

## ANGIOSPERMIC CHARACTERS OF GNETUM

The genus *Gnetum* of the order Gnetales is supposed to be the most evolved member which resembles angiosperms in many of its morphological, anatomical and reproductive features.

According to Arber and Parkin (1908) *Gnetum* and angiosperms both have originated from a single stock Hemiangiosperms and in many respects their line of development is parallel to each other.

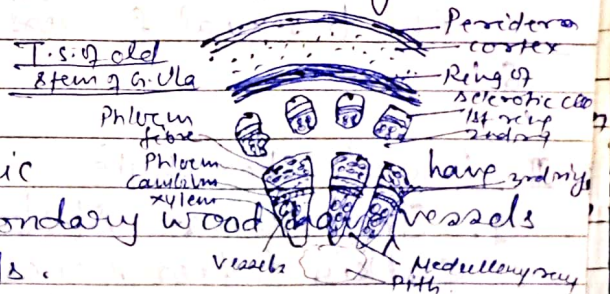
Thompson (1919) is also of the opinion that angiosperms have not been derived from Gnetales but ancestors of angiosperms were not far removed from the genus *Gnetum*.

Thus the genus *Gnetum* has touched the apex of angiosperm level but due to some burning objections it has been left behind.

Similarities of *Gnetum* with Angiosperms

### A. Vegetative Characters

1. Climbing habit of Sposophytic Plants with twining stem in *G. africanum*, *G. neglectum*, *G. ula* etc.
2. Opposite - decussate leaves with reticulate venation
3. Presence of distinct tunica-cortex configuration in the shoot apices.



### B. Anatomical characters.

1. Vascular cylinder eustelic
2. Both the primary and secondary wood associated with the tracheids.
3. The secondary Phloem in some species is composed of fibres and companion cells.
4. In tree form like *G. gnemon*, the activity of persistent cambium in the stem region is normal being similar to dicot stem
5. In the twining stem the secondary growth is anomalous



6. The root of *Gnetum* is diarch and resemble angiospermic root in its structure and arrangement of tissues.
7. Like the angiosperms the mesophyll is differentiated into Palisade and Spongy Parenchyma.
8. Presence of Syndetochilic type of stomata on the lower epidermis is also angiospermic feature.
9. The vascular bundles of leaf having conjoint, collateral bundles with endarch development of xylem elements resemble to a large extent of angiosperms.

### [C]. Reproductive characters

#### I. Male Sporophyte

1. The complex Staminate Strobilus resembles spike or Catkin inflorescence.
2. The male flowers have their own Uniseriate perianth.
3. The microsporophyll is comparable to a true stamen by assuming its stalk as a filament and two Connate sporangia as a bilobed anther.
4. The epidermis of microsporangial jacket bears fibrous bands in its all the cells being similar to endothelium of angiospermic anther.
5. The existence of bisporangiate strobilus in *G. ulm*, *G. abricanum* and *G. gnemon* may be compared to the bisexual flowers.
- 6.

#### II. Female Sporophyte

1. The ovulate Strobilus appears to be a paniculate catkin inflorescence.
2. Normally a female flower bears a bitegmic ovule and a uniseriate perianth but the perianth in *G. ulm* is biseriate as in the majority of angiospermic flowers.
3. The inner integument is comparable to the ovary producing a long micropylar tube equivalent



to style with indistinct stigma. The so called style has a nutritive tissue as in many angiosperms.

### III. In the male gametophyte

1. Complete elimination of male Prothallial cell (Thompson-1916) and the production of two non-motile male gametes by a generative cell. The excellent work of Negi and Madhulata (1957) clarifies that there is prothallial cell of very short duration which shows the tendency ~~to~~ towards the angiospermic level.
2. Germination of Pollen grains and Pollen tube is also angiospermic.

### IV. In the female gametophyte

1. The embryo sac is tetrasporic with free nuclear division during megagametogenesis.
2. Perfect omission of archegonium in the embryo sac.
3. All the free nuclei in the micropylar half of the embryo sac are the potential eggs.
4. The formation of prothallial tissue being equivalent to antipodal cells at the chalazal region is delayed till the entry of Pollen tube in the sac.
5. The cytology of prothallial cells may be haploid, diploid or even polyploid.
6. Fertilization of two eggs simultaneously by a single Pollen tube is comparable to double fertilization.
7. The development of cellular endosperm completes only after fertilization.

### [D] In Embryogeny: -

The zygote does not undergo any free nuclear division

### [E] In seed structure and its germination

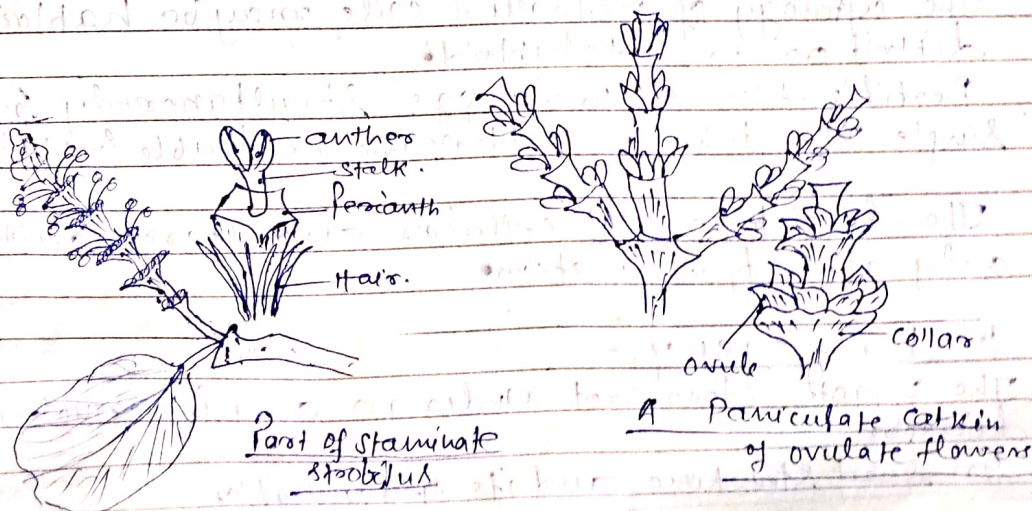


1. The endospermic seed with a dicotyledonous embryo
2. Epigeal germination only after the over of a prescribed period of dormancy
3. Formation of a distinct taproot system by a radicle is said to be earlier than that of shoot system evolved from the Plumule being similar to dicot plants.

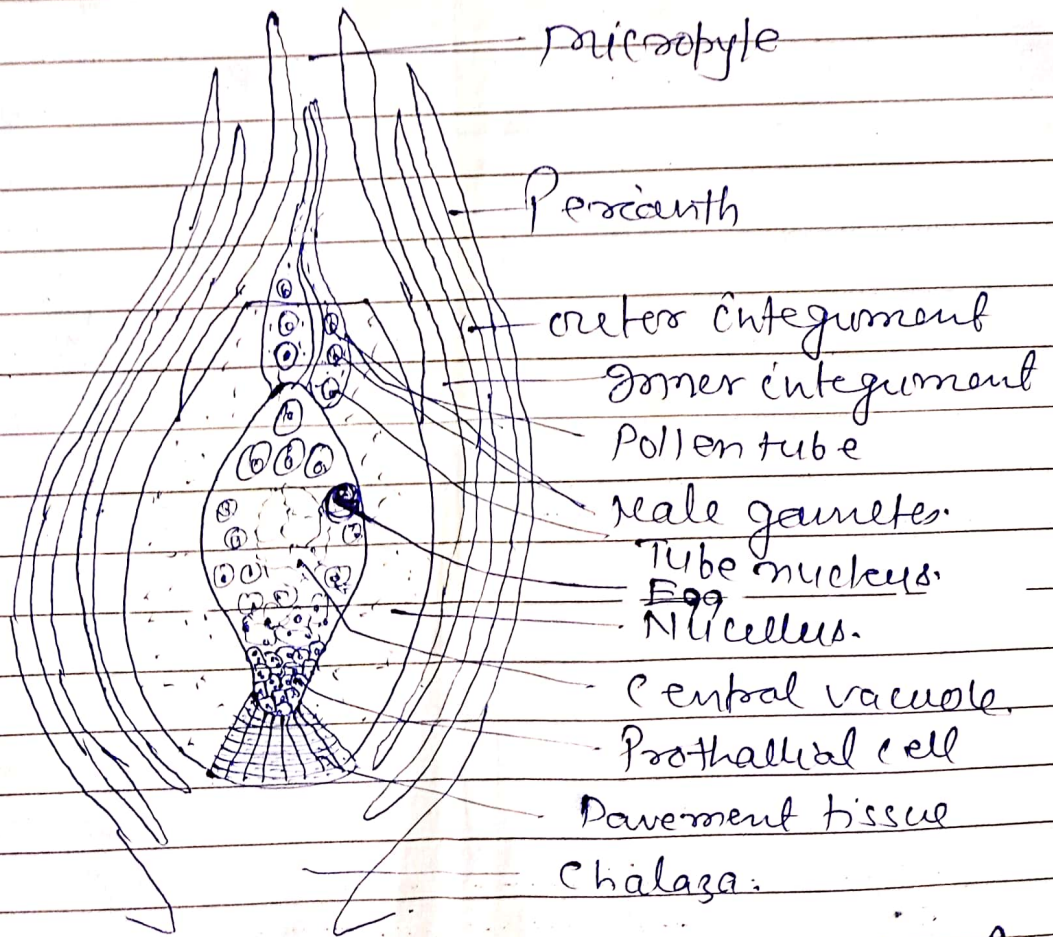
Conclusion: -

On the basis of the above mentioned features of Gnetum which are very similar or nearly related to angiosperms. In this context Arber and Parkin (1908) are of the opinion that they have originated from a hypothetical stock Hemicangiosperm. It is only recently Maheshwari and Vasil (1961) come to a conclusion that Gnetum display a great Phylogenetic Puzzle.

Thus all the similarities of Gnetum with angiosperms is obviously due to parallel evolution. However, these striking features similar to angiosperms suggest that Gnetum has reached very close to angiosperms.







A V.S. of mature ovule showing fertilization