SEMESTER-II
CORE COURSE IV: ARCHEGONIATE COURSE
CODE: BOTACOR04T
UNIT 6: GYMNOSPERMS- PART-I

Dr. Madhushri Das
Assistant Professor, Dept. Of Botany
HMMC for Women, Dakshineswar

GENERAL CHARACTERS OF GYMNOSPERMS

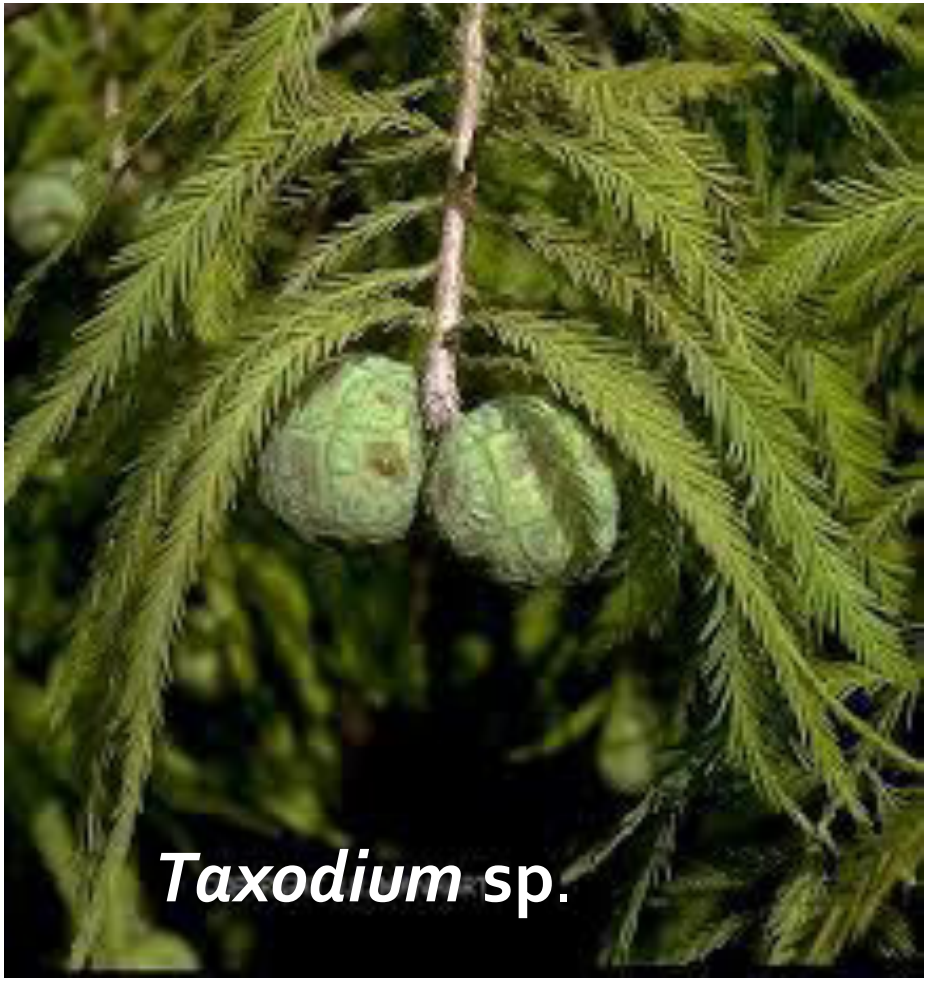
Introduction:

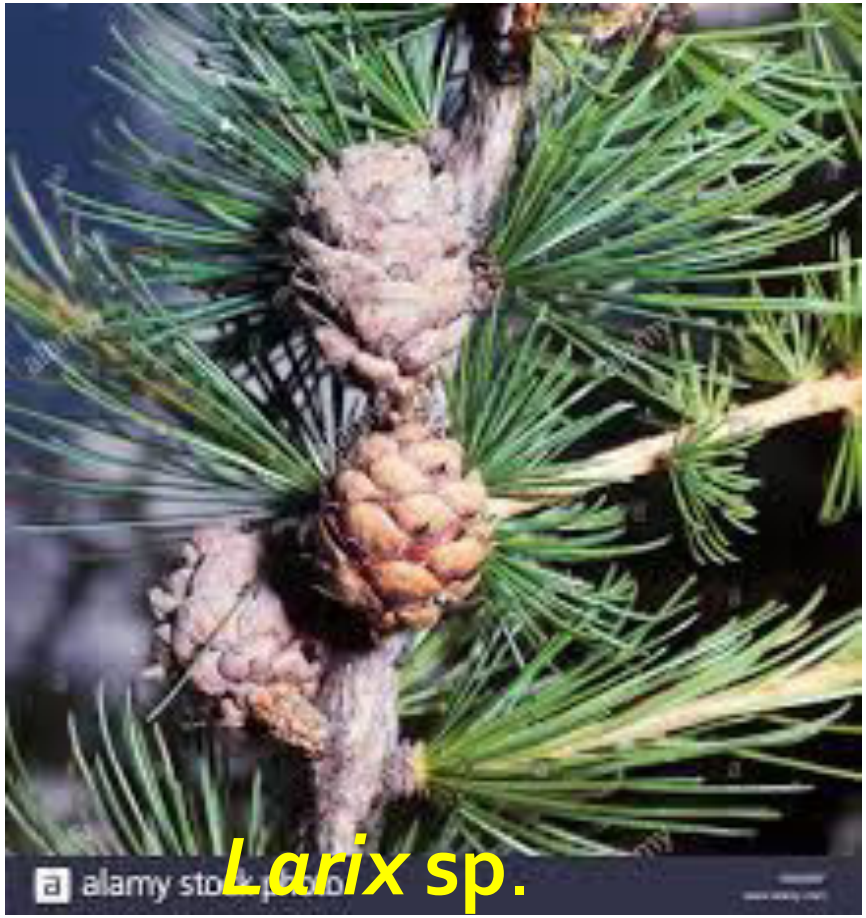
- The sporophyte is usually arborescent (resembling a tree in growth or appearance) comprising of large or small woody trees or shrubs. Few may be lianas or climbers. Most gymnosperms are evergreen but some are deciduous such as *Larix* sp. and *Taxodium* sp.

Gymnosperms features:

(A **xerophyte** (from Greek ξηρός xeros dry, φυτόν phuton plant) is a species of plant that has adaptations to survive in an environment with little liquid water, such as a desert or an ice- or snow-covered region in the Alps or the Arctic. Popular examples of **xerophytes** are cacti, pineapple and some Gymnosperm plants.).

Gymnosperms features:



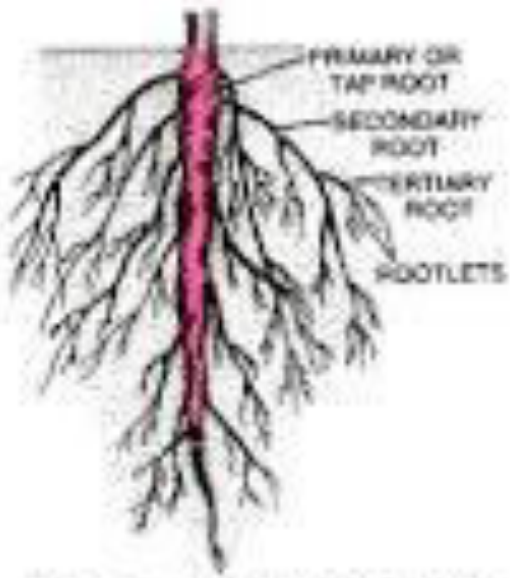


Gymnosperms features:

- The plants are mostly xerophytes.
- The plant body is sporophyte and is differentiated into root, stem and leaves.

Gymnosperms features:

- The plants have a long lasting tap root system.



TAPROOT SYSTEM

Gymnosperms features:

The vascular cylinder is di-to polyarch, xylem exarch.

Main elements of xylem are tracheids but in *Gnetum* and *Ephedra* vessels are also present. Phloem is composed of sieve cells and lacks companion cells.

Gymnosperms features:

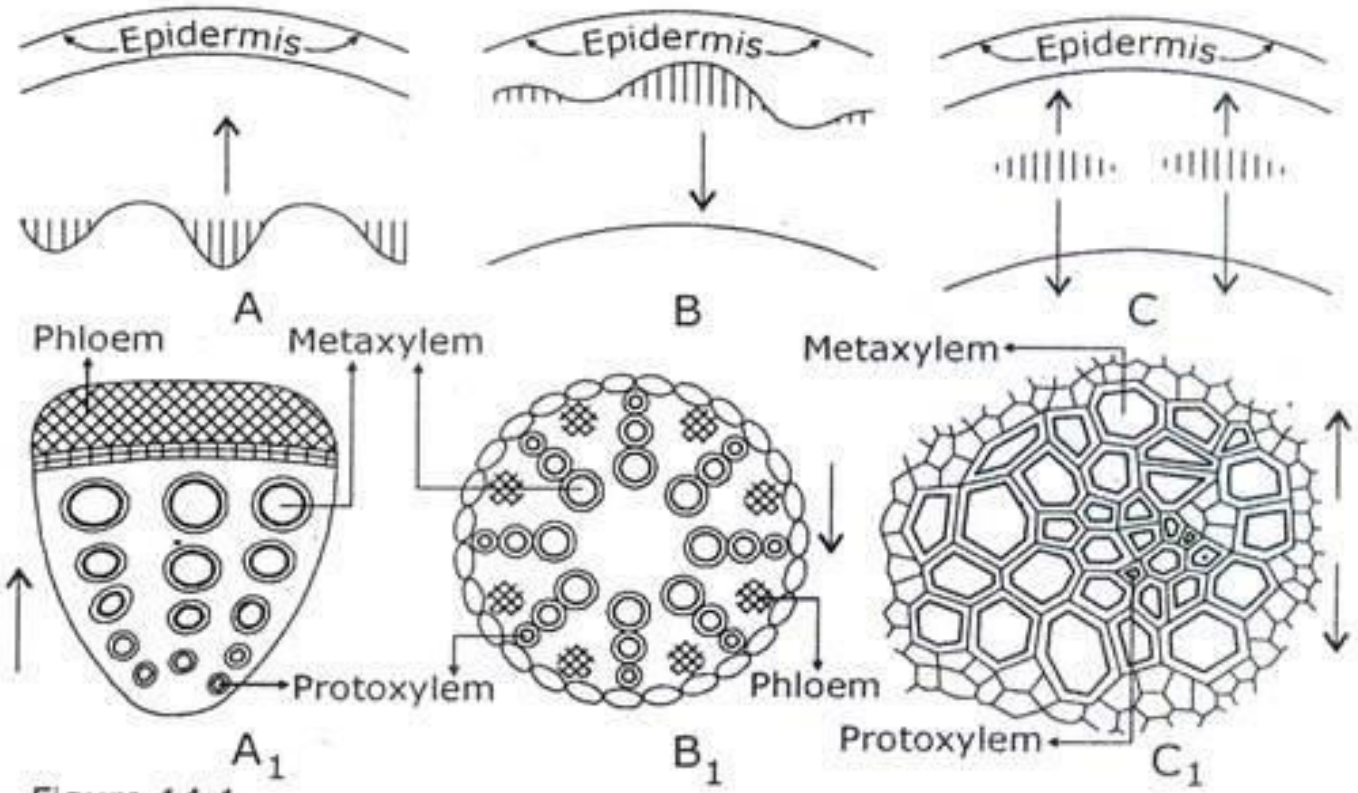


Figure 14.1

Diagrams showing order of development of primary vascular tissues in transverse views. A. & A_1. Centrifugal with endarch xylem. B. & B_1. Centripetal with exarch xylem. C. & C_1. Both centrifugal and centripetal with mesarch xylem.

Gymnosperms features:

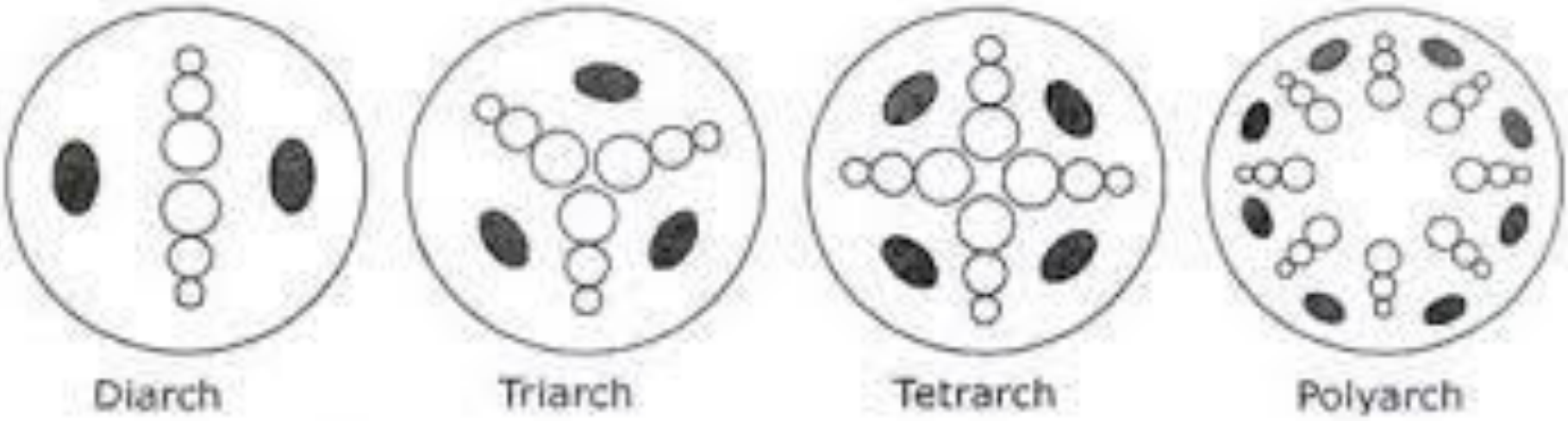


Figure 14.4

Diagram illustrating the different arrangements of the number of protoxylem groups in roots in cross-sectional view.

Gymnosperms features:

- Some forms exhibit additional symbiotic relationship between roots and algae in coralloid roots (*Cycas* sp.) and between roots and fungi in mycorrhizic roots (*Pinus* sp).

Coralloid roots (*Cycas* sp.)

Coralloid (C) and Precoralloid (PC) on a *Cycas circinalis* growing in the Enid Haupt Conservatory at the New York Botanical Garden. The green cyanobacterial zone (arrow) is clearly visible in a broken root as well as the green coloration in the precoralloid apecies.

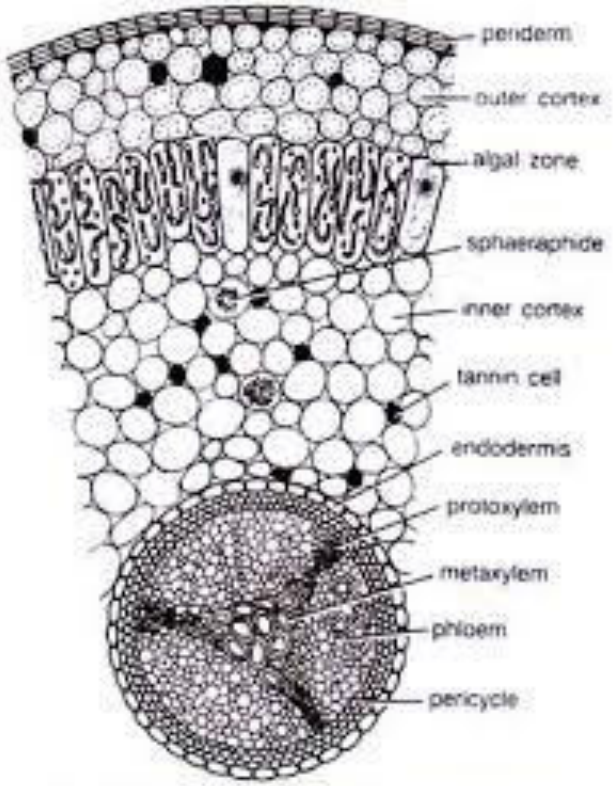


Fig. 8.18. *Cycas revoluta* T S coralloid root

Gymnosperms features:

- The stem is aerial, erect and branched or unbranched (*Cycas* sp.) with leaf scars.

Gymnosperms features:

- In conifers two types of branches namely branches of limited growth (Dwarf shoot) and Branches of unlimited growth (Long shoot) is present.

- Leaves are dimorphic, foliage and scale leaves are present. Foliage leaves are green, photosynthetic and borne on branches of limited growth. They show xerophytic features.

Gymnosperms features:

- Secondary growth is present. The wood may be **Manoxylic** (Porous, soft, more parenchyma with wide medullary ray –*Cycas* sp.) or **Pycnoxylic** (compact with narrow medullary ray-*Pinus* sp.).

Gymnosperms features:

- They are heterosporous. The plant may be monoecious (*Pinus* sp.) or dioecious (*Cycas* sp.).
- Microsporangia and Megasporangia are produced on Microsporophyll and Megasporophyll respectively.
- Male and female cones are produced.

Gymnosperms features:

- Anemophilous pollination (wind-pollinated) is present.
- Fertilization is siphonogamous (a condition in plants in which pollen tubes are developed for the transfer of the male cells to the eggs. Usually the seed plants are **siphonogamous**, while in the lower plants the male cells usually swim to the eggs) and pollen tube helps in the transfer of male nuclei.

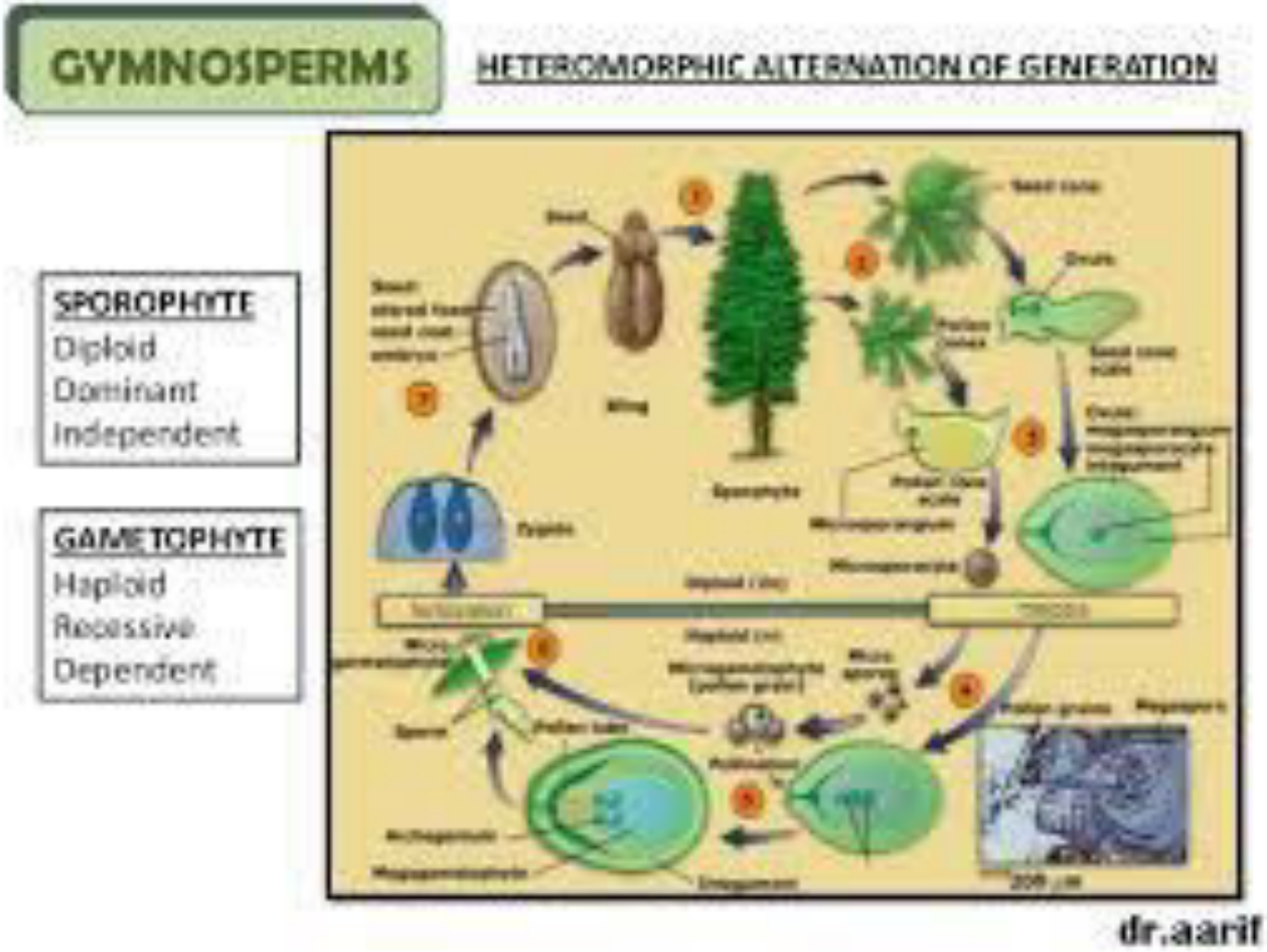
Gymnosperms features:

- Polyembryony (presence of many embryo) is Present. The naked ovule develops into seed.
- The **endosperm** is haploid and develop before fertilization.

Gymnosperms features:

- The life cycle shows alternation of generation. The sporophytic phase is dominant and gametophytic phase is highly reduced.

Heteromorphic alternation of generation in Gymnosperms



Gymnosperms resemble with angiosperms in the following features

- Presence of well organised plant body which is differentiated into roots, stem and leaves.
- Presence of cambium in gymnosperms as in dicotyledons.
- Flowers in *Gnetum* resemble to the angiosperm male flower. The Zygote represent the first cell of sporophyte.

Gymnosperms resemble with angiosperms in the following features

- Presence of integument around the ovule.
- Both plant groups produce seeds.
- Pollen tube helps in the transfer of male nucleus in both.
- Presence of Eustele.

Difference between angiosperms and gymnosperms

Table 2.5: Difference between Gymnosperms and Angiosperms		
S.No	**Gymnosperms**	**Angiosperms**
1.	Vessels are absent [except Gnetales]	Vessels are present
2.	Phloem lacks companion cells	Companion cells are present
3.	Ovules are naked	Ovules are enclosed within the ovary
4.	Wind pollination only	Insects, wind, water, animals etc., act as pollinating agents
5.	Double fertilization is absent	Double fertilization is present
6.	Endosperm is haploid	Endosperm is triploid
7.	Fruit formation is absent	Fruit formation is present
8.	Flowers absent	Flowers present