

STUDY NO.: 10

NAME OF THE STUDY: STUDY ON ANATOMY OF JUTE STEM (DICOT STEM)

A thin transverse section (T.S.) of supplied specimen (jute stem) under compound microscope shows the following structures from the periphery to the centre.

1. **Epidermis:** The epidermis consists of a single layer of compact and rectangular shaped cells having no intercellular spaces among them. A protective layer, composed mainly of cutin substances, called cuticle present on the outer surface of epidermis.
2. **Cortex:** The region that lies next to the epidermis is the cortex. It is differentiated into three zones-hypodermis, general cortex and endodermis.
 - 2.1 **Hypodermis:** This lies below the epidermis and there is one layer with chloroplasts called chlorenchyma below the epidermis. Hypodermis consists of two to three layers of collenchyma cells. At immature stage, it consists of collenchyma cells but at maturity collenchyma may disappear and consists only of parenchyma cells.
 - 2.2 **General cortex:** This lies internal to the hypodermis and consists of thin walled, round or oval shaped parenchyma cells having well defined intercellular spaces among them. Some mucilage canals are scatteredly present in this region.
 - 2.3 **Endodermis:** The innermost layer of the cortex is the endodermis consisting of barrel shaped, elongated, compact cells having no intercellular spaces among them. The cells contain starch grains hence it is known as starch sheath.
3. **Vascular bundle:** The vascular bundles are conjoint, collateral and open, and arranged in a ring. Each bundle is composed of phloem or bast, cambium and xylem or wood.
 - 3.1 **Phloem:** The phloem occurs at the external side of the vascular bundle. Each strand of phloem consists of sieve tube, companion cells, phloem parenchyma and phloem fibre or bast fibre. Phloem fibers present as bundles and arranged in pyramid shaped structure.
 - 3.2 **Cambium:** It lies as a layer of meristematic cells between the xylem and phloem. The cambium consists of thin walled rectangular cells which are arranged in radial rows. They give rise to xylem cells towards the centre and phloem cells towards the periphery of the stem by tangential division. Cambium and its derivatives form cambial zone.
 - 3.3 **Xylem:** Xylem lies at the internal (central) side of the stem and consists of xylem vessels, xylem fibre and xylem parenchyma. The xylem is endarch i.e., the protoxylem lies towards the centre and metaxylem lies towards the periphery. The primary xylem occurs towards the centre and is smaller in size which differentiated into protoxylem and metaxylem vessels; the innermost smallest vessel is the protoxylem vessel and the outers are metaxylem vessels. Secondary xylems are developed by the cambium and lie closer to the cambial zone. Xylem vessels are surrounded by some axial parenchyma. Some ray parenchyma cells of rectangular shapes are also present in the xylem in radial lines.
4. **Pith:** It consists of thin walled, round or oval shaped parenchyma cells. They have well defined intercellular spaces. Some mucilage cells present scatteredly in this region.

Identification:

1. It is a **stem** because
 - i) Vascular bundles are conjoint i.e., xylem and phloem lie in the same radius.
 - ii) Xylem is endarch i.e., metaxylem towards the periphery and protoxylem towards the centre.
2. It is a **dicot stem** because
 - i) Vascular bundles are open type i.e., cambium is present in between xylem and phloem.
 - ii) Hypodermis composed of collenchyma cells.
3. It is a **jute stem** because
 - i) Bast fibre bundles are arranged in pyramid shaped structure.
 - ii) Bundle cap absent over the phloem.

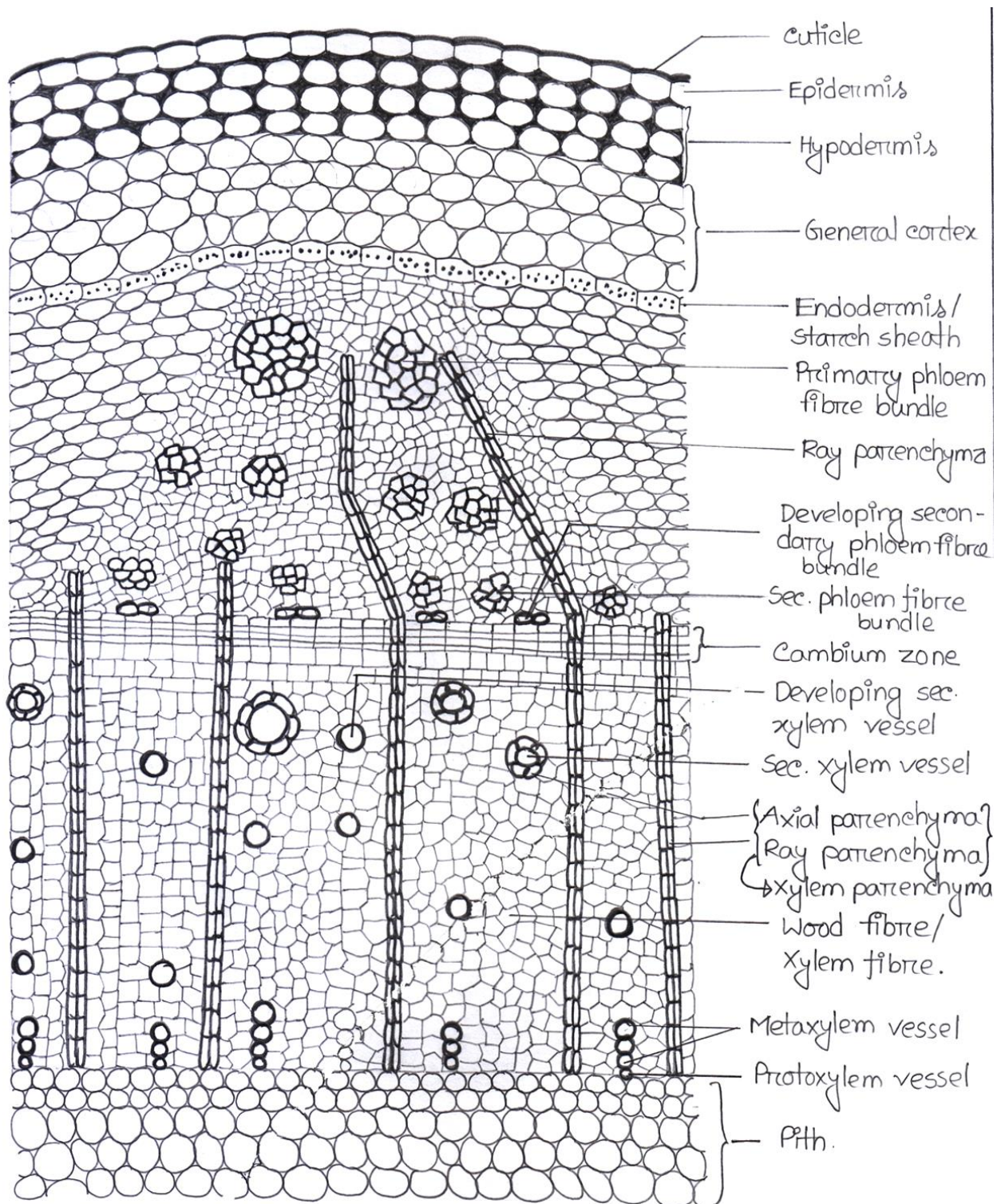


Figure : T.S. of dicot stem (jute)