

**Topic: Anomalous Secondary Growth in Achyranthes**

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### Anomalous Secondary Growth in Achyranthes

T.S. stem of *Achyranthes* (Family- Amarantaceae) is wavy in outline with ridges and furrows, and reveals the following tissues from outside within-

#### **Epidermis**

- Single – layered epidermis consists of many tubular cells and covered externally by thick cuticle.
- From some cells arise multicellular hairs.

#### **Cortex**

- It is well differentiated into collenchyma, chlorenchyma, parenchyma and endodermis.
- Collenchyma is present only below the ridges and its breadth and depth varies below different ridges.
- Chlorenchyma is present below the furrows.
- Parenchymatous cortex is located below collenchyma and chlorenchyma. It is two to three layers deep and cells contain intercellular spaces.
- Endodermis is the innermost layer of cortex, consisting of elongated cells which lack casparian thickenings. In the old stem endodermis is not clear.

#### **Pericycle**

It is represented by groups of sclerenchymatous cells situated just outside the vascular tissue.



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## Vascular System

- In the young stem, vascular bundles are conjoint, collateral, open and endarch but old stems show secondary growth.
- In the old stem, the vascular system consists of primary phloem, secondary phloem, cambium, secondary xylem, conjunctive tissue, included phloem and primary xylem
- Primary phloem is crushed and obliterated.
- Secondary phloem is present in the form of a complete ring and Consists of sieve tubes, companion cells and phloem parenchyma.
- A cambial strip is present in between secondary xylem and secondary phloem.
- Secondary xylem and conjunctive tissue are undistinguishable. Large xylem vessels are very clear in thick walled conjunctive tissue.
- In the conjunctive tissue are present groups of included or interxylary phloem.
- Primary xylem is present near the pith.

## Pith

It is well developed and parenchymatous.

## Medullary Bundles

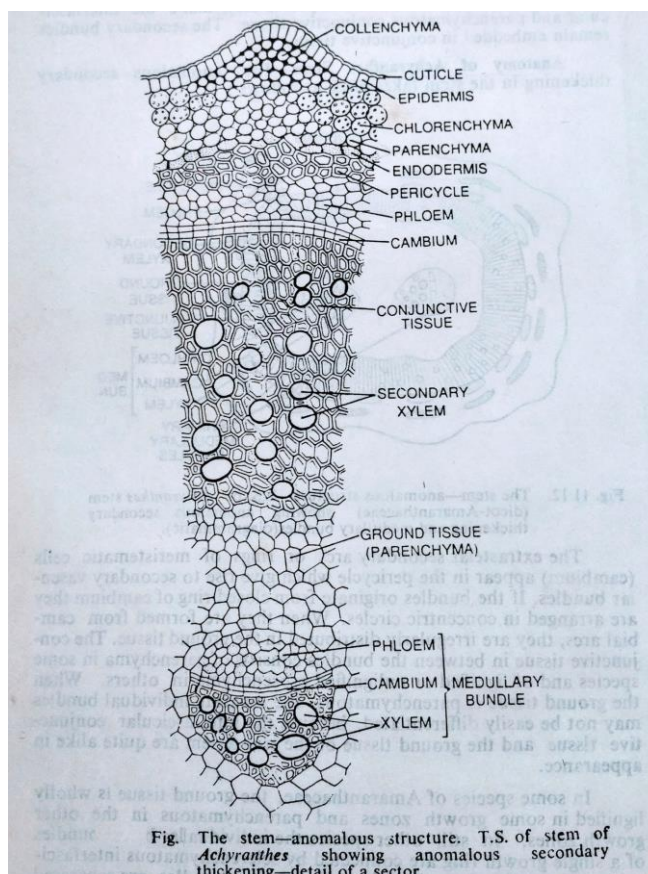
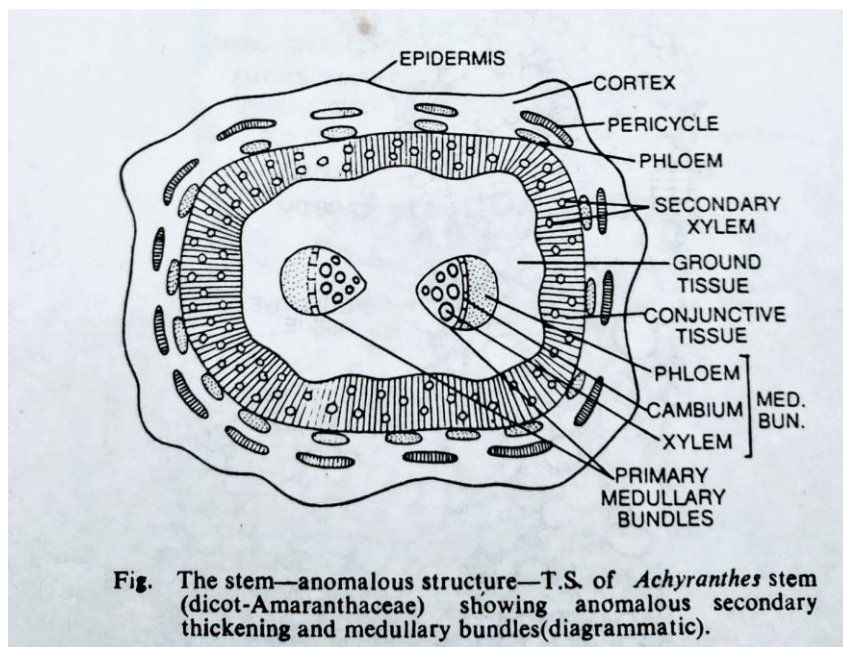
Two medullary bundles are present in pith facing their xylem to each other. They are conjoint, collateral, open and endarch.

## Secondary Growth and Medullary Bundles

In the pericycle region, extrastelar cambium strips develop which produce secondary vascular bundles. Cambium produces the conjunctive tissue. Secondary vascular bundles and conjunctive tissue are present without any sharp limits. So phloem of the secondary vascular bundles appears in the form of patches. This phloem is the included phloem. Medullary bundles are leaf traces.



**Abnormality:** Included (interxylary) phloem and medullary bundles.



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