

ANOMOLUS STRUCTURES.

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The angiosperms in particular are not only very large in numbers, but they exhibit ~~and~~ infinite varieties ^{of} regards their structures as well. It is really difficult to draw a line between the structures which are normal and those which ~~are~~ ^{are} normal and those which may be considered abnormal. But in a pretty good number of cases departures from the normal structures are noticed. These are referred to as ~~referred~~ anomalous structures.

Anomalous Secondary Growth In stem of Bignon Bignonia.

In some liane type of stem as in Bignonia and other members of family Bignoniaceae, the cambium is normal in disposition and activity to begin with, but it soon cuts off different ~~proportions~~ ^{proportions} of xylem and phloem in different points. At four points arranged in form of a cross, formation of secondary xylem is reduced and that of secondary phloem correspondingly increased. As a result the woody cylinder appears to have four longitudinal grooves which becomes increasingly deeper with secondary growth. The cambium breaks up into a number of strips widest ones occurring opposite the four projecting rings of wood and narrow ones at the ~~bases~~ ^{bases} of the grooves. As a result peculiar structure with ridge and ~~fragments~~ ^{fragments} xylem cylinder is formed. Deeply ridged vascular cylinder is formed in some plants due to the fact the cambium produces only ray parenchyma cells at some points.

Proportions $\rightarrow$ Growth of stem.

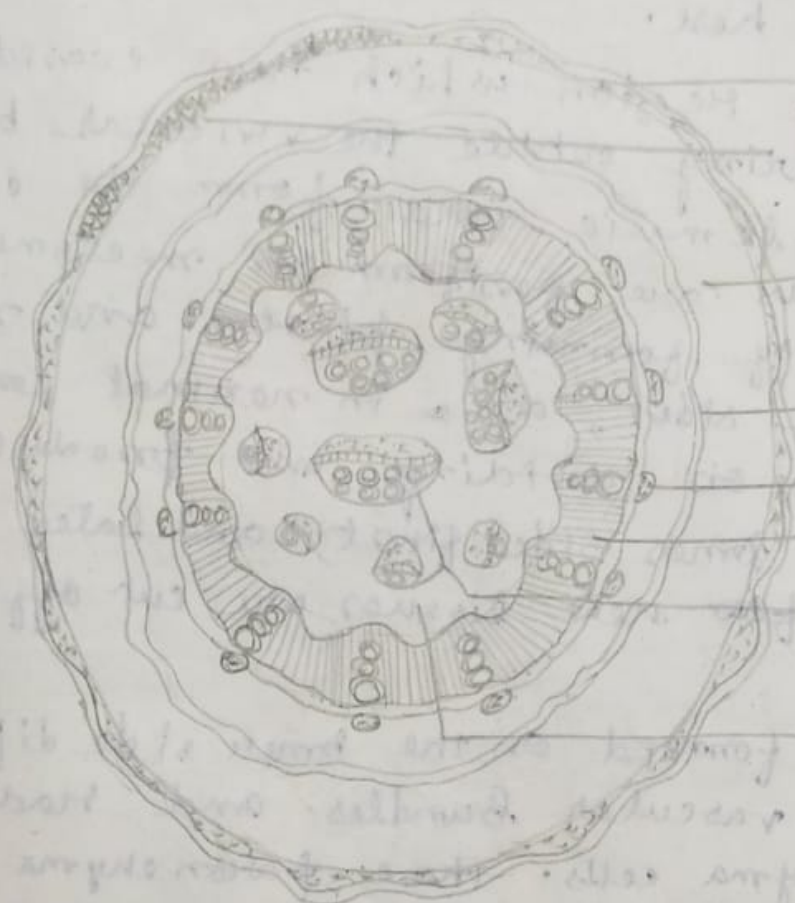
ANOMALOUS SECONDARY GROWTH IN STEMS OF Boerhaavia sp.

(A transverse section through the stem of Boerhaavia sp., a common weed, of the family Nyctaginaceae would show the following characters: The section is more or less circular in outline with uniseriate epidermis having stomata. A few layers of collenchyma in patches with intervening parenchyma cells form the hypodermis followed by parenchyma with distinct intercellular spaces.)

The stem apart from ground tissues include vascular bundles in three rings. Two fairly large bundles occur at the central region surrounded by quite a few comparatively much smaller ones forming a loose ring. The outermost ring consists of pretty large number of much smaller bundles occurring just beneath the pericycle. The central bundles are collateral open ones. but cambial activity remains confined to individual bundles.

Secondary increase in thickness is due firstly to the formation of a continuous cambium cylinder in outer ring. These cells ~~form~~ ^{form} secondary xylem and secondary phloem in the fascicular region and lignified conjunctive tissue in the interfascicular region. The activity of this cambium decline soon and a new cambium arises in the parenchyma outside part, passing through the pericycle. In this manner other cambia may arise outside producing few growth rings.

The newly-formed bundles remain embedded in hard lignified conjunctive tissue. Scanty secondary phloem is formed outside opposite to the xylem vessels.



EPIDERMIS
HYPODERMIS

PARERENCHYMA

STARCH GRAINS

SECONDARY PHLOEM
CONJUNCTIVE
TISSUE

MEDULLARY
BUNDLES

GROUND TISSUE

T.S. OF STEM Boerhaavia sp.

SECONDARY GROWTH IN THICKNESS

- ① Cork Cambium :- The lateral meristem ~~are~~ ^{are} known as cork cambium. cambium and phellogen are known as cork cambium.
- ② Secondary Tissue :- The tissues are known as Secondary tissue.
- ③ Secondary Growth :- The growth in girth or thickness ~~is~~ ^{is} thus accomplished is referred to as Secondary growth.
- ④. periderm deriving ~~to~~ ^{from} their origin from the lateral meristem.
- ⑤ Fascicular Cambium :- The secondary stems ~~show~~ ^{show} dicotyledonous stem shows distinct secondary growth in thickness, as they usually possess open collateral bundles. If cambium is ~~is~~ ^{is} absent in the bundle, it is called fascicular cambium.
- ⑥ Interfascicular Cambium :- where the vascular bundles are ~~possess~~ ^{possess} at a narrow vascular & medullary rays occur in the ~~to~~ ⁱⁿ interfascicular regions. They remain arranged in a ring and narrow medullary rays occur in the interfascicular region. They are called interfascicular cambium.

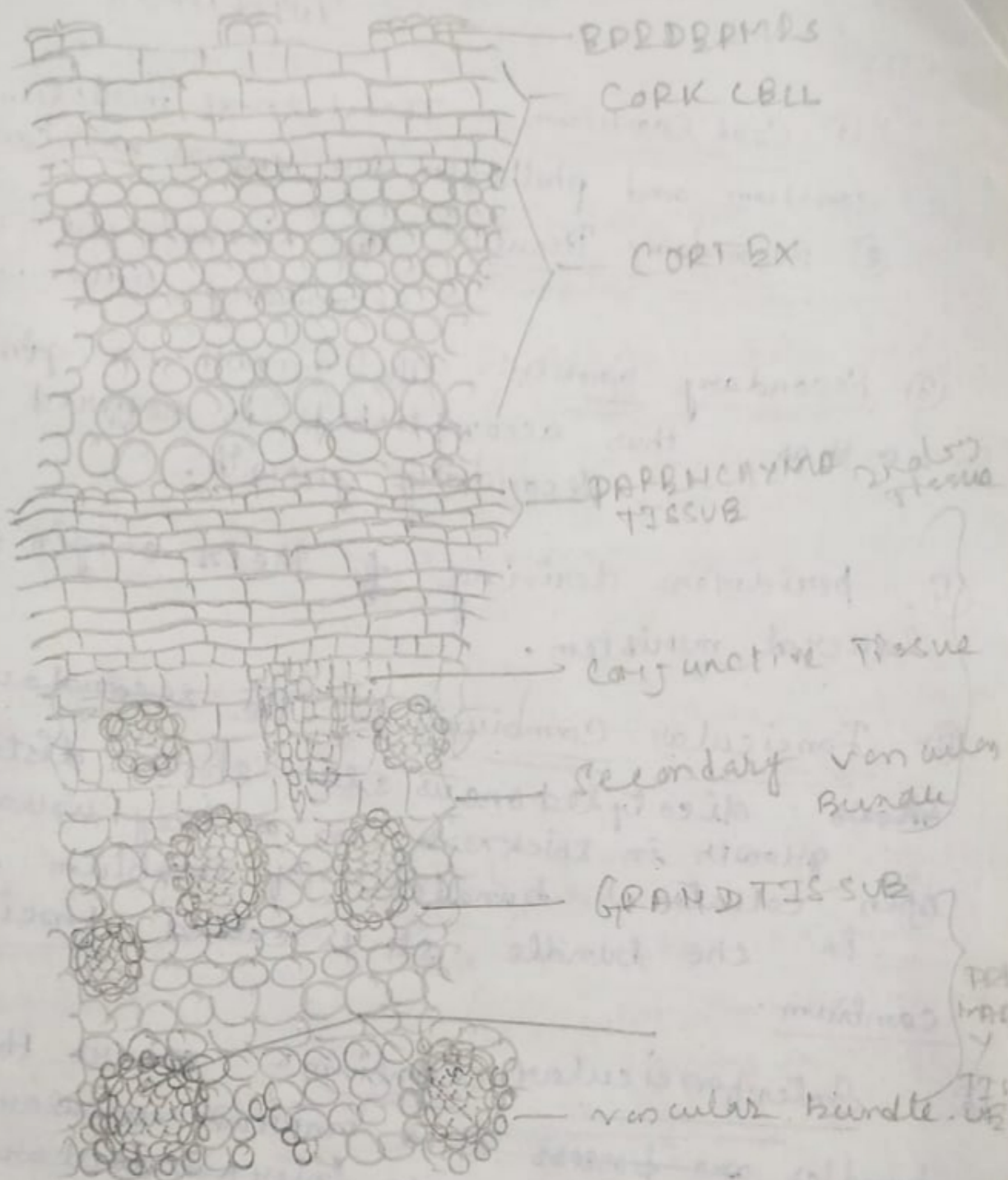
ANOMALOUS SECONDARY GROWTH IN THE STEM OF DRACAENA

Some monocotyledons belonging to the family like *Dracaena* exhibit a peculiar type of secondary increases in thickness, on account of which is given here.

In the region which have ceased to elongate some cells occurring outside the vascular bundles becomes meristematic and form the cambium. The cambial cells are fusiform or rectangular in shape. Instead of forming phloem and xylem on the outer and inner sides, as in normal condition, the cambial cells go on dividing and producing secondary tissues on the inner side first, and later small amount of the few new tissues are cut off on the outer side as well.

(Those formed on the inner side differentiated into oval shaped vascular bundles and radially arranged parenchyma cells. These parenchyma cells in which the vascular bundles remain embedded are said to constitute the conjunctive tissue. The radial arrangement of the parenchymatous cell of conjunctive tissue is due to their origin by ~~transverse~~ tangential divisions of the cambial cells. So, they may be easily distinguished from the irregularly arranged parenchyma of the primary ground tissues, they may be thin walled or thick walled.)

The small amount of phloem consists of short sieve tubes, companion cells and parenchyma. The xylem is made up of only trachei tracheids, usually with scalariform thickening and small amount of xylem parenchyma with lignified walls. The primary bundles are comparatively larger. They are also mostly amphivasal or rather rarely collateral ones.



A Portion of *Dracaena* stem in
 P.S. showing speciality of secondary growth