

**Vivekanand College, Kolhapur (Autonomous)**

**DEPARTMENT OF BOTANY**

**B.Sc.II**

**TOPIC: DICOT ROOT STRUCTURE**

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**M.Sc., Ph.D.**

- ✓ The root system is the descending (**growing downwards**) portion of the plant axis.
- ✓ **It elongates to form primary or the tap root.**
- ✓ **It gives off lateral branches (secondary and tertiary roots) and thus forms the root system.**
- ✓ **It branches through large and deep areas in the soil and anchors the plant very firmly.**

## ROOT SYSTEM



## CONTD.,

- **The root system of a plant constantly provides the stems and leaves with water and dissolved minerals.**
- **When a seed germinates, the first root to emerge is the radicle, or primary root.**



There are two classes of flowering plants, Monocotyledons and Dicotyledons

**DICOTS**



In seeds, two cotyledons (part of the embryo)



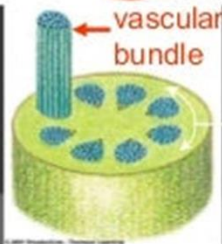
Usually four or five floral parts (or multiples of these)



Usually a netlike array of leaf veins



Basically, three pores or furrows in pollen grain



Vascular bundles arrayed as a ring in stem

**MONOCOTS**



In seeds only one cotyledon



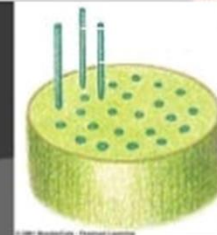
Usually three floral parts (or multiples of three)



Usually a parallel array of leaf veins



Basically, one pore or furrow in pollen grain



Vascular bundles distributed ground tissue of stem

Dicotyledon - Monocotyledon differences

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# FUNCTIONS OF ROOT SYSTEM

- ⦿ **Anchoring:** Roots are the reason plants remain attached to the ground.
- ⦿ **Support:** They support the plant body, ensuring that it stands erect.
- ⦿ **Absorption:** Primary function of the roots is to absorb water and dissolved minerals from the soil.

## Functions of a Root System

- ▣ 1. Absorb water and minerals from the environment
- ▣ 2. Anchor the plant in the ground
- ▣ 3. Store food that has been made in the leaves by photosynthesis
  - ▣ Can be used later by the plant to grow and survive



*Taraxacum officinale* – the common dandelion

Courtesy of Wm. C. Brown Publishers

# T.S OF DICOT ROOT

**ANATOMY  
OF DICOT  
ROOT**

**Epidermis**

**Cortex**

**Endodermis**

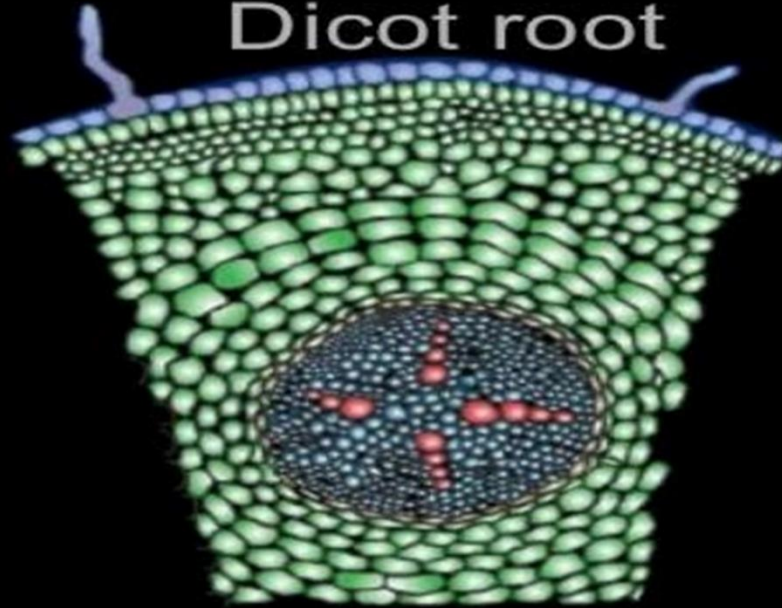
**Pericycle**

**Vascular  
bundles**

**Pith**

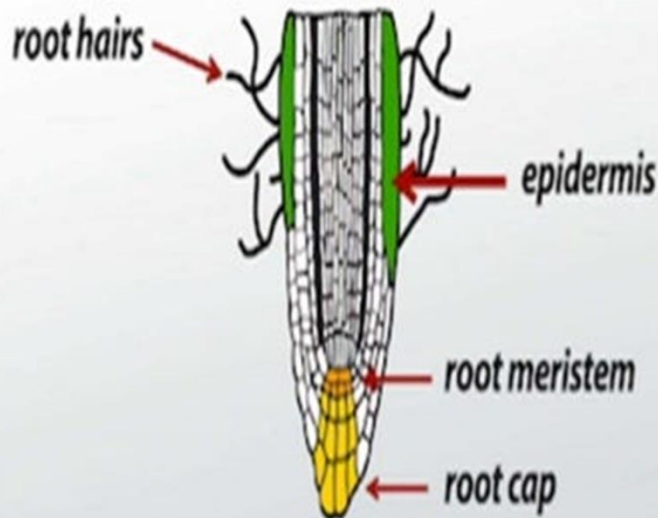
# CROSS SECTION OF DICOT ROOT

Enlarged view of cross section of  
Dicot root



# EPIDERMIS

EPIDERMIS AND ROOT HAIRS

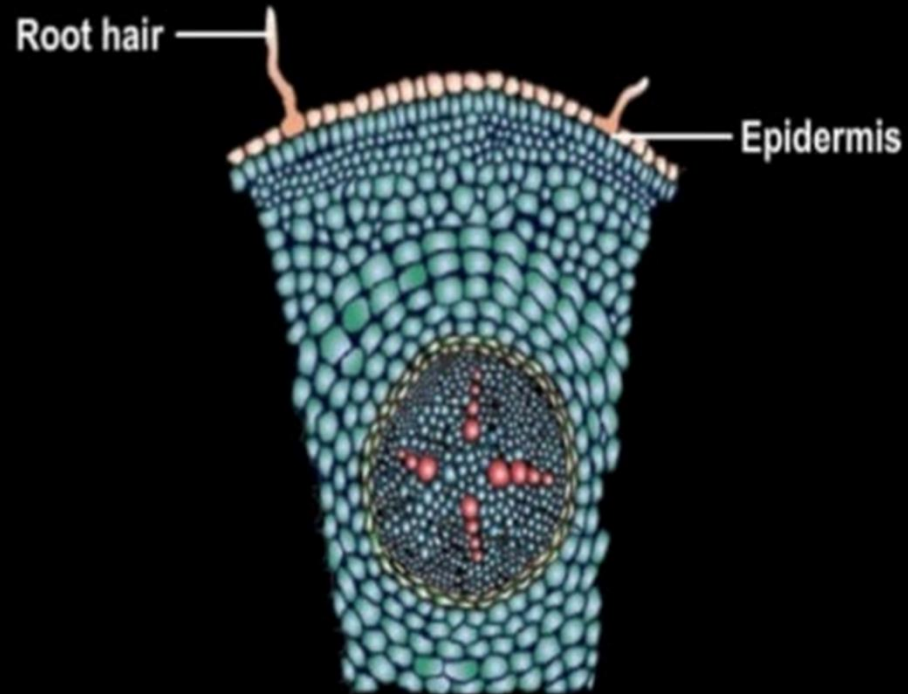


Study.com

- The word epidermis come from the Greek origin, **epi-upon** - **derma-skin** “outer layer of the cell”
- **Role** : to protect the cells from the dangers of the outside world.
- The epidermis consist of loosely packed elongated cells with this **walls-cuticle**



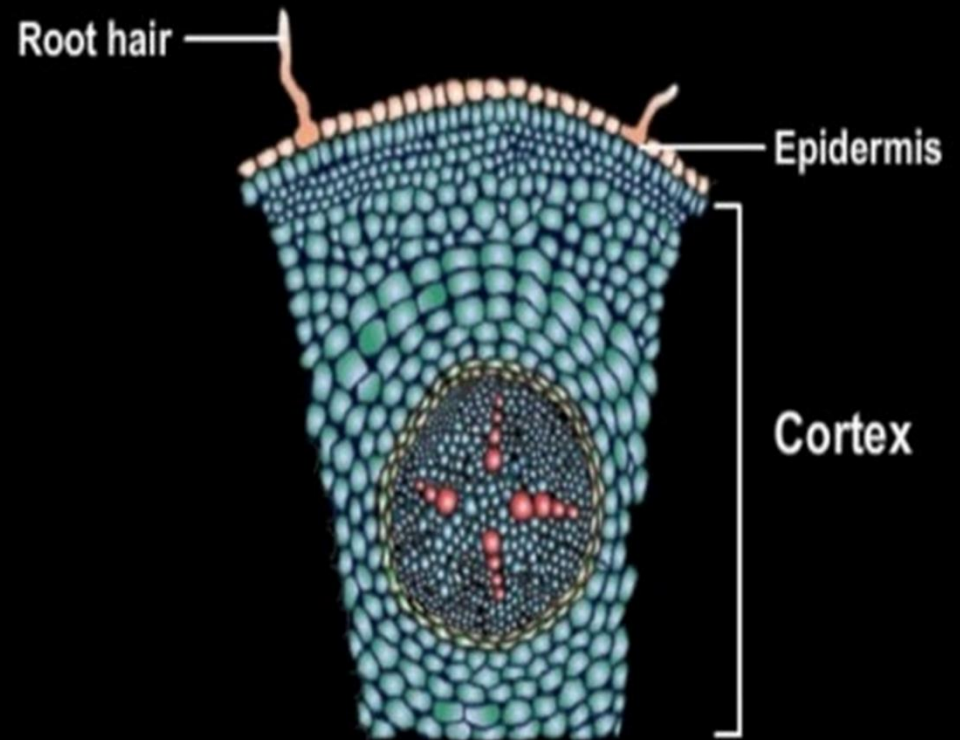
## ROOT HAIR



- It is the site for **water absorption** is an extension of epidermal cells.
- Root hair is made up of **unicellular**.

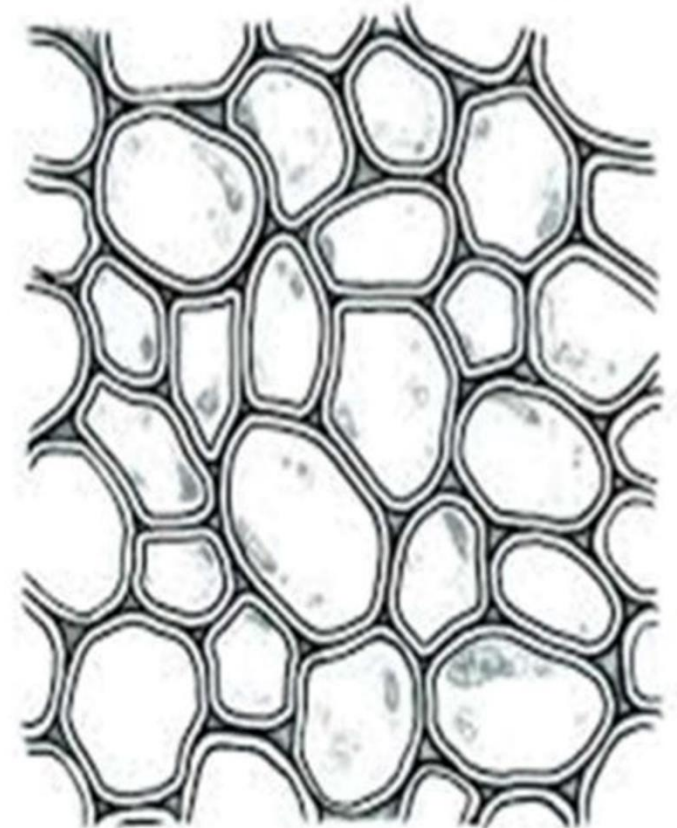
# CORTEX

- In plants tissue of unspecialized cells lying between the epidermis and vascular tissue.
- The cortex is made of parenchyma cells.



# PARENCHYMA

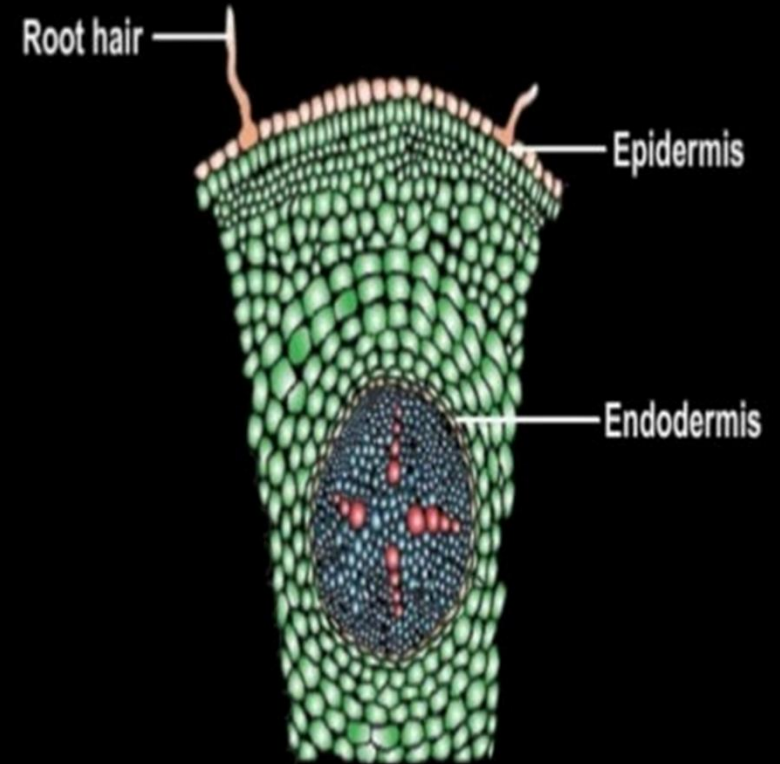
- ❑ **structure** Simplest and thin walled cell, fundamental tissue of plant body.
- ❑ **Shape** - isodiametric or polygonal, thin walled with prominent nucleus and vacuolated cytoplasm.
- ❑ **Functions of parenchyma:**  
**storage** of reserve food materials & mechanical **support**.



Parenchyma

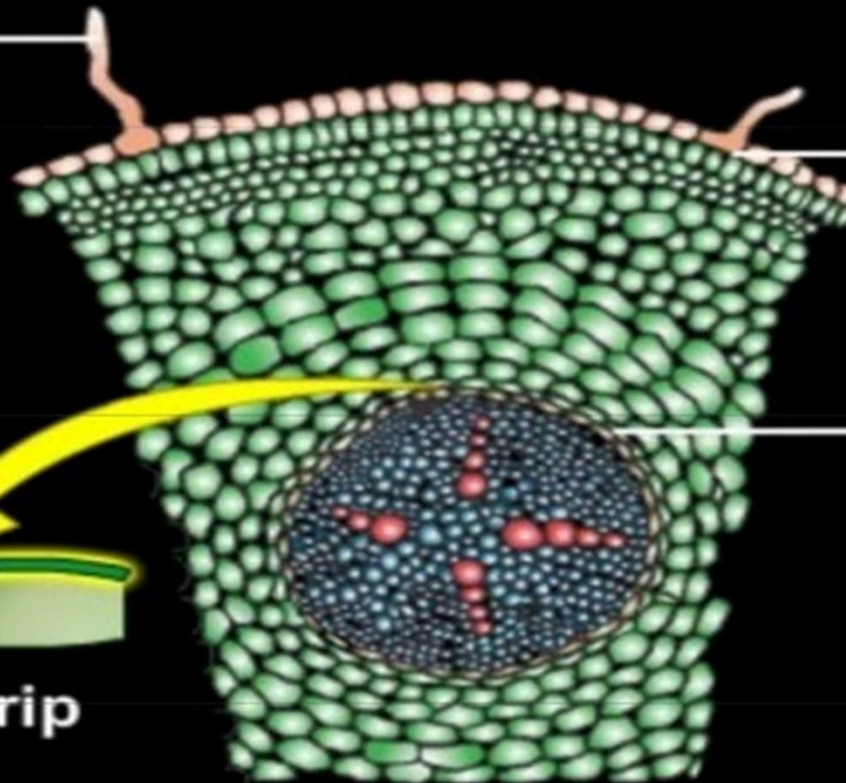
# ENDODERMIS

- The word endodermis is **Latin** origin , **endo-within** **dermis** – **skin**
- The endodermis is the **cylindrical** boundary of vascular tissue-**single layer**.
- **Functions** : regulate the water and other substance that get into the plant.



The walls of the endodermal cells consist of a waxy , water impermeable suberin layer called the casparian strip.

Root hair



Epidermis

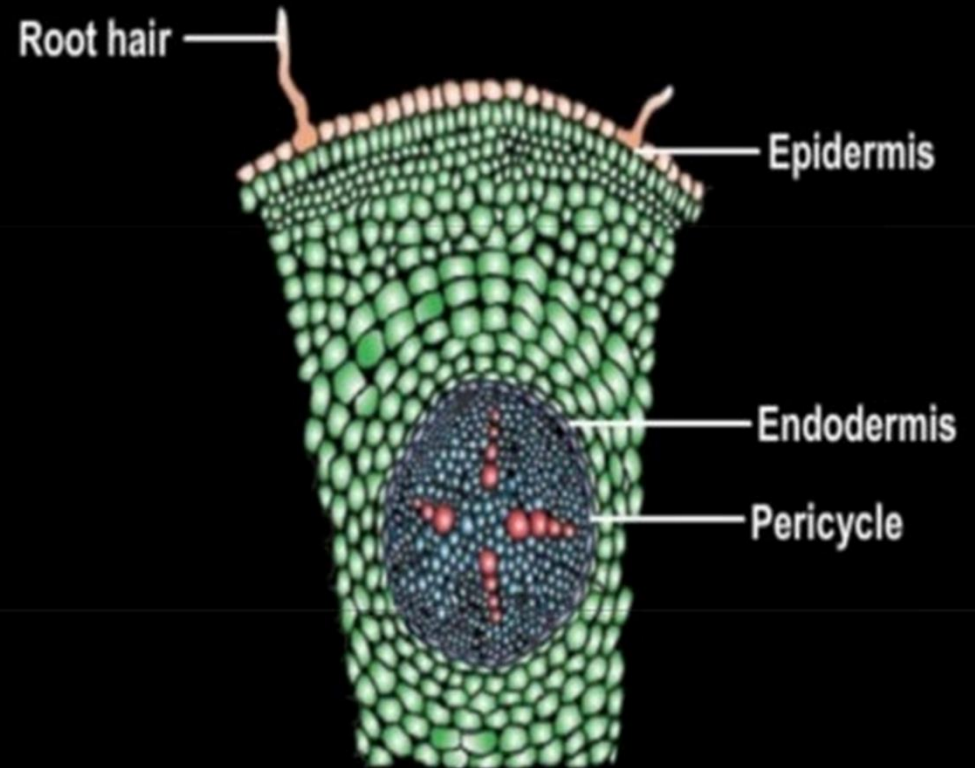
Endodermis



Casparian strip

# PERICYCLE

- It is a **thin layer** of plant tissue.
- It is **present** between the **phloem** and **endodermis**.

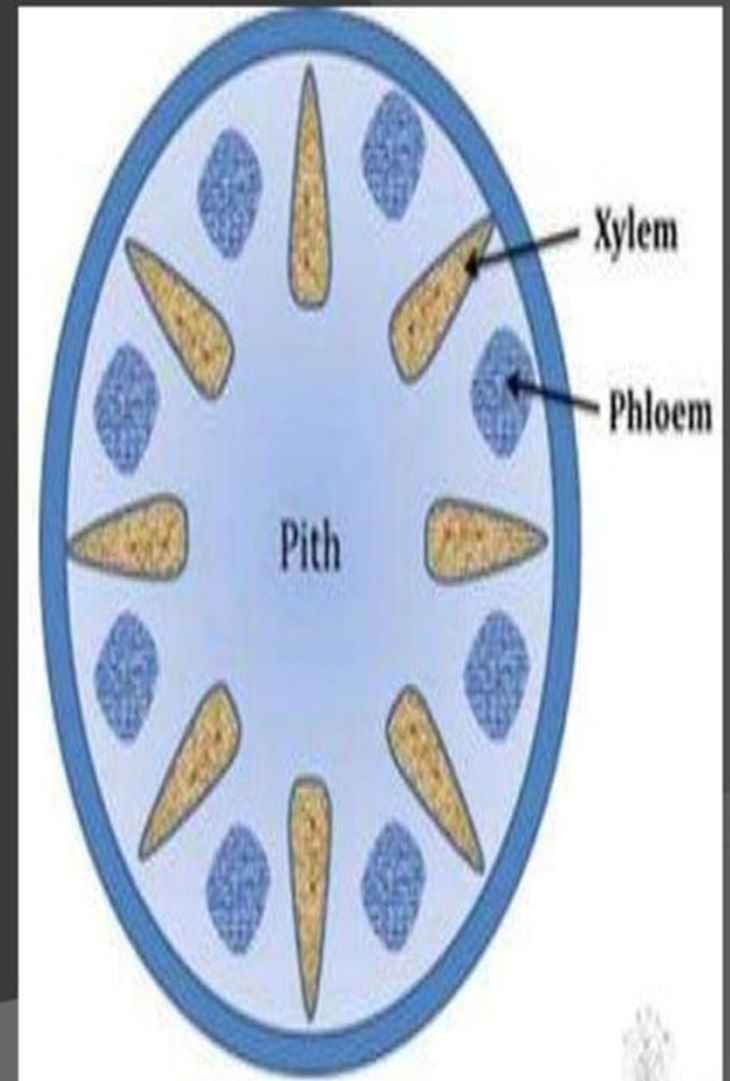


# VASCULAR BUNDLE

- It is a strand of conducting vessels in the root of a plant, typically with **phloem on the outside and xylem on the inside**.
- They are also called as “**fascicle**”
- Vascular bundle consists of two main parts.

xylem: the **water** conducting tissue.

phloem: the **food** conducting tissue



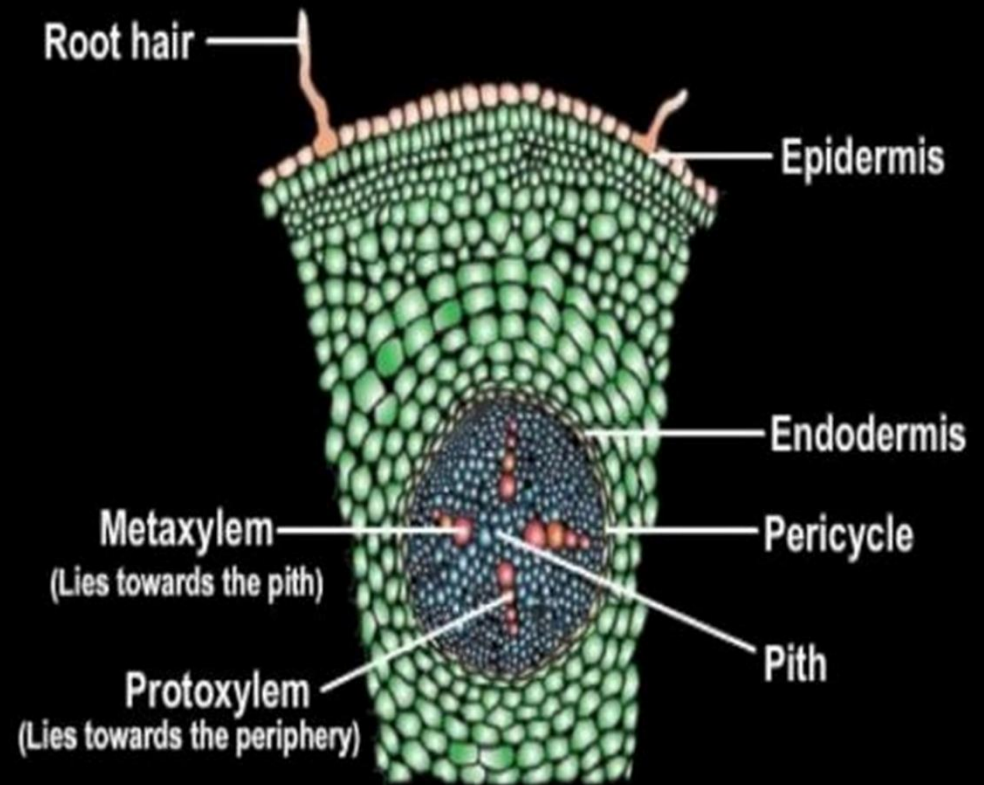
● **xylem:**

**components: tracheids, vessels, xylem fibre and xylem parenchyma**

Xylem

protoxylem

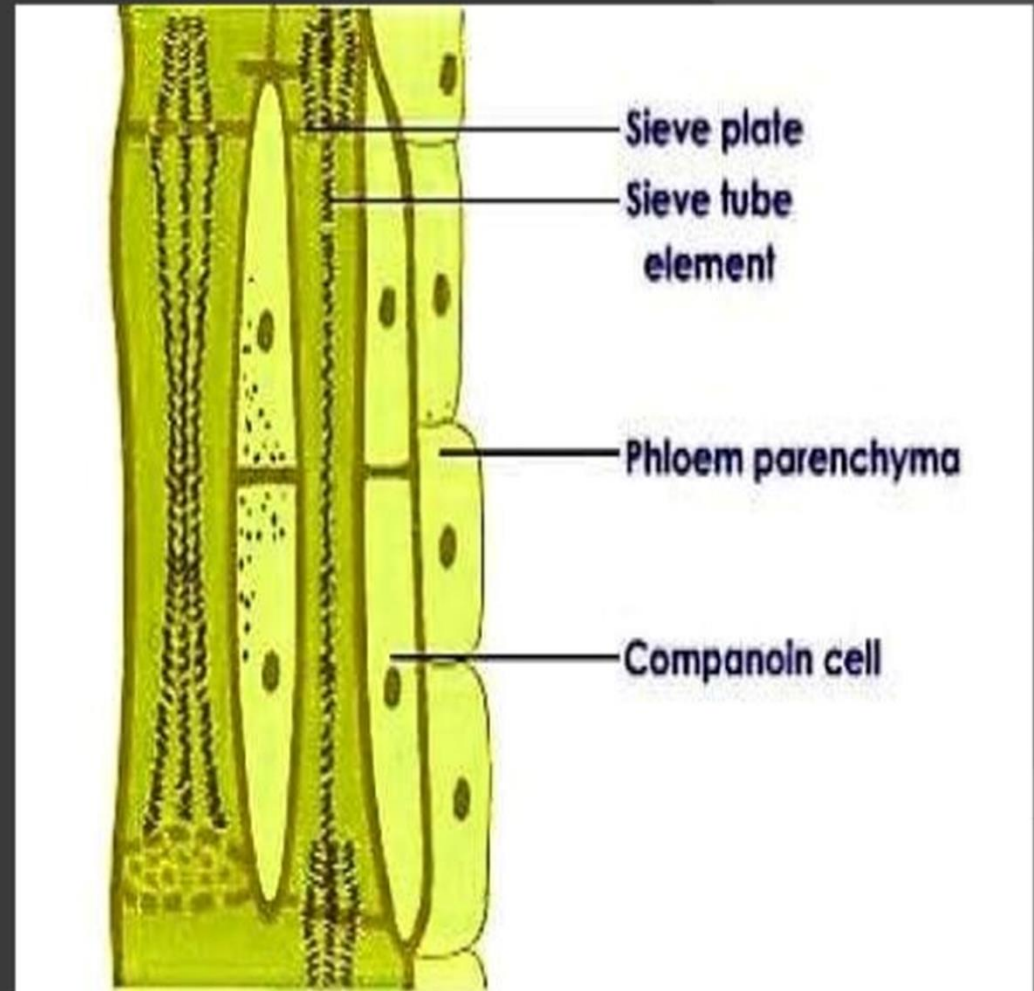
metaxylem





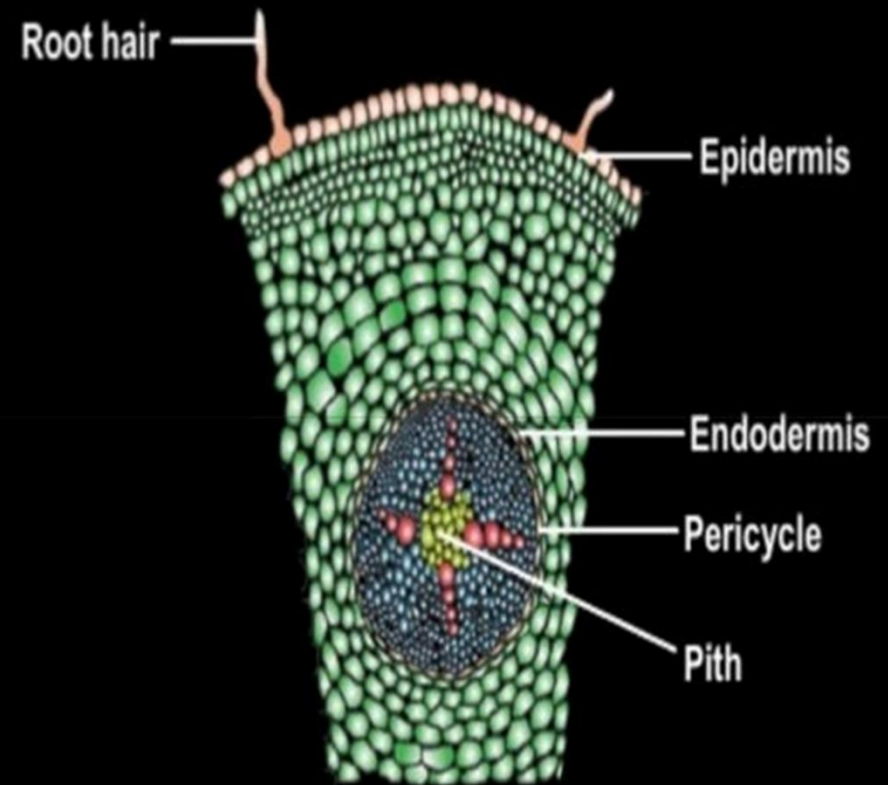
## ● Phloem:

- Components of phloem: sieve cells/sieve tubes companion cells, phloem parenchyma, phloem fibres.
- Companion cells also present in the phloem.



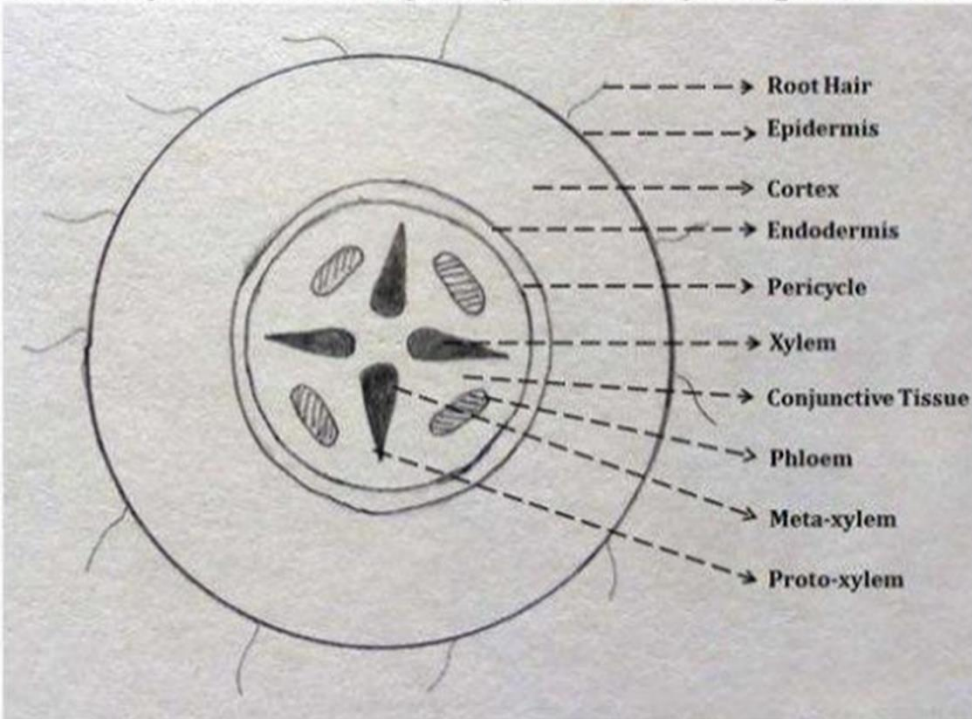
# PITH

- It is **soft and spongy**.
- **New pith** growth appear **white** but as it **matures** it usually turns **brown**.

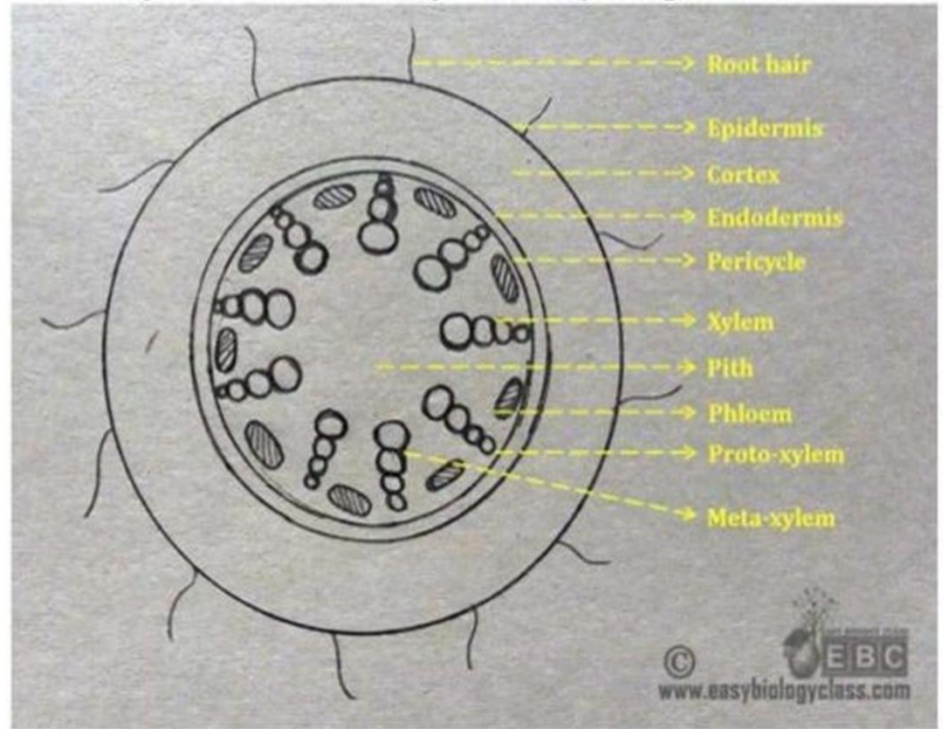


# DIFFERENC BETWEEN MONOCOT AND DICOT ROOT

Anatomy of Dicot Root (*Tinospora, Ficus*): Diagrammatic



Anatomy of Monocot Root (*Colocasia*): Diagrammatic



# DIFFERENC BETWEEN MONOCOT AND DICOT ROOT

## Dicot root

- The cortex area is narrow.
- Pericycle: Gives rise to cork cambium, parts of the vascular cambium, and lateral roots
- Has a limited number of Xylem and Phloem
- Xylem is Angular or Polygonal
- Pith is Absent or very small and undeveloped
- **Cambium is Present and formed by the Conjunctive parenchyma**

## Monocot root

- The cortex region is wide.
- Pericycle: Gives rise to lateral roots only
- Has a higher number of Xylem and Phloem
- Xylem is Round or Oval
- Pith is Larger and well developed
- **Cambium is absent**