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Pinus: Systematic position; Salient Features & External morphology

Pinus are coniferous, evergreen resinous trees which are popularly known as pine. They belong to the family Pinaceae under order Coniferales of class Coniferopsida. Different species of the genus *Pinus* are distributed throughout the temperate and sub-alpine regions of Northern Hemisphere where they form dense forests of evergreen trees. They can grow up to 80 (260 ft) meters in height. The tallest pine tree is ponderosa pine which can grow about 81.79 m (268.35 ft) tall. They are long lived plant and can live up to 1000 years or more under favorable conditions. There are about 120 species of pine tree throughout the world. They are widely distributed in the hills and have economic value because many pines are used in the construction, paper-products industries as the source of timber and resin. Some pine trees are also sources of wood tars, resin, turpentine, and oils while some produce edible seeds such as pine nuts. Besides these, white, black, Himalayan, and stone pines are cultivated as ornamental pine trees.

Systematic Position

Division: Coniferophyta

Class: Coniferopsida

Order: Coniferales

Family: Pinaceae

Genus: *Pinus*

Species: *P. wallichiana*, *P. insularis*, *P. armandi*, *Pinus khasya*, *Pinus geradiana*, *Pinus roxburghii*, etc.

Salient Features of Pinus

- They are evergreen, perennial lofty trees with spirally growing branches which give pyramidal or conical appearance.
- The body is divided into stem, roots and needle-like leaves.
- The stem is erect and cylindrical and is covered with bark.
- There are two types of branches: the long shoot of unlimited growth and dwarf shoot of limited growth.
- The long shoot bears apical bud and grows indefinitely with many scaly leaves.
- Dwarf shoot does not contain any apical bud and they arise on the long shoot in the axil of scaly leaves.
- Each dwarf shoot bear two scaly leaves which is also known as prophylls.
- Leaves are dimorphic: the long green needle shaped foliage leaves and small, brown, membranous scale leaves.
- Scale leaves are thin and brownish in color which is developed only on long as well as dwarf shoots while the foliage leaves are large, needle-like and found only at the apex of the dwarf shoots.
- The pine bears tap root system with insufficient hairs but it disappears soon. Many lateral roots also develop which play an important role to absorb the mineral containing water.

- The branch roots are infested with mycorrhizal fungus and hence it is called the mycorrhizal root.
- They have endarch vascular bundles. Individual vascular bundles are separated by means of medullary rays.
- The anatomy of leaves shows xerophytic structure: thick cuticularised epidermis with sunken stomata and sclerenchymatous hypodermis.
- Resin ducts are present in the mesophyll tissue and the cells of the mesophyll have ridges on the walls which project inside the cell cavities.
- Microsporophylls are arranged spirally on the central axis and forms male cone.
- Megasporophyll of the female cone is composed of large ovuliferous scale and lower smaller bract scale, which are the free from each other.
- Each ovuliferous scale bears two anatropous ovules or megasporangia.
- The pollen grains are winged.
- During the development of male gametophyte, two prothelial cells are formed which later on degenerates. Besides these, 2-3 archaegonia are formed with a neck of eight cells.

Pine trees are widely distributed throughout the world and have lots of economic value. Pine tree wood is very strong and it is extensively used to manufacture doors, electric poles, window panes, boats, railway sleepers, musical instruments, boards, boxes, veneers and plywood, building construction, paneling, etc. due to its durability. Turpentine oil is produced from the pine tree which is used as a solvent for varnishes, paints and in perfumery industry. It is also used for producing disinfectants, synthetic pine oil, denaturants, and insecticides, etc. Pine oil from the pinewood is used in pharmaceutical industries, textile industries, leather industries, etc.

External morphology of Pinus:

The plant body represents the sporophyte. The sporophytes are evergreen and tall tree (10 -80 m in height). The body has three parts: root, stem and leaves. The plants bear well developed tap root system. The stem is stout, branched and pyramidal in shape with recemose branches.

Root: A strong tap root system is present in young plant which may persist or roots develop and become stronger adventitious roots with increasing age. The roots can grow on rocks or hard ground and spread over a large area. The lateral roots are well developed with insufficient root hairs. Often a branch roots are infested with mycorrhizal fungus and hence it is called the mycorrhizal root.

Stem: The stem is erect, stout, cylindrical and pyramidal shape with dimorphic branches. The branches are restricted in the apical region. The stem is covered with bark. There are two types of branches:

The long shoot of unlimited growth: The main branches or long shoots have an unlimited growth with scale leaves which are found below the dwarf shoots and the needle like foliage leaves are present exclusively at their terminal ends.

The dwarf shoot of limited growth: The dwarf shoots develop in the axils of scale leaves on the main branches, which are without apical buds. It is about 1 -2 cm long with one or two scale leaves. The dwarf shoot also contains foliage leaves. In this case, a dwarf shoot with its foliage leaves is known as spur.

Leaf: The pine tree bears two types of leaves:

The scale leaves: Both long and dwarf shoots bear scale-leaves and fall off as the branches attain maturity. These leaves are small, brownish in color and membranous with protective structures.

The foliage leaves: The dwarf shoots bear foliage leaves. The leaves are long, green, simple, needle-like with photosynthetic structures. They develop in clusters

at the apex of the dwarf shoots and can form the spur. Their number varies from 1-5 in different species.


