

# Difference Between Bryophytes Pteridophytes and Gymnosperms

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## Key Difference - Bryophytes Pteridophytes vs Gymnosperms

The kingdom Plantae is one of the most widespread kingdoms with over 300,000 different species. Plants are eukaryotic, multicellular, autotrophic organisms that are capable of photosynthesis. The evolution of the species under the plant kingdom is based on their adaptability to terrestrial environments. There are five phyla under the plant kingdom – Phylum Bryophyta, Phylum LycopHYta, Phylum Pteridophyta, Phylum Cycadophyta, Phylum Coniferophyta and Phylum Anthophyta. Coniferophytes and Cycadophytes collectively are termed as Gymnosperms. Bryophytes are the most preliminary type of plants which include mosses and liverworts. Fern plants are placed under the phylum Pteridophyta. Conifers and cycads which include plants such as *Cycas* and *Pinus* respectively are termed as Gymnosperms. The **key difference** between these three groups is the habitat where they are grown. **Bryophytes are adapted to grow in amphibious environments; Pteridophytes are adapted to terrestrial environments which are a moist and shady while, Gymnosperms are fully adapted to terrestrial environments.**

## What are Bryophytes?

Bryophytes are the most primitive type of plants in nature. They show heteromorphic alternation of generations. The gametophytic generation of bryophytes is dominant. Examples of Bryophyta are *Marchantia* and *Pogonatum*. They only grow in very moist environments. The gametophyte is independent and haploid. It consists of a small stem with leaf-like projections which are termed as pseudo leaves or leafless flattened bodies. The plant is anchored by means of thread-like structures called rhizoids. The gametophyte reproduces sexually, giving rise to a diploid sporophyte. The sporophyte is dependent.



**Figure 01: Bryophytes**

Bryophytes fertilization is dependent on water. They depend usually on a film of water or the splashing of raindrops for the transfer of sperms towards the egg. Bryophytes consist of motile flagellate sperms which are directed to the archegonium. The fertilized egg ([zygote](#)) grows out of the [gametophyte](#), which is also the source of its nourishment.

## What are Pteridophytes?

Pteridophytes are the most abundant group of seedless [vascular fern](#) plants. Tree ferns grow up to 30 - 40 feet of height. They show heteromorphic alternation of generations and dominant generation is the [sporophytic](#) generation. These fern plants are distributed in wet moist places (e.g., *Nephrolepis*) and in freshwater (freshwater fern, e.g., *Azolla*).

The sporophyte is independent and photosynthetic. It is differentiated into roots, stem, and leaves. Mechanical tissues and vascular tissues are present. However, in pteridophytes, vessel elements in xylem tissue and sieve tube elements and companion cells in phloem tissue are absent. The leaves contain a prominent cuticle and stomata. The leaves are arranged as compound leaves, and the arrangement is referred to as a frond arrangement. The young leaves show circinate venation.



**Figure 02: Pteridophyte**

The sporophyte has a horizontal underground stem called rhizome with roots emerging from sides. Young leaves are on the underside of the leaves. Sporangia are arranged as groups known as sori. These sporangia undergo meiosis to produce haploid, homosporous spores which form the prothallus and mature into the gametophyte. Gametophyte is a flat, heart-shaped independent structure known as the thallus. It is photosynthetic and monoecious (antheridia and archegonia are in the same structure). Archegonium is the female structure and produces ova. Antheridium is the male structure and produces multi-flagellated sperms. Fertilization is dependent on external water. After fertilization, the zygote develops into embryo and to the sporophyte.

## **What are Gymnosperms?**

Gymnosperms are seed-bearing plants. The seeds lack an outer covering, and thus these seeds are named as naked seeds. These are higher order plants showing high adaptability to terrestrial environments. Two main phyla fall under the group Gymnosperms. They are Cycadophyta and Coniferophyta. Both show heteromorphic alternation of generations and the dominant generation is the sporophytic generation. The common example for Cycads is *Cycas* whereas the common example for Conifers is *Pinus*.



**Figure 03: Gymnosperms**

These plants have a well-developed root system and are composed of vascular tissues, but no vessel elements in [xylem](#) tissue and no sieve tube elements and companion cells in phloem tissue. Gymnosperms do not depend on external water for fertilization, and the male sperms or gametes are transferred across the wind for fertilization. The male plant bears a cone at the apex of the stem. It consists of microsporophylls. Sori are found on the under the surface. Female plants have whirls of megasporophylls and 2-3 naked ovules are found on their two margins. Megaspore germinates and produces the female gametophyte within the ovule.

## **What are the Similarities Between Bryophytes Pteridophytes and Gymnosperms?**

- All are eukaryotic.
- All are multicellular.
- All are photosynthetic.
- All show heteromorphic alternation of generations.
- They do not bear flowers.
- They do not contain vessel elements in xylem tissue and no sieve tube elements and companion cells in phloem tissue.
- They do not contain fruits.

# What is the Difference Between Bryophytes Pteridophytes and Gymnosperms?

Bryophytes vs Pteridophytes vs Gymnosperms	
Definition	
<b>Bryophytes</b>	Bryophytes are the most preliminary type of plants which includes mosses and liverworts.
<b>Pteridophytes</b>	Pteridophytes include fern plants.
<b>Gymnosperms</b>	Gymnosperms are seed-bearing plants and include cycads and conifers.
Dominant generation	
<b>Bryophytes</b>	Gametophyte is the dominant generation of Bryophytes.
<b>Pteridophytes</b>	Sporophyte is the dominant generation of Pteridophytes.
<b>Gymnosperms</b>	Sporophyte is the dominant generation of Gymnosperms.
Spores	
<b>Bryophytes</b>	Flagellated
<b>Pteridophytes</b>	Flagellated
<b>Gymnosperms</b>	Non – flagellated may bear cilia.
Seeds	
<b>Bryophytes</b>	Absent
<b>Pteridophytes</b>	Absent
<b>Gymnosperms</b>	Present – naked seeds
External water for fertilization	
<b>Bryophytes</b>	Bryophytes require external water for fertilization
<b>Pteridophytes</b>	Pteridophytes require external water for fertilization

<b>Gymnosperms</b>	Gymnosperms do not require external water for fertilization
<b>Vascular Systems</b>	
<b>Bryophytes</b>	Absent
<b>Pteridophytes</b>	Absent
<b>Gymnosperms</b>	Present

## Summary - Bryophytes vs Pteridophytes vs Gymnosperms

Kingdom Plantae is a diverse kingdom consisting of different phyla. Bryophyta defines the most primitive class which have a dependent sporophyte and flagellated sperms suitable for fertilization which is dependent on external water medium. Pteridophytes belong to the class of fern plants and are of higher order composed of an independent sporophyte. Gymnosperms are nonflowering seed bearing plants which are much adapted for terrestrial environments and therefore have features for its survival in harsh weather conditions. This is the difference between bryophytes pteridophytes and gymnosperms.

### Reference:

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- 2.“Gymnosperms .” Study.com. [Available here](#)
- 3.“Kingdom Plantae.”Biology@TutorVista.com. [Available here](#)

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APA: Difference Between Bryophytes Pteridophytes and Gymnosperms. (2017, October 10). Retrieved (date), from <http://differencebetween.com/difference-between-bryophytes-pteridophytes-and-vs-gymnosperms/>

MLA: " Difference Between Bryophytes Pteridophytes and Gymnosperms " Difference Between.Com. 10 October 2017. Web.

Chicago: "Difference Between Bryophytes Pteridophytes and Gymnosperms." Difference Between.Com.  
<http://differencebetween.com/difference-between-bryophytes-pteridophytes-and-vs-gymnosperms/> accessed  
(accessed [date]).



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