

CONIFERALES

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FOR M.Sc 2ND SEMESTER STUDENTS

Class-Coniferopsida; Order-Coniferales; Genus-Pinus:

According to Buchholz (1948), the existing Coniferales have 50 genera and 550 species, 30 of the genera being confined to the Northern and 14 to the Southern hemisphere.

The Coniferales are well represented in the tropics but are abundant in temperate regions of the world. Many genera, e.g., *Pinus*, *Picea*, *Cupressus* and *Juniperus* are common to both Eastern and Western hemispheres. All the Pinaceae except one species of *Pinus* are confined to the Northern hemisphere while Araucariaceae and most of Podocarpaceae belong to the Southern hemisphere.

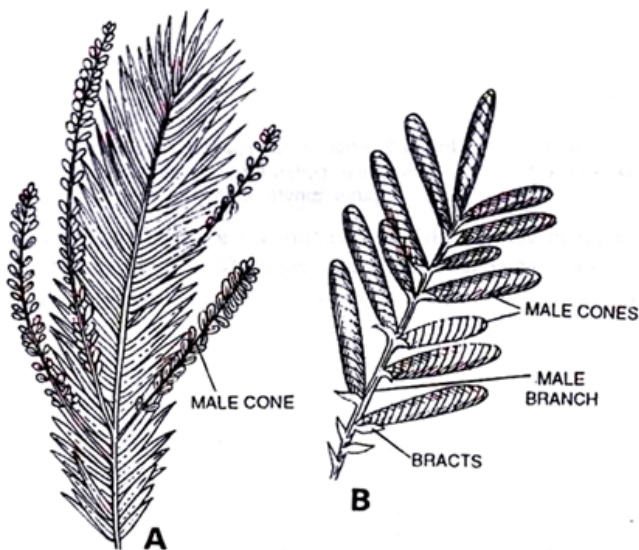


Fig. 4.1. *Podocarpus* spp. A, shoot bearing male cones;
B, Male branch with male cones in bracts.

The Taxaceae are mostly found in the Northern hemisphere. The Taxodiaceae, Cupressaceae and some of Podocarpaceae are commonly found in both the Northern and Southern hemispheres of the world. A large number of Coniferales are found abundantly in the western parts of the United States and also in the extra tropical regions of Eastern and Central Asia.

A very few conifers have been reported from tropical regions of Africa and especially of South Africa. In India, about 13 genera and 25 species of Coniferales are found.

Cephalotaxus and Taxodium have been reported to be found in South India only while the remaining 11 genera are found throughout the country especially in cool hilly places. About 7 conifers have been reported from the vicinity of Shimla, e.g., Cupressus, Pinus, Picea, Abies, Juniperus, Podocarpus and Taxus.

In Shimla hills, there are five well marked species of conifers. Pinus roxburghii (Syn. P. longifolia) is found upto a height of 6,000' and this species is also commonly found in the plains. P. wallichiana, (Syn. V. excelsa) is found between 5,000' to 7,000' elevation. Cedrus deodora, the well known deodar tree is found at 8,000' elevation or so.

Picea morindoides is found between 7,000' to 9000' in Shimla hills. Abies pindrow, Taxus sp. and Cupressus sp. are found at about 8,000' elevation in Shimla hills.

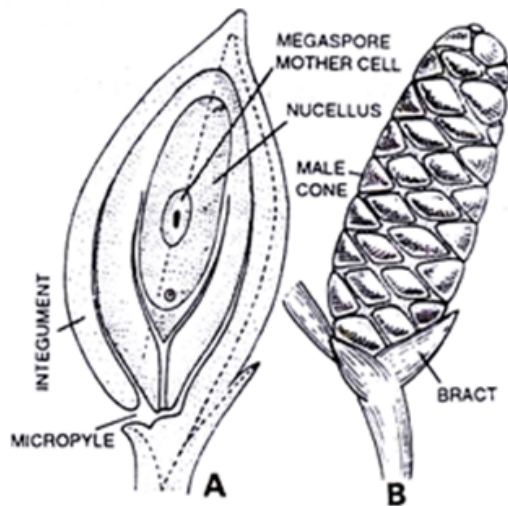


Fig. 4.2. *Podocarpus* spp. A, L.S. of ovule; B, single male cone arising from axil of bract.

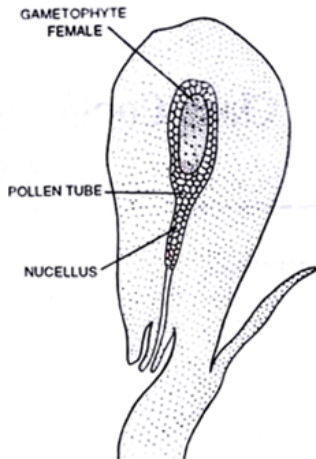


Fig. 4.3. *Podocarpus* spp. L.S. ovule showing micropyle, pollen tube, nucellus, female gametophyte, stalk and bract.

About all the conifers are evergreen plants with few exceptions, e.g., dwarf junipers and few others. The trees are with a long shaft which may reach to a height of 250' or more and may attain the girth of even 50' or so. The conifers include the biggest trees of the world, e.g., *Sequoia gigantea* and *Taxodium mucronatum*.

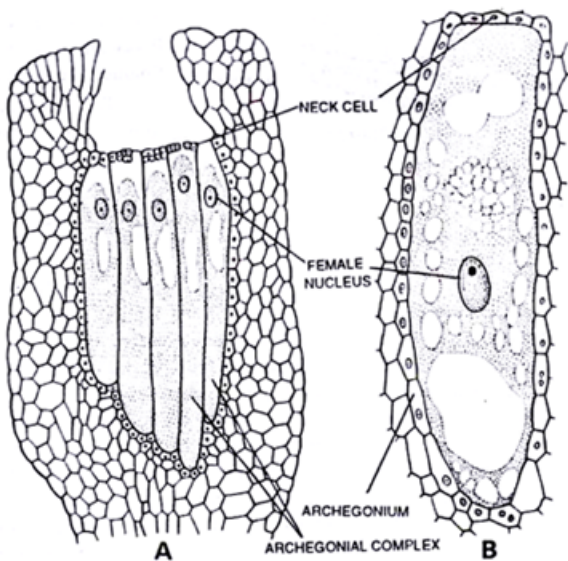


Fig. 4.4. *Podocarpus* spp. A, female gametophyte with archegonial complex in micropylar region (L.S.); B, single archegonium.

All the conifers are long-lived plants and some of them may live 1,000 years and few of them like *Sequoia* and *Taxodium* sp. are said to be living for last 4,000 years or more. Lobb, an English explorer discovered these trees (*Sequoia* and *Taxodium*) in 1850 on the Sierra Nevada Mountains in California.

Dr. Schulman at the Arizona University discovered the pine trees called 'bristle cone pines' which he estimates to be more than 4,000 years old. They are quite small trees in

their dimensions.

They are 4.5 metres to 9 metres high, 0.6 metre to 1.5 metres in diameter. These trees are now being considered the oldest living beings in the world. The species is known as *Pinus aristata* Englem. In our country the deodar tree attains an age of 750-900 years.

Characteristic Features of Coniferopsida:

1. Mostly evergreen with branched stems, rarely shrubs.
2. The leaves are needle or scale-like, sometimes flattened, rarely falling in autumn, spirally arranged or whorled, entire. The leaves possess xerophytic characters.

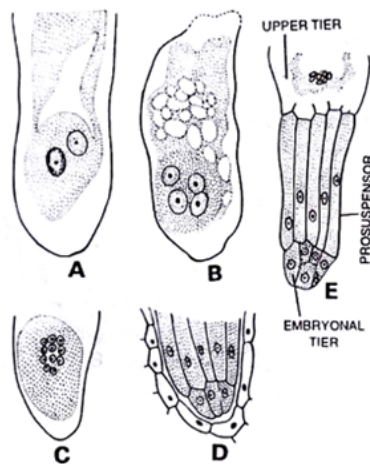


Fig. 4.5. *Podocarpus* spp. Embryogenesis. A-C, 2-16 nucleate proembryo; D, embryonal and suspensor tiers of proembryo; E, three-tiered embryo.

3. Wood without vessels consisting of long tracheids which show bordered pits. Resin canals present frequently.

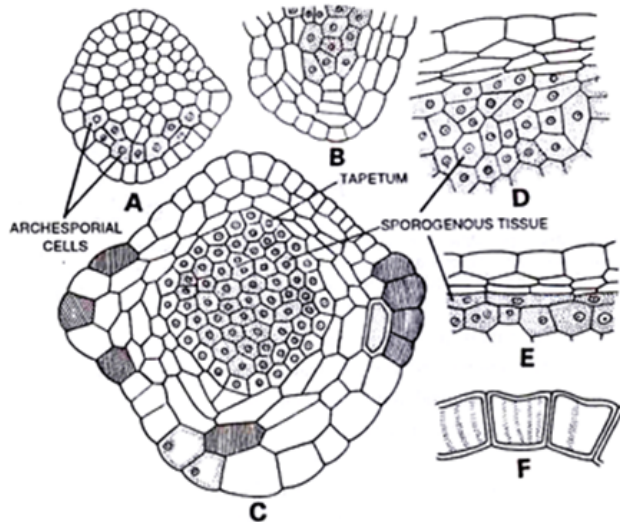


Fig. 4.6. Cephalotaxaceae. *Cephalotaxus* spp. A-F, successive stages in the development of microsporangium.

4. The flowers are monoecious or dioecious, e.g., *Juniperus*, *Podocarpus*, *Taxaceae*, etc. The female flowers are terminal or lateral and then surrounded by supporting bracts.
5. The male flowers consist of a number of stamens arranged in strobili. The stamens are usually many, each with 2 to 20 pollen sacs, connective often produced as an appendage.
6. Pollen grains may be winged, e.g., *Pinus*.
7. The female flowers are arranged in cones or catkins with the exception of *Taxaceae*, *Cephalotaxaceae* and *Podocarpaceae*.
8. Each female flower consists of a bract (sterile) and a scale (fertile). The scale is found above the bract. The ovules develop on the upper surface of ovuliferous scales.

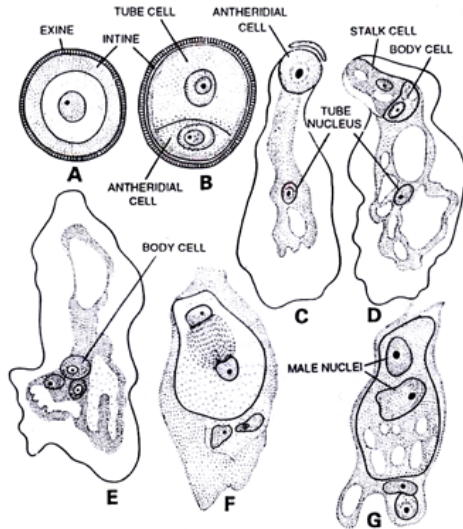


Fig. 4.7. *Cephalotaxus* spp. Male gametophyte. A, pollen grain; B, two-celled stage of pollen grain; C, pollen tube with tube nucleus and antheridial cell; D, antheridial cell formed stalk cell and body cell; E, pollen tube containing body cell stalk and tube nuclei; F, dividing body cell; G, two male nuclei formed.

9. The female cone ripens in 1-3 years and is usually dry on ripening.
10. The seeds are often winged, nut like and with a leathery or woody testa.
11. The cotyledons are epigeal and 2-16 in number.
12. Polyembryony is quite common. 13. They produce non-motile sperms at the time of fertilization.

Classification of Coniferopsida:

The Coniferales may be divided into two main series-the Pinades and the Taxades characterized by the presence or absence of an ovulate cone. The classification of conifers depends on the worker's personal stand point.

In fact all external features of the various parts, the superficial characters of reproductive structures and the anatomy of the vegetative and reproductive parts are taken into consideration for the study of their taxonomy.

According to Sexton, the structure of male gametophyte, the position of archegonia and the structure and development of the embryo are sufficiently distinctive to be used in the classification of conifers. He, however, recognizes only five families-1. Pinaceae; 2. Cupressaceae; 3. Araucariaceae; 4. Podocarpaceae and 5. Taxaceae. He does not recognize Taxodiaceae.

Upto 1917 Chamberlain divided the conifers into two main series co-ordinate with each other and to other groups of gymnosperms-Pinaceae and Taxaceae. Chamberlain in 1935 slightly modified his view and divided the conifers into six families.

1. Abietaceae; 2. Taxodiaceae; 3. Cupressaceae; 4. Araucariaceae; 5. Podocarpaceae and 6. Taxaceae. He included the first four families in his series Pinades and the last two families in series Taxades.

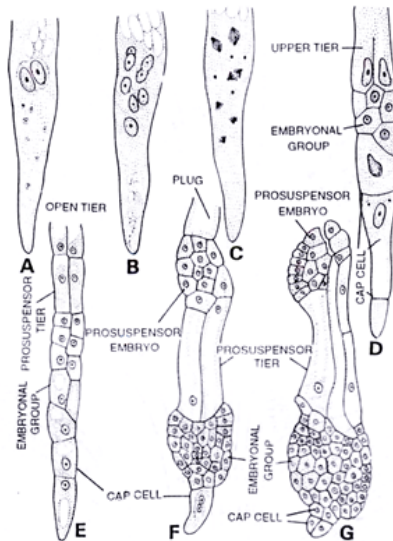


Fig. 4.8. *Cephalotaxus* spp. Successive stages in the development of embryo. A, two-nucleate stage. B, eight nucleate stage; C, further free nuclear division; D, wall formation in proembryo; E, proembryo with prosensor and embryonal tiers; F-G, embryo with cap cells.

Pulle has proposed a revised classification of the group.

It is as follows:

1. Order-Araucariales

Family-Araucariaceae

2. Order-Podocarpaceae

Family- Podocarpaceae

3. Order-Pinales

Family-Pinaceae

4. Order-Cupressales

Families-Cupressaceae

Taxodiaceae

5. Order-Taxales

Families-Cephalotaxaceae

Taxaceae

Economic Importance of Coniferopsida:

From the point of their utility, the conifers are the most important.

Timber:

Their timber is of universal importance. The timber is recognized for its durability, strength, lightness, elasticity, fineness in grain, etc. The conifers are abundantly found, and therefore the timber produced by them is the cheapest and the best.

Resin and turpentine:

Resin and turpentine are obtained from the coniferous trees on commercial scale. A well known resin Canada balsam is obtained from *Abies balsamia*. It is used as mounting medium for preparing permanent biological slides. They are a source of immense revenue to the Government of India.

Railway sleepers:

Deodar wood is the strongest of the Indian conifers. Its primary use is for railway sleepers. The average life of the sleepers being 15 years.

Newsprint paper:

A large quantity of newsprint and other rough paper is obtained from the wood of various conifers, e.g., *Abies*, *Picea*, *Cryptomeria*, etc.

Dry fruits:

The seeds of *Pinus gerardiana* are called chilgoza which are roasted and eaten.