

# Some of the most important characters of gymnosperms are as follows:

## 1. Habit:

The living gymnosperms are woody, evergreen (except *Larix* and a *Taxodium*) perennials grow as trees or shrubs. Tallest trees are *Sequoia sempervirens* (366ft) and *S. gigantea* (342ft).

## 2. Occurrence:

The living members are found in colder regions of earth where snow (not rain) is the source of water. Only the members of cycadales and gnetales thrive in warm dry climate.

3. The dominant plant body is sporophyte ( $2n$ ) which may be dioecious or monoecious. Gametophytes are inconspicuous and endosporic i.e. develop with the spores.

4. Sporophyte differentiated into — root, stem and leaves.

## Root system:

Tap root system is exarch and diarch to polyarch. Besides tap root, coralloid roots (in cycads) and mycorrhizal root (in coniferals) present.

Stem: Erect, generally branched (*Cycas* is un-branched)

## Leaves:

Dimorphic i.e. 2 types, foliage and scale leaves.

## 5. Xerophytic Traits:

Gymnosperms are xerophytes in nature due to presence of thick bark, thick hypodermis, thick cuticle, scales leaves, sunken stomata, transfusion tissue, etc. In some cases leaves modified into needle-like, scale like or small leathery. These are the adaptations to combat water stress in air and colder regions.

## 6. Xylem:

Composed of xylem parenchyma and tracheids with bordered pits. Vessels are absent (except in Gnetales).

## 7. Phloem:

Composed of sieve cells and phloem parenchyma but companion cells absent.

## 8. Heterospory:

The gymnosperms are heterosporous, means 2 types of spores produced i.e. haploid microspores and megaspores. Microspores produced within micro-sporangia while megaspores produce within megasporangia (nucellus) of ovules. Both types of sporangia are formed on special leaf-like structures called sporophylls (microsporophylls and megasporophylls).

## 9. Cones or Strobili:

Sporophylls are spirally arranged along an axis to form compact cone or strobili i.e. male or pollen cones and female or seed cones but in *Cycas* female cone is loosely arranged called lax.

**10. Ovules:**

Naked, sessile, generally orthotropous, and unitegmic or bitegmic (in Gnetum).

11. Pollination is anemophilous i.e. by wind.

12. Fertilization is siphonogamous i.e. male gametes carried to female gametes by means of a pollen tube. Double fertilization, a feature unique to angiosperms, is absent in gymnosperms, but found in Ephedra. After fertilization, Zygote develops into embryo and ovules become seed.

13. Endosperm or female gametophyte formed before fertilization and is always haploid. (But triploid in angiosperms.)

14. Embryo development is meroblastic i.e. develops from a small part of zygote.

15. Most members show polyembryony i.e. development of more than one embryo, but only one survives at the end.

16. Cotyledons 2 (in Cycas) or many (in Pinus 2-14).

17. Cambium form secondary wood which is monoxyletic (soft and porous) or pycnoxylic (hard and compact)