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cells of mesophyll are polygonal and filled with chloroplasts. Many peg-like infolding of cellulose also arise from the inner side of the wall.

(iv) Endodermis :- Endodermis is single layered with barrel-shaped cells and clear Casparian strips. It is present outside the pericycle.

(v) Pericycle :- It is multi-layered and consists of parenchymatous cells and some sclerenchymatous cells forming T-shaped girdles which separate two V-bundles. ~~Transfusion tissue consists of~~ ~~tracheids~~ Cells of Pericycle near adjacent to the phloem are called - albuminous cells while the cells adjacent to the xylem are called tracheidal cells. These specialized cells form the transfusion tissue which helps in the lateral flow of nutrients.

(vi) Vascular bundle :-

Two conjoint and collateral vascular bundles are present in the centre.

T.S of the basal portion of needle shows that cambium remains present in the section.

Xylem lies towards the angular side and the phloem towards the convex side of the needle.

College :- S.S. College, Jehanabad

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Department: Botany

Time: 11.00 - 12.00

Subject: Gymnosperm

Name of the Teacher: Dr. S.S. Sharma

Topic : T.S. Pinus Needle

Class :- Biotech PI - Sub.

Medium of Teaching :- WhatsApp
College Website.

B.Sc (BOT) P11 - Hons.

T.S. PINUS NEEDLE

A transverse section of Pinus needle shows following features :

i) Shape - It is circular in outline in Pinus monophylla, semicircular in P. sylvestris and triangular in P. longifolia, P. roxburghii etc.

ii) Epidermis :- It is the outermost layer which consists thick walled cells. It remains covered by a thick layer of cuticle.

• Stomata - Many sunken stomata are present on the epidermis. Each stomata opens internally into a sub-stomatal cavity.

• Hypodermis - Below epidermis, a few layers (2-3) thick hypodermis is present. It is made up of thick-walled sclerenchymatous cells and is well developed at ridges. Hypodermis is the main strengthening tissue of the leaf.

iii) Mesophyll :- Between ^{hypo}~~epi~~dermis and endodermis parenchymatous mesophyll is found. It is not differentiated into palisade and spongy parenchyma. Resin canals are present in mesophyll tissues ^{adjoining the hypodermis}. Each resin canal is lined by a layer of small epithelial cells.

Xerophytic Features of PINUS NEEDLE

Xerophytic adaptations are morphological and physiological characteristics that enable an organism to survive under xeric conditions. The following are examples of adaptations that Pinus leaves possess to prevent water loss:

- (i) The foliage leaves of Pinus are needle like ^(acicular) due to which surface area is much reduced. It reduces the evaporation of water. These needle like leaves are found in bundles called fascicles (ex. P. monophylla).
- (ii) Thick cuticle is present outside the epidermis. It is waxy type. These characters also help in reducing the water loss.
- (iii) Stomata are sunken which helps in reducing the loss of water. No. of stomata is also reduced.
- (iv) Hypodermis consists of a few layers of lignified sclerenchymatous cells. They are able to check water loss through epidermis.
- v) Resin canals are found.