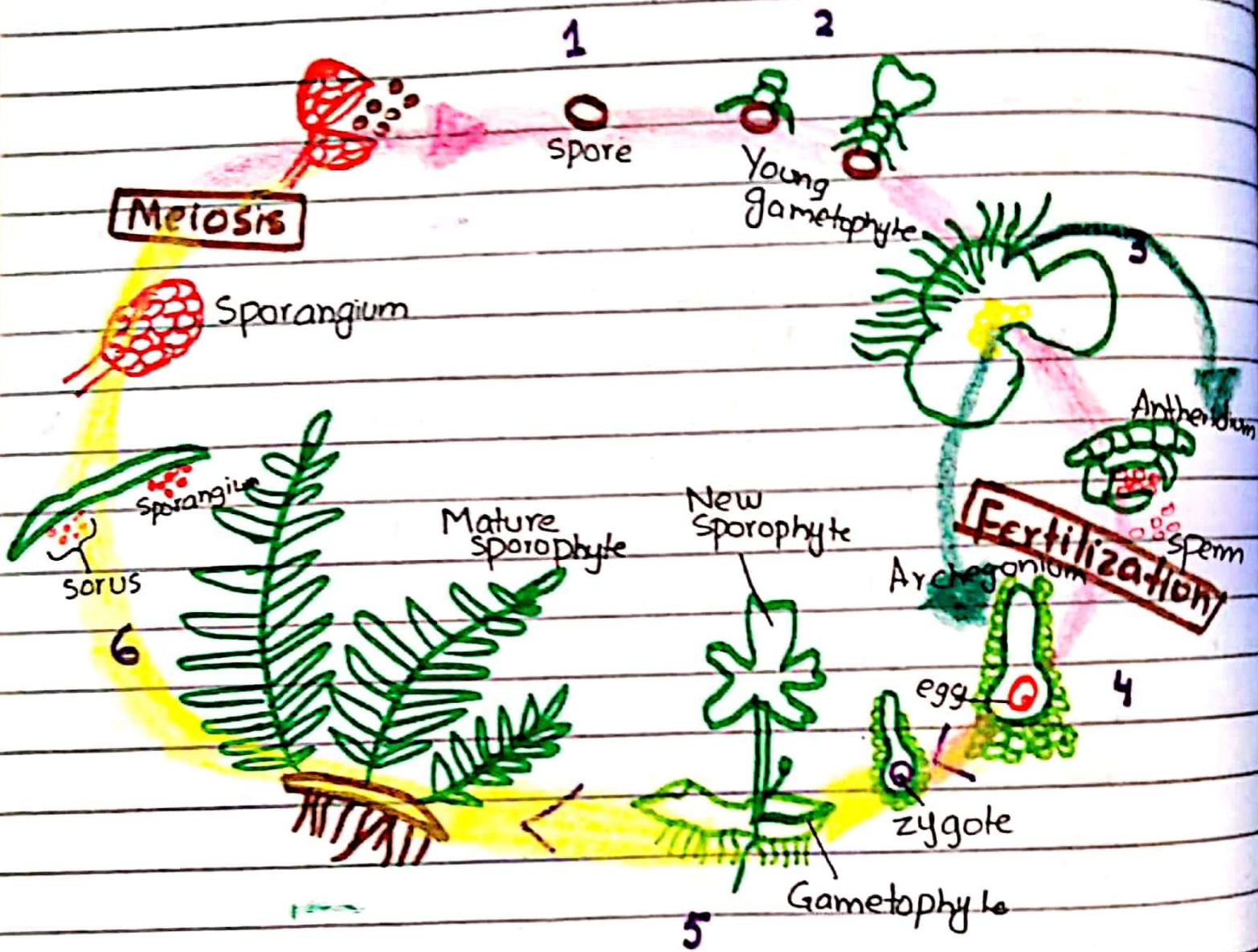
## ALTERNATION OF GENERATION IN ADIANTUM

The life history of Adiantum includes two quite distinct generations, the sporophyte generation and the gametophyte generation. The sporophyte produce spores which on germination gives rise to a heart-shaped gametophyte or prothallus. The gametophyte develops antheridia and archegonia, which contains sperms and eggs respectively. The oospore resulting from the fusion of the sperm with the egg doesnot give rise to gametophyte but grow into an independent young sporophyte of Adiantum. Thus the sporophyte gives rise to gametophyte and gametophyte to the sporophyte and is known as alternation of generations.



# Fern Life Cycle

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Key:

Haploid ( $n$ )

Diploid ( $2n$ )