

B.Sc Botany (Sub.) I

Group: A

General Characters of Gymnosperm

Gymnosperms are a small group of plants comprising only 70 genera and 725 living species. The word Gymnosperm was used by the Greek botanists Theophrastus in 300 B.C. for the plants with unprotected seeds. Gymnosperms are naked seeded plants.

The gymnosperms are characterized by the following features:

- i. It shows the distinct alternation of generations.
- ii. Sporophytic generation is the dormant phase of the life cycle. The main plants are sporophyte and the gametophytes are dependent on it throughout.
- iii. The sporophytic plants are usually tall, woody, perennial trees or shrubs and differentiated into root, stem and leaves.
- iv. Root- Root is usually well developed tap root system. The stele in root is diarch or polyarch.
- v. Stem- stems are usually branched but unbranched in *Cycas*.
- vi. The leaves may be compound as in *Cycas* or simple as in *Pinus*.

Internal structure:

- i. The vascular bundles in stem are arranged in a ring. The bundles are conjoint, collateral and open.
- ii. The secondary growth is effected by a cambial layer which produces secondary xylem and secondary phloem on the inner and outer side respectively.
- iii. The secondary wood forming distinct annual ring.

Spring wood: It is made up of layer tracheids with the walls and layer lumen.

Autumn wood: It is made up of compactly arranged smaller tracheids with thick walls and smaller lumen.

- iv. The wood may be manoxylic or pycnoxylic and may be monoxylic or polyxylic.

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Manoxylic: The wood having narrow medullary rays and usually commercially.

Pycnoxylic: The wood having narrow medullary rays and it is of great commercial use.

Monoxylic: The wood formed by persistent cambium ring.

Polyxylic: It consists of alternate concentric rings of secondary xylem and phloem formed by successive rings of cambium.

- v. The wood is gymnosperm each vessels (trachea) except in Gnetopsida.
- vi. The wood tracheids have bordered pits.
- vii. The phloem is lack of companion cells.
- viii. Presence of mesarch xylem in the leaves of certain graphs.

Reproductive Structure:

The plants are heterosporous and they are found two types spores – microspores and megaspores

- i. Microspore: They are formed in microsporangia which are developed in microsporophyll. The microsporophyll aggregated to form compact male strobilus or cone. The male cones are usually smaller and short lived.
- ii. Megaspores: megaspores are formed in megasporangia (ovules) which are developed on megasporophylls or ovuliferous scale. The ovules are borne naked on the megasporophylls. The ovules are not enclosed within the ovary with style and stigma.
- iii. The pollen grain (microspores) is directly carried to the micropyle by wind and is drawn to the tip of the nucellus. The microspore develops into male gametophyte within the ovule.
- iv. The integument is usually differentiated into three layers outer fleshy-sarcotesta, middle stony sclerotesta and inner fleshy endotesta.
- v. The ovules show the presence of pollen chamber and archegonial chamber.
- vi. The meroblastic formation of embryo.
- vii. Polyembryony is of common occurrence since gymnosperms produce several archegonia in the female gametophyte.

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- viii. **Seed-** The mature seed represents three successive generations-
- (i) The integuments and nucellus of the old sporophyte (2N) as testa or seed coat and perisperm.
 - (ii) The female gametophyte (1N) as endosperm.
 - (iii) The embryo as new sporophyte (2N).

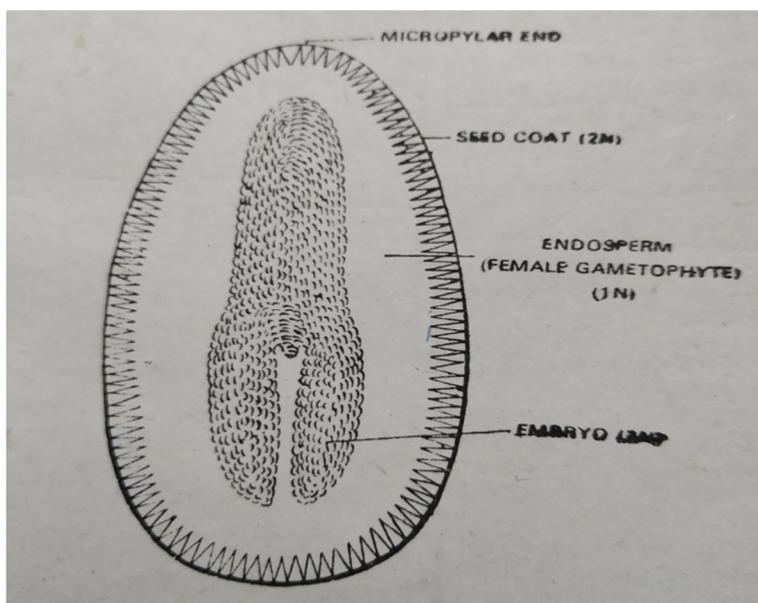


Fig. L.S. of gymnospermous seed

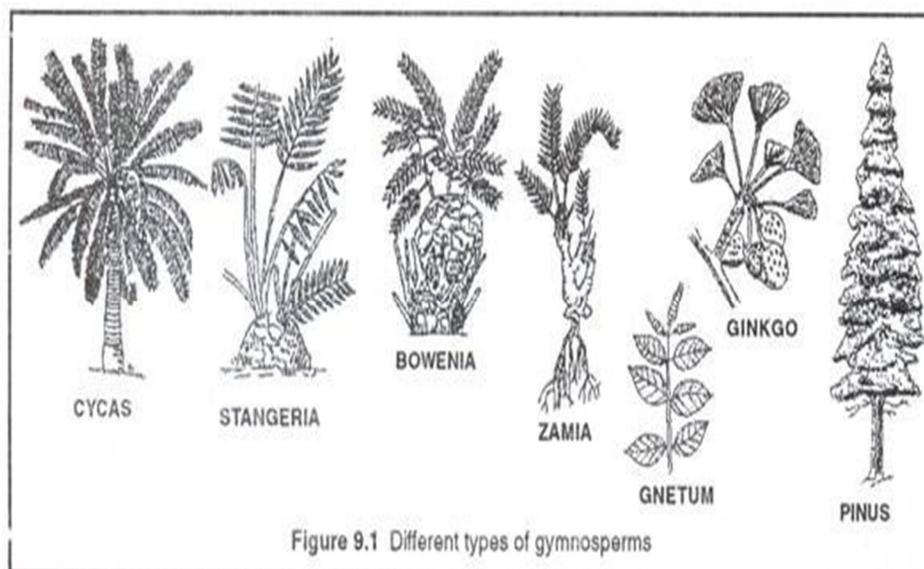


Figure 9.1 Different types of gymnosperms