

Quadrant II – Transcript and Related Materials

Programme	: Bachelor of Science (First Year)
Subject	: Botany
Paper Code	: BOC 102
Paper Title	: Biodiversity II (vascular plants)
Module Name	: Anatomy of <i>Pinus</i> .
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Notes

Primary structure of root- It consists of the following layers.

1. Epiblema.
2. Cortex.
3. Endodermis.
4. Pericycle.
5. Vascular cylinder.
6. Pith.

Epiblema is the outer piliferous layer, with unicellular thin-walled root hairs. This is followed by a wide zone of cortex that is made of 4-5 layers of parenchymatous cells. Next to cortex occurs a single layered endodermis that is followed by multilayered pericycle. Vascular cylinder may be diarch to tetrarch. The vascular bundles are radial and lie opposite the resin canals. Protoxylem exarch, Y-shaped. Opposite to each protoxylem group in between the two arms of the “Y” shaped protoxylem there occurs resin canal. Phloem alternating to the protoxylem. Pith absent. Secondary growth is seen in roots. Some cells become meristematic in between the xylem and the phloem called as cambium cells. This

cambium cells divide and form secondary xylem on the inner side and secondary phloem on the outer side resulting in increase in girth of root.

Primary structure of stem: Consists of the following layers

1. Epidermis
2. Cortex
3. Endodermis
4. Pericycle
5. Vascular cylinder
6. Pith

It shows a wavy outline due to presence of leaf bases. The epidermis is single layered covered with a thick cuticle. The epidermis is followed by a broad zone of cortex. The outer cortex has one or few layers of sclerenchymatous cells & inner cortex is parenchymatous. The presence of resin ducts is a characteristic feature of the cortex that run radially & longitudinally in inner cortex. Each duct is lined by parenchymatous glandular secretory cells - the epithelium. External to epithelial cells is sclerotic sheath of thick-walled cells. The epithelial cells secrete resin into the canal. This resin flows out during injury & forms a solid covering until fresh bark is formed. No pericycle or endodermis is recognized. The vascular bundles are 5-8 closely arranged conjoint, endarch, open. Phloem on outside and xylem towards the inner side. The cambium is present in between the xylem and phloem. Pith is parenchymatous & some pith cells are filled with resin.

Anatomy of leaf (Needle)

The outline of the needle varies in monofoliar, bifoliar, trifoliar and pentafoliar spurs. It is triangular in shape for a trifoliar spur of *Pinus roxburghii*.

Irrespective of the difference in outline, the internal structure of the needle is typically same in all species of *Pinus*. It consists of the following layers.

1. Epidermis
2. Hypodermis
3. Mesophyll
4. Endodermis
5. Pericycle
6. Vascular bundle

The epidermis is single layered, thick walled heavily cutinized. It is interrupted with sunken stomata all over. Below the epidermis is present a few layered hypodermis that is made of thick walled sclerenchymatous cells. It is well developed below the ridges. Hypodermis is broken into pieces due to interruption by substomatal cavities. Hypodermis is followed by mesophyll that is compact and shows no differentiation into palisade and spongy tissues. It consists of thin walled, parenchymatous cells with numerous chloroplasts & starch. Its cells are peculiar in which inner walls have numerous small infoldings that project into the cavities of the cell and form peg like infoldings. These are known as arms, flanges or infoldings. These increase the photosynthetic and respiratory area. Thus, compensating for reduced leafy surface. The mesophyll also contains resin ducts under the hypodermis. The central portion is the vascular cylinder surrounded by endodermis which is single layered and barrel shaped cells. Pericycle is many layered, parenchymatous. Embedded in them are two other types of cells. These are 1. Albuminous cells which are parenchymatous, rich in protein. They abut upon the phloem of the vascular bundle & serve to pass on elaborated compounds from mesophyll to phloem and 2) Tracheidal cells that resemble tracheids, which elongate radially & are

contiguous with xylem. They help to carry watery fluids from xylem to mesophyll. These special kinds of cells collectively constitute transfusion tissue. Two vascular bundles are embedded in the pericycle that are separated by a band of "T" shaped sclerenchymatous fibres. The two bundles run closely parallel from base to apex of leaf. Each bundle contains xylem and phloem. The phloem faces the outer side. The xylem lies below the phloem facing inwards that is towards the pointed end. The bundle is collateral, open and endarch.

The Xerophytic characters include:

1. Acicular form of leaves which reduces transpiring leaf surface.
2. Heavily cutinized epidermis
3. Sclerenchymatous hypodermis
4. Sunken stomata and
5. Poor development of vascular tissue.