Pinus Needle

The needle are present on the spur only. The number of needles per spur is fixed in different sps. The outline of needle in T.S is variable based on the number of needles in a spur shoot i.e. circular in monofoliar eg. P. monophylla. semicircular in bifoliar eg. P. sylvestris and triangular in trifoliar eg. P. roxburghii, tetrafoliar and pentafoliar shoots.

Irrespective of difference in outline, the internal structure of the needle is typically same in all the sps of Pinus.

1. Epidermis → It is thick walled uniseriate, parenchymatous with a thick cuticle. It is interrupted by sunken stomata throughout the surface. It opens outside into a cavity called vestibule and inside into a substomatal cavity.

2. Hypodermis →
It is multilayered, Selerenchymatous and is relatively well developed at the angular points of the needle. enclosing resin ducts. It is broken up into pieces on account of the presence of substomatal cavities.

3. Mesophyll → It is multilayered, homogenous, polygonal chlorenchymatous and each cell with several peg-like infoldings of cellulosic walls, consists of arm palisade having sufficient chloroplasts and starch. In P. roxburghii, this zone contains resin ducts too. The infoldings increase the water retaining capacity and the surface area for other physiological activities including photosynthesis.

4. Endodermis →
It is very conspicuous, single layered. It is composed of barrel shaped cells with prominent casparian strips.

5. Pericycle → It is multilayered parenchymatous lying immediately below the endodermis. It may also possess a 'T' shaped girder of sclerenchymatous cells which seperates the two bundles. It is transformed into a complex transfusion tissue with dimorphic cells. (i) Transfusion tracheids with bearded pits along the sides of xylem. (ii) Transfusion parenchyma or albuminous cells with proteinous contents occur near the phloem. From xylem into the phloem runs a thin sheet of parenchyma with dense contents recalling the xylem rays of the stem.

In P. Sylvestris both the bundles individually carry a separate such sheath which is restricted upto the phloem only.

Vascular Sheath → There are two collateral, open & endarch bundles per needle, lying embedded in transfusion tissue. Bundles, if two are slightly obliquly placed with their protoxylem facing towards the pointed end and phloem towards the upper cortex surface. Xylem consists of radial rows of cells and phloem of sieve cells and phloem parenchyma. companion cells are lacking.

The needle possess basal meristem which helps in their elongation.

Needle shows xerophytic character as follows —

I) leaf-lamina reduced to needle like.
II) Epidermis thickwalled with a thick cuticle.
III) Presence of sunken stomata and multilayered sclerenchymatous hypodermis.
IV) Mesophyll cells with cellulosic projections in the cell cavities.
V) Presence of resin ducts and transfusion tissue.

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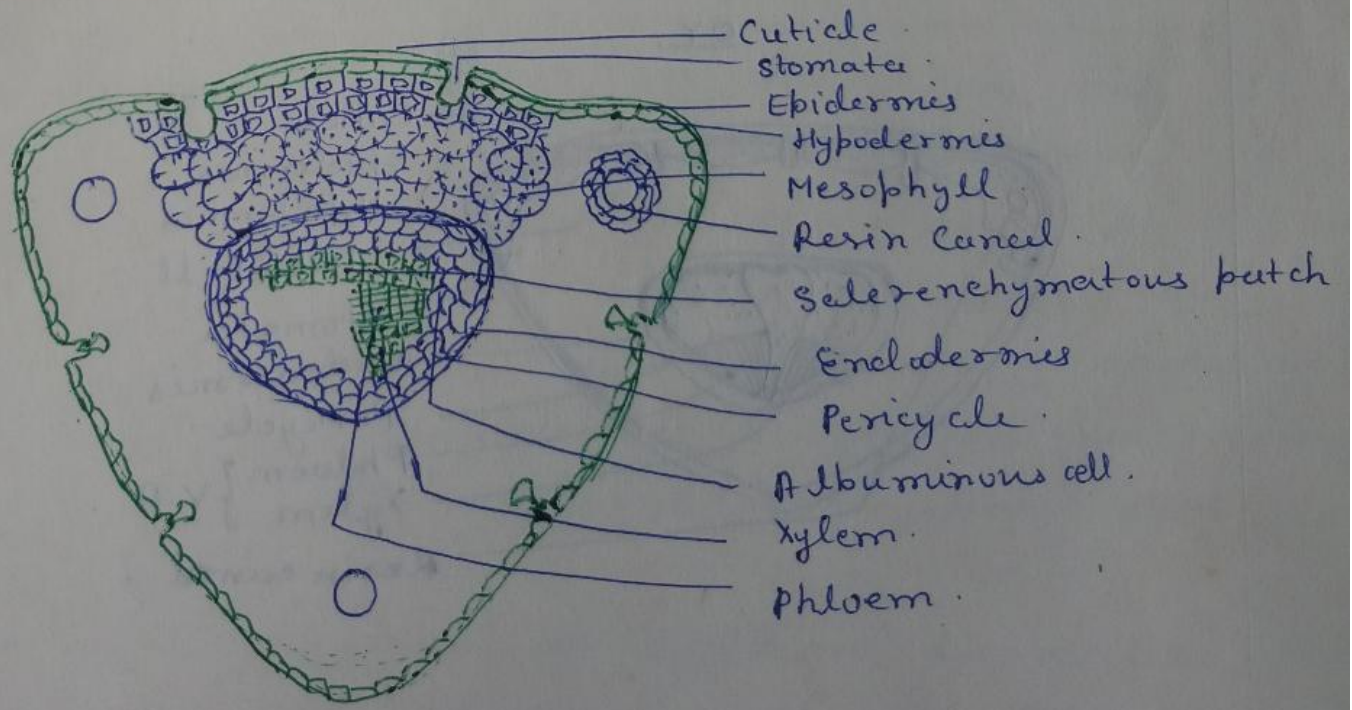
Cuticle
Stomata
Epidermis
Hypodermis
Mesophyll
Resin Canal
Sclerenchymatous patch
Endodermis
Pericycle
Albuminous cell
Xylem
Phloem