

## **PINUS**

- Widely distributed in the Northern Hemisphere, mostly in temperate areas.
- Of the 90 species, 6 species are Indian- *P. excelsa*, *P. longifolia*, *P. gerardiana*, *P. insularis*, *P. armandi*, forms dense evergreen forests in hilly regions (Himalayas)

### **Systemic Position of Pinus**

Gymnospermae

Division-Coniferophyta

Class-Coniferopsida

Order-Coniferales

Family-Pinaceae

Genus-Pinus

- ❖ ***Pinus* are evergreen coniferous trees growing 3-80m tall with the majority of species reaching 114-145m tall .**
- ❖ **The leaves are bright green in clusters of three slender , 8-15cm long and with blunt tip.**
- ❖ **The bark of most *pinus* is thick and scaly , but some species have thin , flaky bark.**
- ❖ **The cones are 7-17cm long , brown , ovoid .**
- ❖ ***Pinus* are long-lived , typically reaching ages of 100-1,000 years.**

### **ROOT**

- The primary root is tap root which does not grow very deep into the soil .
- Root hairs are scanty and found in very young roots.
- They are soon replaced by **autotrophic Mycorrhiza** ,this association is believed to be symbiotic .
- Fungus helps roots in the absorption of nutrients and also protects them from pathogens.

### **STEM**

- The stem erect , tall , cylindrical woody and branched.
- The apical growth occurs by a large apical bud .
- The branches arise laterally and spirally from the axils of scale leaves.

- The branches are **Dimorphic** :
  1. Branches of unlimited growth
  2. Branches of limited growth
  - a) **BRANCHES OF UNLIMITED GROWTH:** The branches which grow for unlimited period, are called long shoots. These branches are arranged spirally on the main trunk. The branches bears scale leaves.
  - b) **BRANCHES OF LIMITED GROWTH:** The branches which lacks apical bud and grow for a shorter period are called Dwarf shoot. Each dwarf shoot possesses 8-10 spirally arranged scale leaves.

## **LEAVES**

The leaves are **dimorphic** i.e. there are two types

1. **Scale leaves**
2. **foliage leaves**
  - A. **Scale leaves:** They are thin, brown, flattened and minute. The scale leaves are born on long shoots as well as on dwarf shoots. The main function of scale leaves is to protect the young buds. They are not photosynthetic
  - B. **Foliage leaves:** they are long acicular and needle like structure generally in green color. They born only on dwarf shoots.

## **REPRODUCTION:**

- The pinus plant are **heterosporous**.
- Microspores are produced in microsporangia born on male cones
- Megaspores are produced in microsporangia born on female cones.

## **MALE CONES**

- The male cones of pinus are also known as **male strobili** or **staminate cones**.
- They appear in the month of March-April in hills and in January in plains.
- They arise on the branch of unlimited growth.
- Male cone is small and ovoid structure.
- It varies from 2-4cm in length and 5-6mm in diameter.
- It is pale yellow in color.

## **STRUCTURE OF MATURE MICROSPORANGIUM**

- Mature microsporangium is small, sessile and elongated sac.
- It is pale brown in color.
- The tapetum layer is disintegrates during maturation of spores.

- The spore sac is filled by pollen grains

### **DEHISCENCE OF MICROSPORANGIUM:**

- Each microsporangium has a longitudinal line. In hot dry weather the wall of sporangium cracks through this line. A large number of pollen grains are released through this line and dispersed in air. These spores are shed in huge amount that they form yellow clouds. This feature is called **shower of sulphur dust** in the Himalayan pine forests.
- The pollen grains are generally released in months of March to beginning of June and travel to long distances the empty pollen grains wither and dry cones fall off from the trees.

### **FEMALE CONES**

- The female cones of Pinus are also called **ovulate strobili**.
- They appear in the months of February in plains and May in the hills.
- Each female cone arises in the place of dwarf shoot.
- Each female cone takes three years to get mature and set seeds.
- The first year cones are comparatively small, compact and reddish green in color.
- The second year cones are comparatively large, they become slightly woody.
- The third year cones are large and woody.
- They develop seeds at the end of third year.
- They are elongated cylindrical shape and 15-20 cm long.

### **MEGASPOROPHYLL:**

- Each megasporophyll is differentiated into two parts :

#### **Bract scale**

#### **Ovuliferous scale**

- **The Bract scale:** It is lower part of megasporophyll. It is called **carpellary**.
- They are small, dry and membranous structures attached on central axis.
- **The ovuliferous scale:** the upper part of megasporophyll bears **ovules**.
- Each ovuliferous scale is thick, woody and brownish structure.
- Its broad terminal portion called **apophysis** and a small central projection, called **umbo**.

### **STRUCTURE OF OVULE:**

- The mature ovule is oval in shape and attached laterally on the upper surface of ovuliferous scale.

- The central part of ovule contain **nucellus**.
- The nucellus is covered by thick protective covering called **integument**.

#### STRUCTURE OF MATURE OVULE BEFORE FERTILIZATION:

Mature ovule of pinus is oval in shape and attached laterally on the surface of ovuliferous scale. The nucellus is fused with the inner layer of integument. The cells of nucellus surrounding the female gametophyte differentiate to form 2-3 layers of nutritive tissue, called spongy layer.

It is haploid. The micropylar end bears archegonia. Each archegonium has 8 neck cells arranged in 4 tiers of 2 cells each. The neck canal cells are absent.

#### FERTILIZATION

- Fertilization occurs about 12-14 months after pollination, during May –June of the second year.
- Mature male gametophyte consists along pollen tube containing two unequal non flagellated male gametes ,
- The tube acts as **carrier of gametes**.
- After reaching at apex of female gametophyte the tube enters into archegonium through neck.
- The male gametes show amoeboid movement and finally one of them fuses with the egg becomes **Zygote**.
- The haploid nucleus of male gametes fuses with the **haploid (n=12)** nucleus of egg to form **diploid (2n=24)** nucleus of zygote.
- The zygote acts as the first cell of sporophytic generation.

#### ECONOMIC IMPORTANCE OF PINUS

- The most important product obtained from pine forests is **Timber** .as the wood of pinus is **pycnoxylic** , it provides valuable timber for building and other construction purpose .
- Species of pinus also yield many resins , **oils** and turpentine which are of great value.
- Resins are used in varnish making , enamels and in the preparation of soap , **paints** , oil clothes etc.
- The seed of *p. gerardiana* are commonly called **chilgoza** they are used as highly nutritious **dry fruits**.
- The wood and female cone of pinus are used as **fuel**.
- Pinus are grown in the gardens and parks as **ornamentals**.

# Life Cycle

