

Gnetum

Gnetum is a genus of gymnosperms, the sole genus in the family **Gnetaceae*** and order **Gnetales***. They are tropical evergreen trees, shrubs and lianas. Unlike other gymnosperms, they possess vessel elements in the xylem. Some species have been proposed to have been the first plants to be insect-pollinated as their fossils occur in association with extinct pollinating scorpionflies.

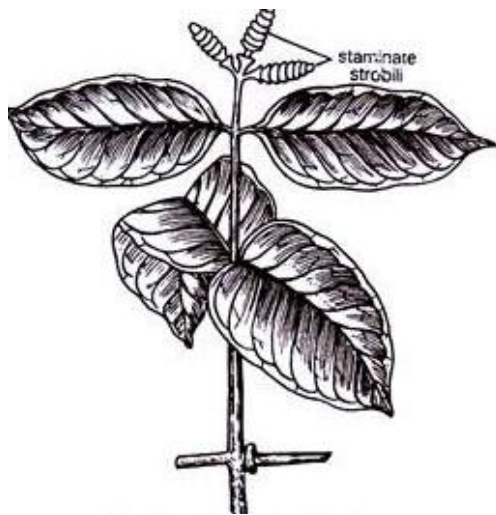
(Note* General Characteristics of order Gnetales and family Gnetaceae already discussed in the theory class)

Distribution:

Gnetum, represented by about 40 species is confined to the tropical and humid regions of the world. Nearly all species, except *G. microcarpum*, occur below an altitude of 1500 metres. Five species (*Gnetum contractum*, *G. gnemon*, *G. montanum*, *G. ula* and *G. latifolium*) have been reported from India *Gnetum ula* is the most commonly occurring species of India and grows in Western Ghats, Kerala, Nilgiris, Godawari district of Andhra Pradesh and Orissa.

Habit/ Morphology:

Gnetum shows varied forms of morphology where most of the species are woody climbers (*G. latifolium*, *G. montanum*, *G. ula*) while few are shrubs and trees (*G. gnemon*, *G. contractum*). On the main stem of plant two types of branches are present i.e. branches of limited growth and branches of unlimited growth. Each branch contains nodes and internodes and climbing species the branches of limited growth or short shoots are generally un-branched and bear the foliage leaves. The leaves (9-10) are arranged in decussate pairs. They often lie in one plane giving the appearance of a pinnate leaf to the branch. The leaves are large and oval with entire margin and reticulate venation as also seen in dicotyledons. Some scaly leaves are also present.



Strobilus

Stem

Leaf with
reticulate
venation

A branch of *Gnetum*

Root:

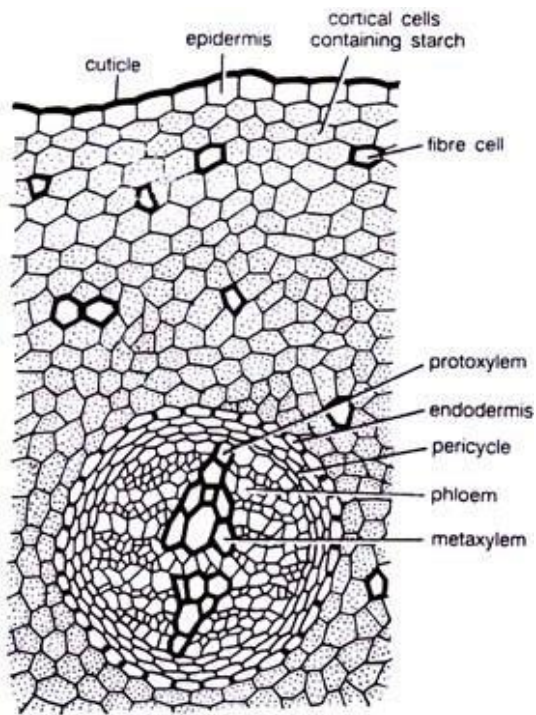
External Morphology:

Gnetum shows a typical tap root system which is profusely branched. The mature roots show normal secondary growth.

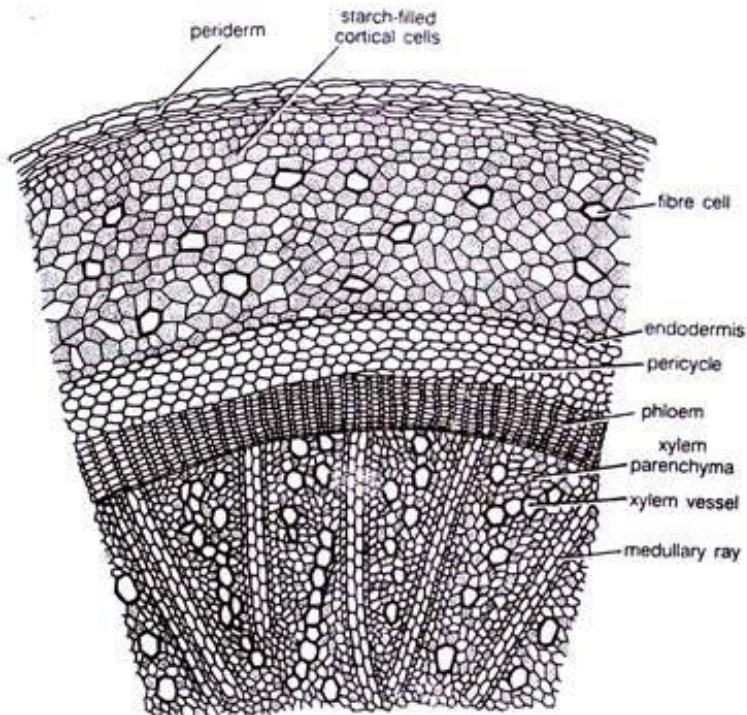
Anatomy of root:

The root of *Gnetum* resembles the root of angiosperm. The root is differentiated into the outermost layer, epidermis, multilayered cortex and diarch vascular cylinder. The cortex consists of polygonal or oval-shaped parenchymatous cells containing starch grains. The thick-walled fibre cells are often present in the cortex. A single-layered endodermis encircles a multilayered pericycle. The primary vascular cylinder is diarch, radial and exarch.

The secondary growth in roots is of normal type. The arcs of cambium form below the phloem groups and above the xylem groups which join together to form a cambium ring. The secondary xylem consists of tracheids possessing uniseriate bordered pits with conspicuous Bars of Sanio. The vessels lack bars of Sanio. The pits on the vessels are bordered or simple, small and multiseriate. The xylem ray is composed of thin-walled parenchymatous cells containing starch grains. The phloem consists of sieve cells and parenchyma. The periderm is formed due to the extrastelar secondary growth and forms a continuous zone of wood.



Gnetum: T.S. of Young Root



Gnetum: T.S. of Old Root

Stem:

External Morphology:

Almost all the species of *Gnetum*, except the tree type like *G. gnemon*, exhibits two types of branches viz. dwarf shoots or branches of limited growth and long shoots or branches of unlimited growth. In climbing and scandent species of *Gnetum*, the stem is articulated with prominent joints. The joint consists of two parts: one just above the node and the other below the node and these two are separated by an annular groove. In arboreal species such as *G. gnemon*, the stem exhibits uniform type of branching.



▶ Stem

Anatomy:

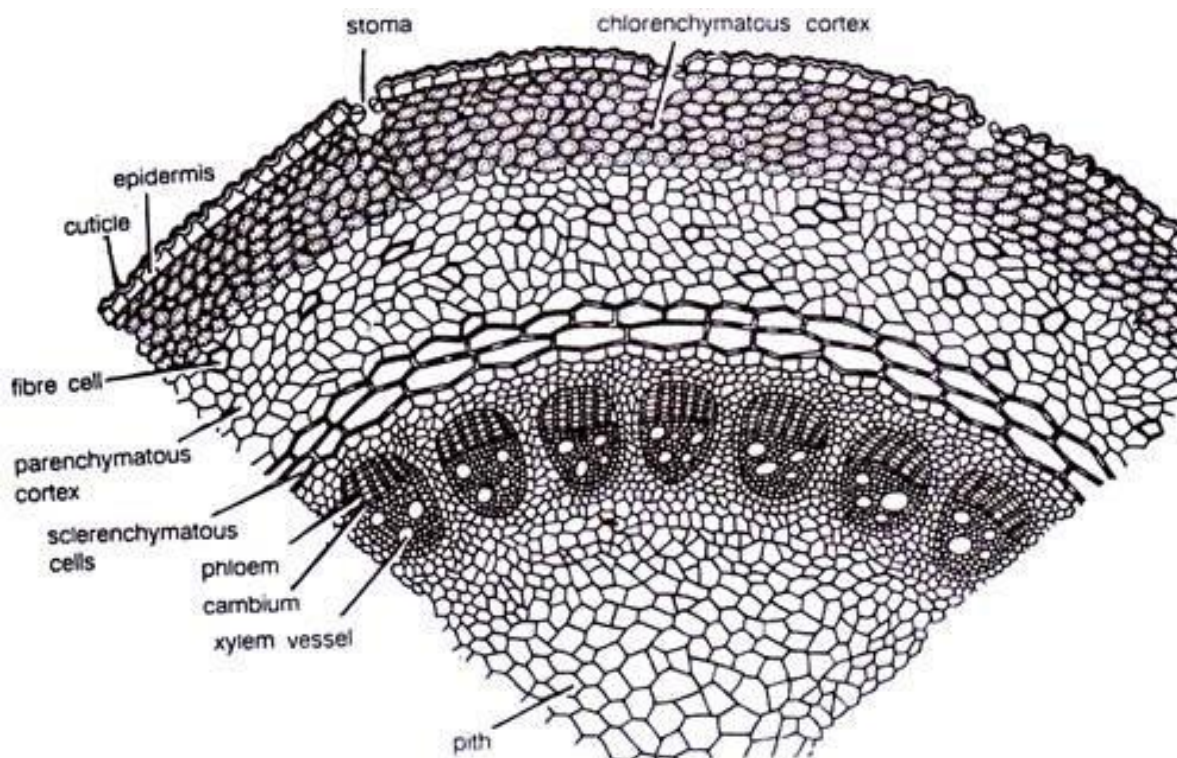
Young Stem:

The young stem in transverse section is roughly circular in outline, and resembles with a typical dicotyledonous stem. It remains surrounded by a single-layered epidermis, which is thickly circularized and consists of rectangular cells. Some of the epidermal cells show papillate outgrowths. Sunken stomata are present.

The cortex consists of outer 5-7 cells thick chlorenchymatous region, middle few-cells thick parenchymatous region and inner 2-4 cells thick sclerenchymatous region. Endodermis and pericycle regions are not

very clearly distinguishable. Several conjoint, collateral, open and endarch vascular bundles are arranged in a ring in the young stem.

Xylem consists of tracheitis and vessels. Presence of vessels is an angiospermic character. Protoxylem elements are spiral or annular while the metaxylem shows bordered pits which are circular in outline. The phloem consists of sieve cells and phloem parenchyma.



Gnetum: T.S. of Young Stem

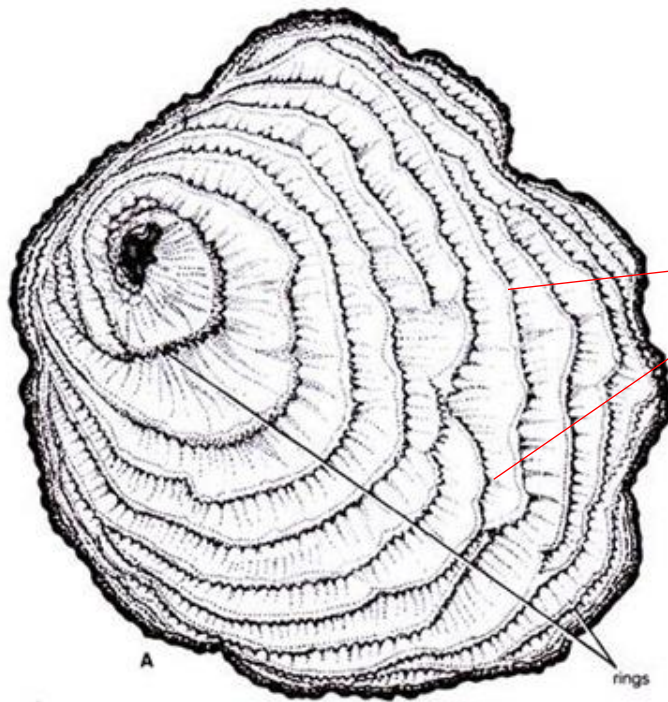
Old Stem:

Old stems in *Gnetum* show secondary growth. In *G. gnemon* the secondary growth is normal, as seen also in the dicotyledons. But in majority of the species (e.g., *G. ula*, *G. africanum*, etc.) the anomalous secondary growth is present.

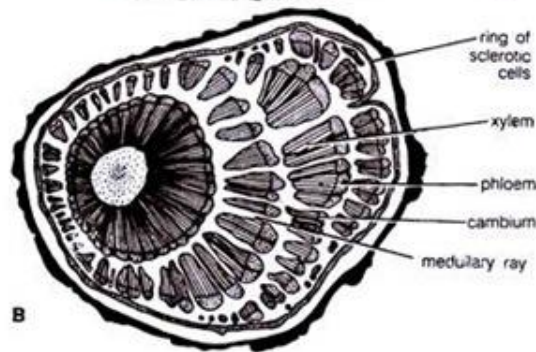
The primary cambium is ephemeral (i.e., short-lived). The secondary cambium in different parts of cortex develops in the form of successive rings, one after the other. The first cambium cuts off secondary xylem towards inside and secondary phloem towards outside. This cambium ceases to function after some time.

Another cambium gets differentiated along the outermost secondary phloem region, and the same process is repeated. In the later stages, more secondary xylem is produced on one side and less on the other

side, and thus the eccentric rings of xylem and phloem are formed in the wood. This type of eccentric wood is the characteristic feature of angiospermic lianes. The periderm is thin and develops from the outer cortex. It also possesses lenticels. The cortex also contains chlorenchymatous and parenchymatous tissues along with many sclereids. In old stems the secondary wood consists of tracheids and vessels. Tracheids contain bordered pits on their radial walls while vessels contain simple pits. Transitional stages, containing one to many perforations in the terminal part of the vessels, are also seen commonly. In tangential longitudinal section (T.L.S) of the stem, the wood xylem and medullary rays are visible. Bordered pits on both the radial and tangential walls are present. Medullary rays are either uniseriate or multiseriate and consist of polygonal parenchymatous cells. They are boat-shaped and their breadth varies from 2 to many cells. Sieve cells of the phloem contain oblique and perforated sieve plates.



Rings formed due to anomalous secondary growth



Gnetum: T.S. of Old Stem

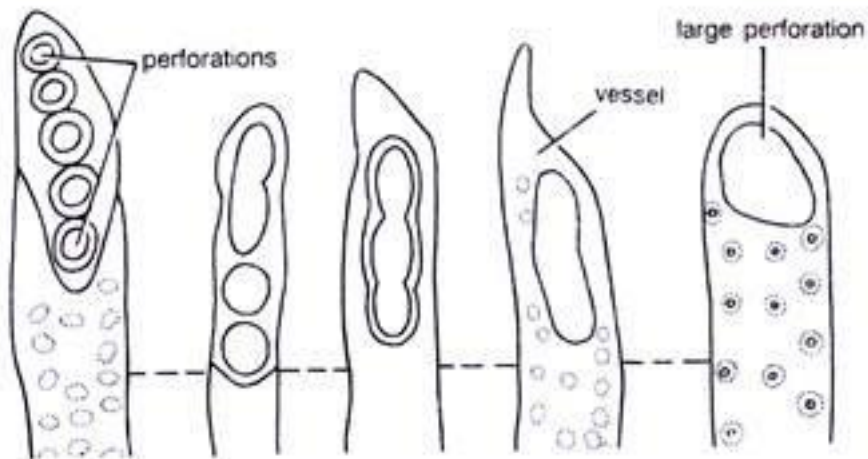


Fig. 13.7. *Gnetum africanum*. Perforation in the end walls of the vessels. (after Duthie, 1912).

Leaf:

External Morphology:

Gnetum exhibits leaf dimorphism bearing both the foliage leaves and scale leaves. A dwarf shoot bears 9 to 10 foliage leaves, arranged in an opposite decussate manner. The leaves are large, simple having an oval-shaped broad coriaceous lamina with unicostate reticulate venation. The leaves are exstipulate, shortly petiolate with entire margin. The leaf of Gnetum resembles a dicot leaf.



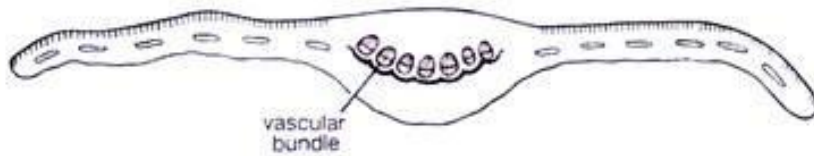
Anatomy:

Internally, Gnetum leaves also resemble with a dicot leaf. It is bounded by a layer of thickly circularized epidermis on both the surfaces. Stomata are distributed all over the lower surface except on the veins. The mesophyll is differentiated generally into a single-layered palisade and a well-developed spongy parenchyma.

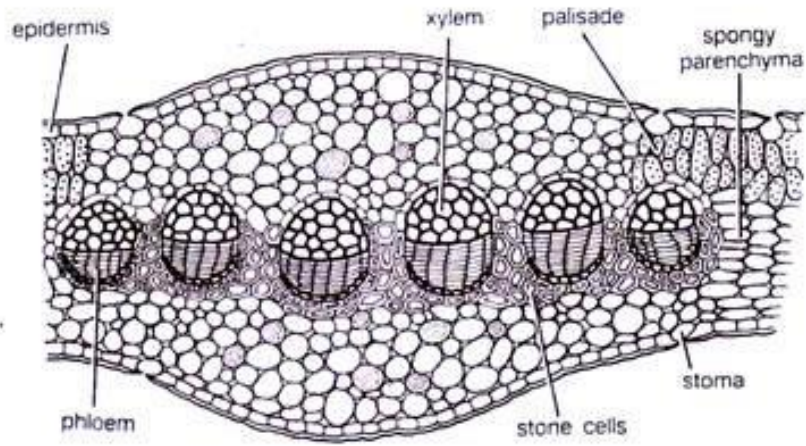
The latter consists of many loosely-packed cells. Many stellately branched sclereids are present near the lower epidermis in the spongy parenchyma. Many stone cells and latex tubes are present in the midrib region of the leaf.

Several vascular bundles in the form of an arch or curve are present in the prominent midrib region. A ring of thick-walled stone cells is present just outside the phloem. Each vascular bundle is conjoint and collateral.

The xylem of each vascular bundle faces towards the upper surface while the phloem faces towards the lower surface. The xylem consists of tracheids, vessels and xylem parenchyma while the phloem consists of sieve cells and phloem parenchyma.



A



B

Gnetum: T.S. of Leaf: A) outline B)cellular

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