

Gnetum

Characteristic Features of *Gnetum*

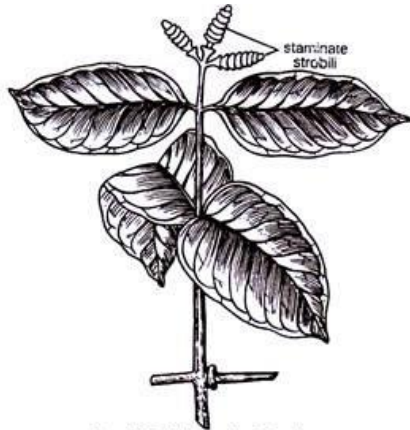


Fig. 13.2. A branch of *Gnetum*.

- Most Species are climbers except few being shrubs & trees.
- Branches 2 types: Branches of limited growth Branches of unlimited growth
- Climbing Species have branches of limited growth (short shoots) and unbranched with foliage leaves.
- Leaves: Dicot like large & oval with entire margins 9-10 in pairs arranged in decussate fashion with reticulate venation.

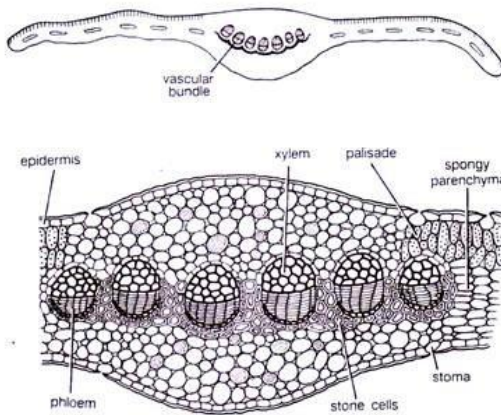


Fig. 13.9. *Gnetum*. Upper-T.S. leaf (diagrammatic) ; Lower-T.S. leaf (a part cellular).

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.

Male Cone and Male Flower The male flowers are arranged in definite rings above each

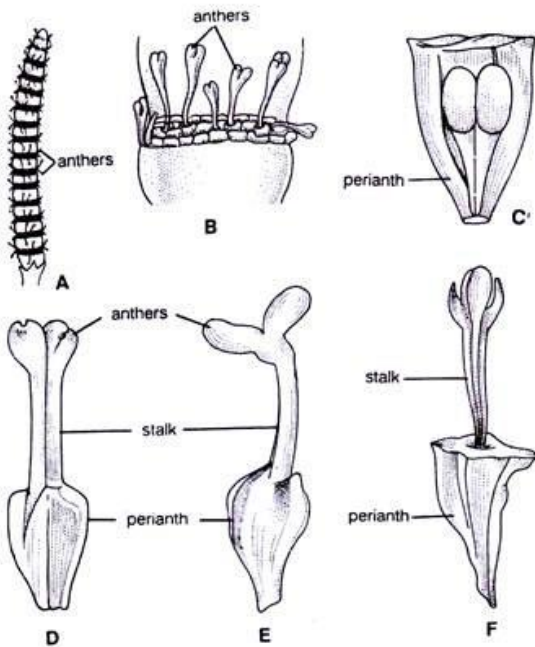


Fig. 13.11. *Gnetum ula*. A, A male cone; B, A part of 'A' showing male flowers; C, L.S. male flower; D-E, Male flowers with anthers emerged out of a perianth; F, A dehiscent male flower.

collar on the nodes of the axis of male cone. The number of rings varies between 3-6. The male flowers in the rings are arranged alternately. There is a ring of abortive ovules or imperfect female flowers above the rings of male flowers. Each male flower contains two coherent bracts which form the perianth. Two unilocular anthers remain attached on a short stalk enclosed within the perianth. At maturity, when the anthers are ready for dehiscence, the stalk elongates, and the anthers come out of the

perianth sheath. In *Gnetum gnemon* a few (2-3) flowers are sometimes seen fusing each other.



Female Cone The female cones resemble with the male cones except in some definite aspects.

A single ring of 4-10 female flowers or ovules is present just above each collar. Only a few of the

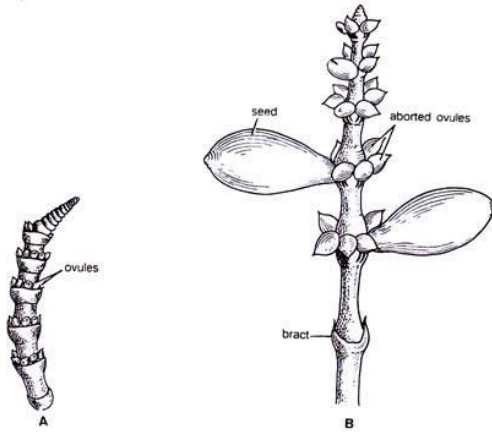


Fig. 13.15. *Gnetum*. A, An old female cone of *G. ula*; B, A female cone of *G. gnemon* bearing two seeds.

ovules develop into mature seeds. In the young condition, there is hardly any external difference between female and male cones. All the ovules are of the same size when young but later on a few of them enlarge and develop into mature seeds. All the ovules never mature into seeds.

Ovule or Female Flower

Each ovule consists of a nucellus surrounded of three envelopes. The nucellus consists of central

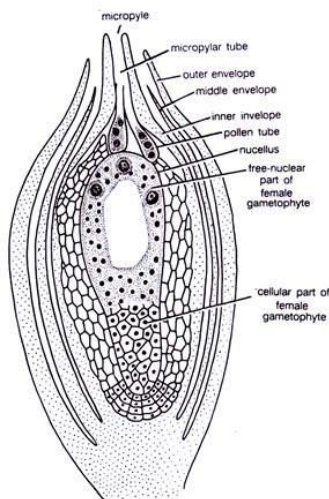


Fig. 13.16. *Gnetum*. L.S. ovule.

mass of cells. The inner envelope elongates beyond the middle envelope to form the micropylar tube or style. The nucellus contains the female gametophyte. There is no nucellar beak in the ovule of *Gnetum*. Stomata, sclereids and laticiferous cells are present in the two outer envelopes. Madhulata (1960) observed the formation of a circular rim from the outer epidermis of the inner integument in *G. gnemon*. Thoday (1921), however, observed the formation of a second such rim at a higher level. The

ovules in *G. ula* are stalked.

Relationships of *Gnetum*

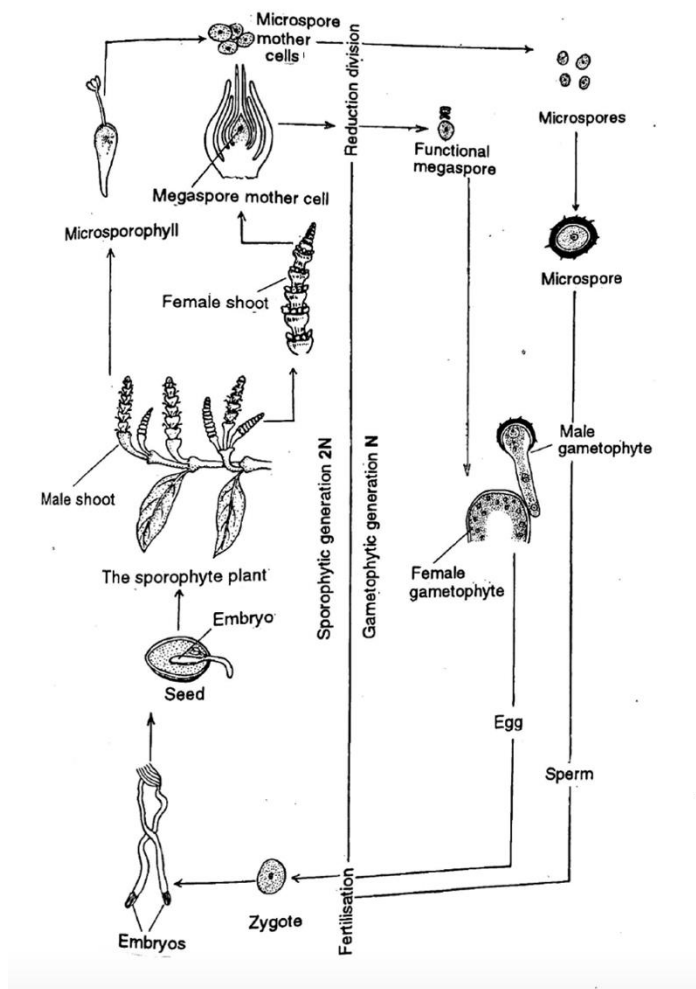


Gnetum and Other Gymnosperms:

Gnetum shows several resemblances with gymnosperms and has, therefore, been finally included under this group.

Some of the characteristics common in both *Gnetum* and other gymnosperms are under mentioned:

1. Wood having tracheids with bordered pits.
2. No sieve tubes and companion cells are present.
3. Presence of naked ovules.
4. Absence of fruit formation because of the absence of ovary.
5. Anemophilous type of pollination.
6. Development of prothallial cell.
7. Cleavage polyembryony.



8. Resemblance of the vascular supply of the peduncle of the cone of *Cycadeoidea wielandii* with that of a single flower of *Gnetum*.
9. Resemblance of the structure of basal part of the ovule in *Gnetum* and *Bennettites*.

Gnetum and Angiosperms:

A key position to *Gnetum* has been assigned by scientists while discussing the origin of angiosperms. Both Gnetales and angiosperms originated from a common stalk called "Hemi-angiosperm".



Thompson (1916) opined that the ancestors of both *Gnetum* and angiosperms were close relatives. Some other workers have gone up to the extent in stating that *Gnetum* actually belongs to angiosperms. Hagerup (1934) has shown a close relationship between Gnetales and Piperaceae.

In a beautiful monograph on *Gnetum*, Maheshwari and Vasil (1961) have stated that “***Gnetum* remains largely a phylogenetic puzzle. It is gymnospermous but possesses some strong angiospermic features**”.

Some of the resemblances between *Gnetum* and angiosperms are under mentioned:

1. The general habit of the sporophyte of many species of *Gnetum* resembles with angiosperms.
2. Reticulate venation in the leaves of *Gnetum* is an angiospermic character.
3. Presence of vessels in xylem is again an angiospermic character.
4. Clear tunica and corpus configuration of shoot apices is a character of both *Gnetum* and angiosperms.
5. Strobili of *Gnetum* resemble much more with angiosperms than any of the gymnosperms
6. Micropylar tube of Gnetales can be compared with the style of the angiosperms because both perform more or less similar functions.
7. Tetrasporic development of the female gametophyte is again a character which brings *Gnetum* close to angiosperms.
8. Absence of archegonia again brings *Gnetum* and angiosperms much closer.
9. Dicotyledonous nature of the embryo of *Gnetum* brings it quite close to the dicotyledons.

Resemblances Between *Gnetum*, *Ephedra* and *Welwitschia*:

All the three genera of Gnetales show following resemblances:

- (1) Opposite leaves;
- (2) Vessels in their secondary wood,
- (3) Similar structure and development of perforation plates in their vessels;



- (4) Similar Gnetalean mode of development of their vessels i.e. by the dissolution of torus and middle lamella of the bordered pits;
- (5) Almost similar structure of their sieve cells and phloem parenchyma;
- (6) Spiral or annular elements in their protoxylem;
- (7) Arrangement of their flowers in compound strobili;
- (8) Unisexual flowers;
- (9) Dioecious plants;
- (10) Stalked male flowers bearing synangia made of 1-6 or more sporangia;
- (11) Almost consistent structure of the wall of their microsporangia;
- (12) Wingless pollen grains;
- (13) Orthotropous ovules;
- (14) Ovules surrounded by several envelopes which are interpreted variously as integuments or perianth;
- (15) Extremely elongated micropylar tube;
- (16) Formation of unicellular primary suspensors;
- (17) Dicotyledonous embryo;
- (18) Simple type of polyembryony.

References

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