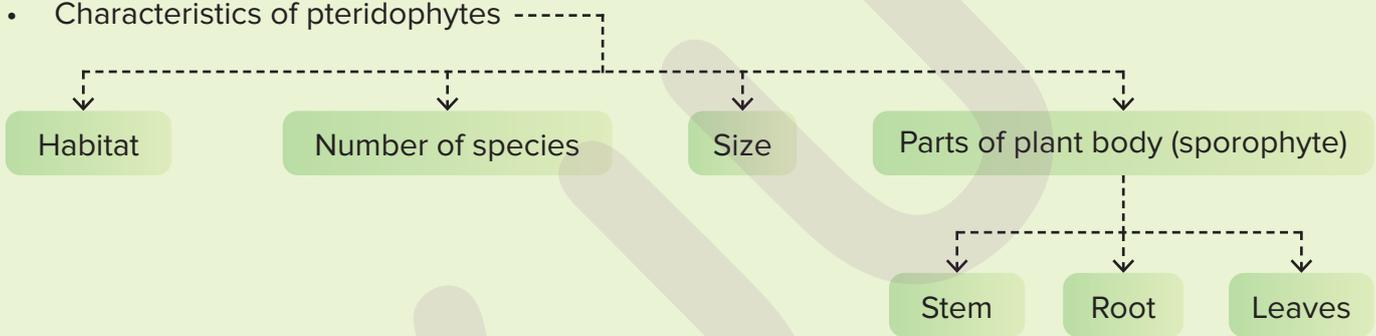




Key takeaways

- Introduction
- Origin of pteridophytes
- Alternation of generations
- Characteristics of pteridophytes
- Life cycle of pteridophytes
- Classification of pteridophytes
- Uses of pteridophytes



Phylum Pteridophyta

Pteridophytes are the **first land plants** to have **vascular tissues**.

Vascular tissues

Xylem transports water and mineral nutrients

Phloem transports food

Pteridophytes are also the first plants to have **true root, stem, and leaves**.

Origin of pteridophytes

- Fossil evidences prove that pteridophytes originated 350 billion years ago.

Fossil evidences



Characteristics of pteridophytes

Habitat



Moist shady forests



Crevices of rocks



Bogs and marshes



Epiphytes on tree trunks

An epiphyte is an organism that grows on the surface of a plant and derives its moisture and nutrients from the air, rain, and debris

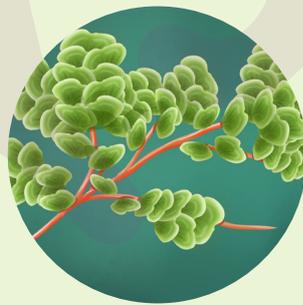
Number of pteridophyte species

There are 11,000 species of pteridophytes approximately. This is the second most diverse group of land plants after flowering plants.

Size The size of the pteridophytes varies from



The smallest
Malvi's adder's-
tongue fern



Fairy moss



The tallest
Cyathea australis



Did you know?

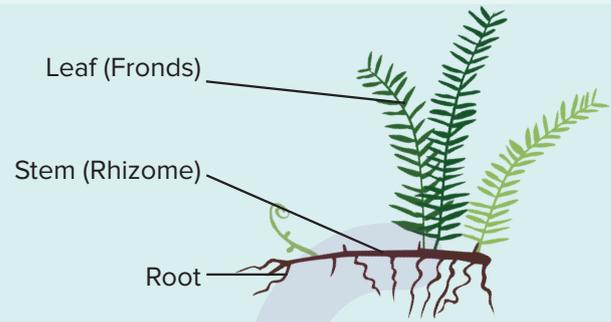
Resurrection fern - *Selaginella*



- Resurrection fern can lose 75% of water content during a normal dry period, and in drought conditions upto 97% water content and still stay alive. When it gets water again, it 'comes back to life', hence the name.
- It is said that this fern can stay in this dry state without water for about 100 years and still come back to life.

Parts of pteridophyte plant body

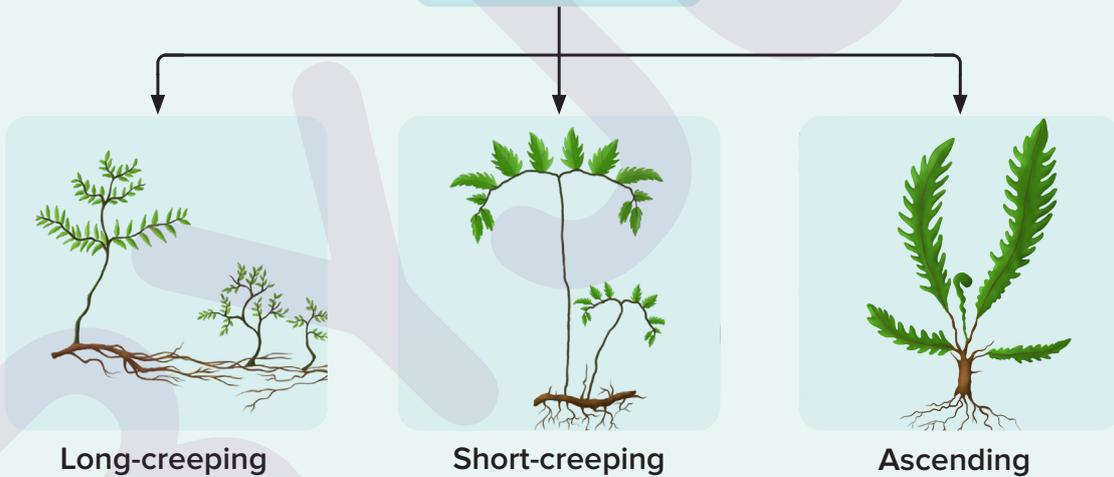
- The main plant body of pteridophytes is **sporophyte**.
- Differentiated plant body



Stem

- Stem of pteridophytes is known as **rhizome**.
- The function of it are as follows:
 - **Supports** the leaves
 - Sometimes performs **photosynthesis**
- There are three types of **rhizome**

Types of rhizome



Roots

- Develop from the rhizome and are **adventitious roots**.
- Help in **absorption** of water and nutrients.

Leaves

- Leaves are also known as **fronds** and are green and feathery.
- New leaves or fronds typically expand by the unrolling of a tight spiral as they arise from the stem.
- These are known as '**fiddleheads**', due to their resemblance to the handle of a violin or fiddle.

Fiddlehead ferns



There are two types of fronds

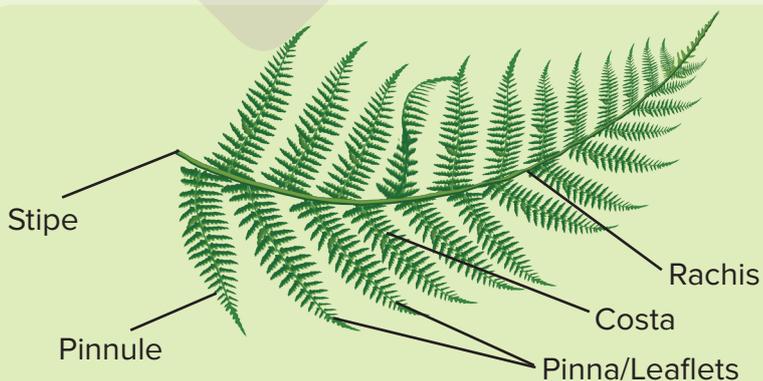
Microphyll	Megaphyll
Have single unbranched vein	Have a branched vein
Are attached directly to the stem, no stalk	Usually have a stalk
Generally small	Larger in size
	
 <i>Selaginella</i>	 Fern

Structure of fern frond

- **Stalk** within the blade is known as **rachis**
- **Pinna** are the small **leaflets** that grow along the rachis
- **Costa** is the midrib of each Pinna
- **Stipe** is the stalk below the leaf blade
- **Pinnules** are the sub-leaflets that arise from the costa

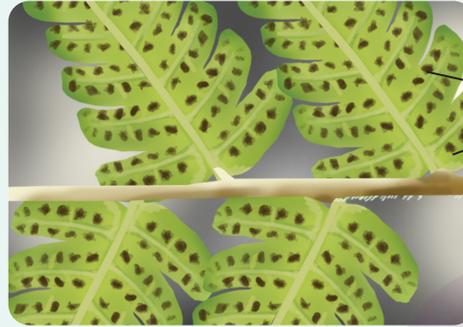
Function

- **Photosynthesis**
- **Reproduction**



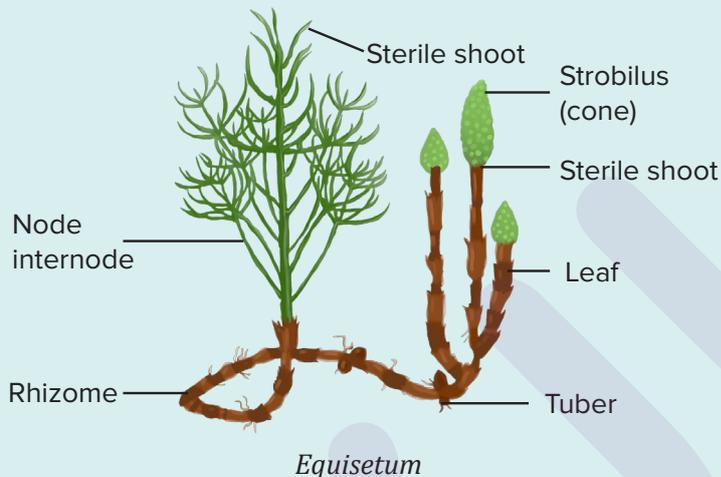
Sporophylls

- Specialised fronds/leaves that help in **reproduction**.
- Leafy structures that bear the **spores** within the **sporangia**.
- In some pteridophytes, sporophylls aggregate into distinct compact structures known as **strobili** or **cones** (Examples: *Selaginella*, *Equisetum*).



Sporangia bearing spores

Strobilus or cones



Equisetum

Equisetum



Selaginella



- Spores are **haploid, unicellular** structures that **germinate** to form **gametophyte (prothallus)**.



Did you know?

Myth of the flowering fern



In many European mythologies, the flower of a fern is a sought after thing. It is believed that the fern flower blooms for a very short time on the eve of the Summer Solstice (celebrated on June 23 or sometimes July 7), when one of the Earth's poles has its maximum tilt toward the sun.

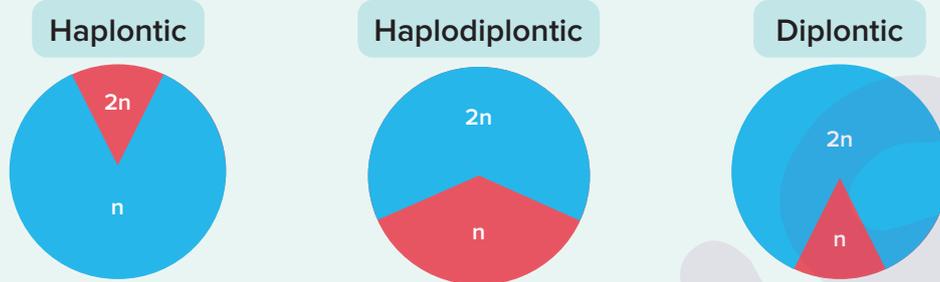
The fern that do not flower is said to bring luck, wealth, or the ability to understand animal speech. However, the flower is closely guarded by evil spirits and anyone who finds the flower will have access to earthly riches, which has never benefited anyone. So, the decision to pick the flower or leave it alone is left up to the individual.

But the sad part is that ferns never flower.

Alternation of generations in Pteridophytes

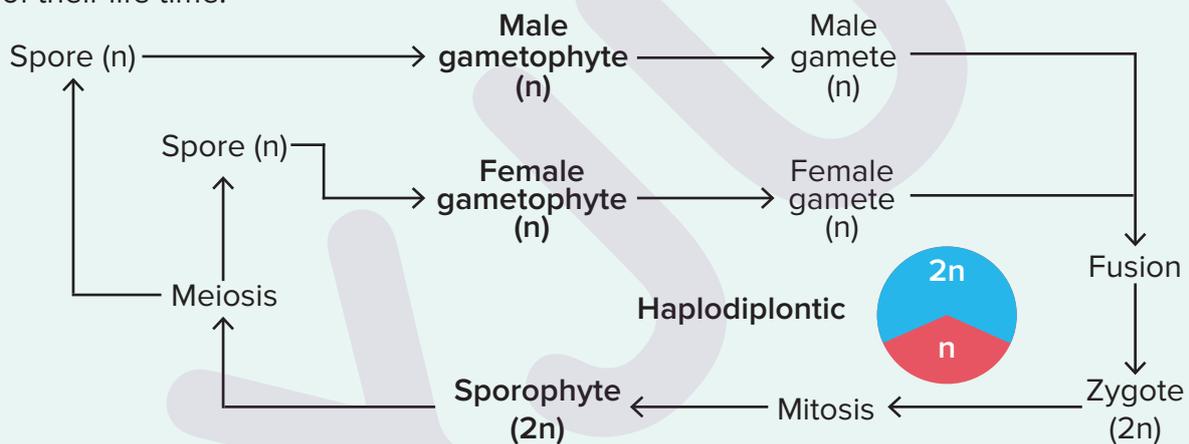
- During their lifetime, pteridophytes alternate between the **gametophyte** and **sporophyte** generation. This is known as **alternation of generations**.

- **Gametophyte stage** is haploid and produces **gametes**.
- **Sporophyte stage** is diploid and produces spores by meiosis.
- Based on the type of alternation of generation, the life cycle of an organism can be classified into three types:



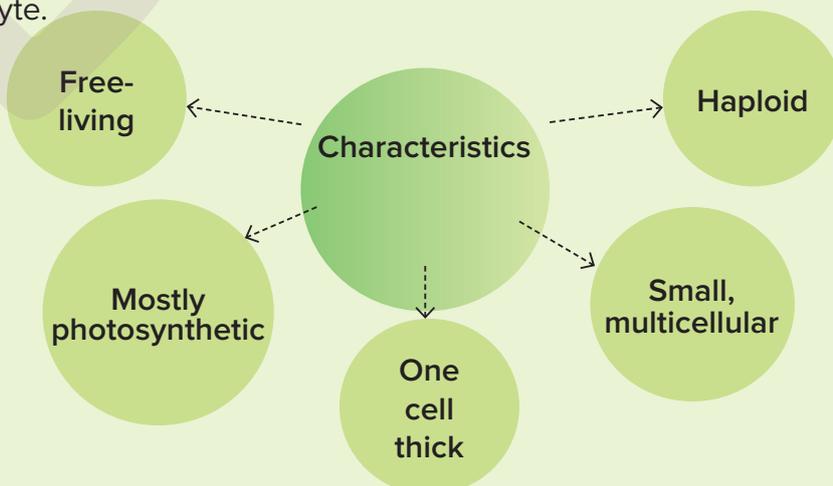
Haplodiplontic

The diploid sporophytic generation is slightly predominant to haploid sporophytic stage. They exhibit diploid sporophytic stage for about 60% of their life span. It is different from diplontic in that organisms exhibiting diplontic life cycle exhibit diploid sporophytic generation for about 80% or more of their life time.



Life cycle of pteridophytes

- The life cycle of pteridophytes comprises two phases— **sporophytic** and **gametophytic**.
- (a) **Gametophytic/Prothallus**
- Diploid sporophyte undergoes meiosis to form haploid spores, which germinate to form the gametophyte.



- It bears **sex organs** (unisexual or bisexual)
 - **Male sex organ- antheridium**
 - **Female sex organ- archegonium**



Archegonium



Antheridium

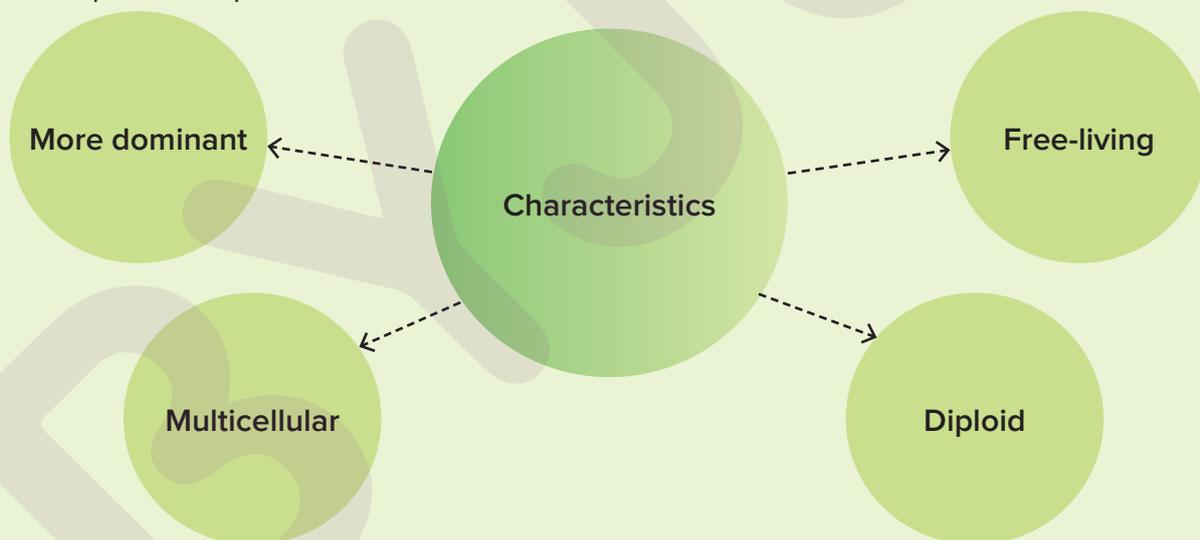


Gametophyte (n)

- Gametes produced by sex organs fuse to form **zygote**.
- Zygote develops into **sporophyte**.

(b) Sporophyte

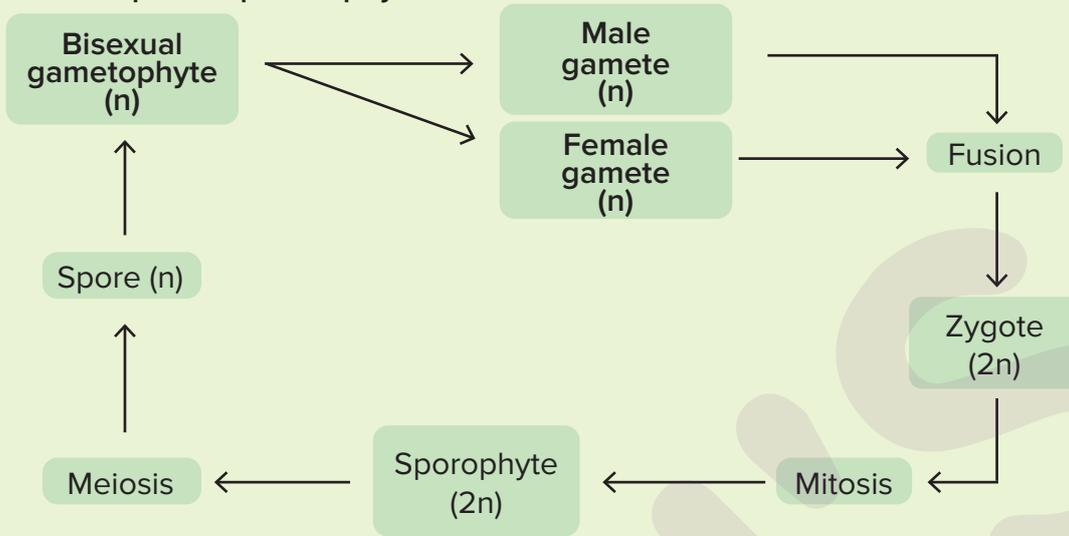
- Has a well-differentiated plant body with **root, stem, and leaves**.
- Leaves produce spores.



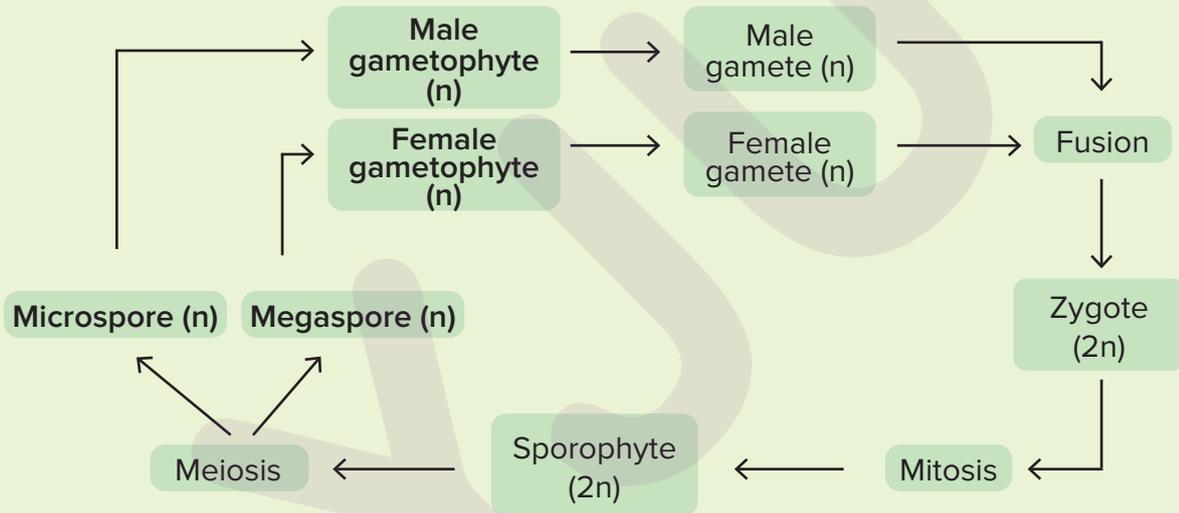
- Based on the types of spores formed, there are two types of pteridophytes, homosporous and heterosporous.

Homosporous	Heterosporous
One type of spore	Two types of spores
Small spores	Small microspores and large megaspores
Spores produce bisexual gametophyte	Microspore produces male gametophyte Megaspore produces female gametophyte
Seen in majority of pteridophytes	Seen in <i>Selaginella</i> and <i>Salvinia</i>

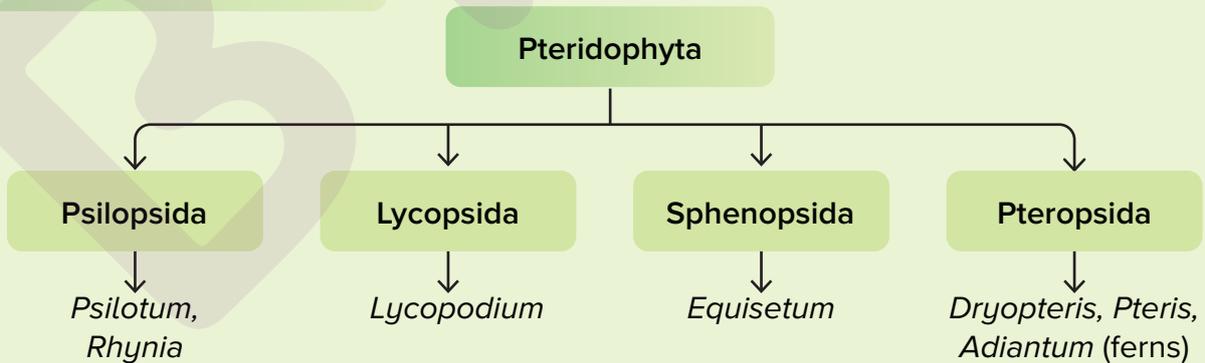
Life cycle of homosporous pteridophyte



Life cycle of heterosporous pteridophyte



Classification of pteridophytes



PSILOPSIDA



Malvi's adder's tongue fern
Psilotum

LYCOPSIDA



Selaginella
Lycopodium

SPHENOPSIDA



Equisetum (Horsetails)

PTEROPSIDA



Walking fern

Uses of pteridophytes

- Form fossil fuels
- Used as ornamental plants
- Help in absorption of heavy metals from soil and air, and hence used to prevent pollution and clean polluted areas
- Used as natural fertilisers by farmers as they help in absorbing atmospheric nitrogen
- Used as building materials
- Serve as a habitat for several invertebrates and small animals



Did you know?



Pteridophytes may represent the closest living relatives (sister group) to the seed plants, (Seed plants include the gymnosperms and angiosperms).



Summary Sheet

- **Pteridophytes** are the first land plants which have the vascular tissues— xylem and phloem.

