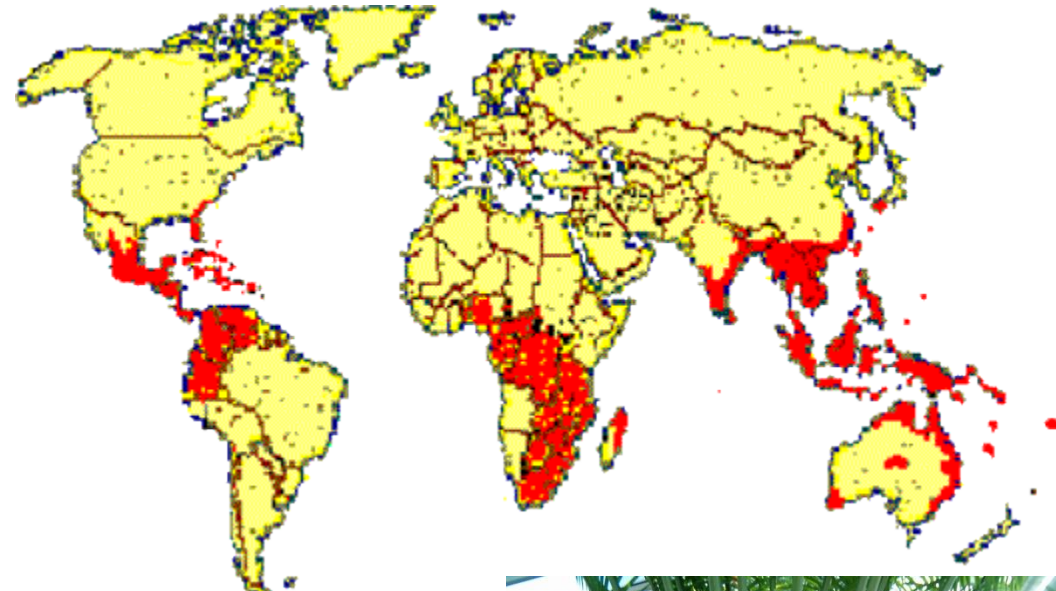


CYCAS

- Cycads occur in Tropical and subtropical region
- Grows in drained soil
- Cycas – 15 species in India (Masood Akhtar, Praveen K. Agrawal & R C Srivastava, 2018)
- Common sps. Are- *C. beddomei*, *C. pectinata*, *C. circinalis*,
- Garden sps. Are *C. revolute*, *C. siamensis*



1. *Cycas annaikalensis* Rita Singh & P.Radha, *Brittonia* 58(2): 119-123, figs. 1-2. 2006;

https://cycadlist.org/taxon.php?Taxon_ID=56

Distribution: Kerala

Red List Category: Critically Endangered (CR)

2. *Cycas beddomei* Dyer, Trans. *Linn. Soc. London, Bot.* 2(5): 85-86, pl. 17. 1885;

https://cycadlist.org/taxon.php?Taxon_ID=67

Cycas circinalis var. *beddomei* (Dyer) J.Schust.

Distribution: Andhra Pradesh

Red List Category: Critically Endangered (CR)

3. *Cycas circinalis* L., *Sp. Pl.* 2: 1188. 1763; https://cycadlist.org/taxon.php?Taxon_ID=87

Cycas circinalis f. *undulata* (Hort. ex Gaudich.) J.Schust.

Cycas circinalis var. *angustifolia* Miq.

Cycas rumphii f. *undulata* (Desf. ex Gaudich.) Kaneh.

Cycas undulata Desf. ex Gaudich.

Cycas undulata Desf. ex Gaudich. *Cycas wallichii* Miq. *Cycas circinalis* f. *circinalis* *Cycas circinalis*

subsp. *circinalis* *Cycas circinalis* var. *circinalis*

Cycas circinalis subsp. *vera* var. *vera*

Cycas circinalis subsp. *vera* J.Schust.

Distribution: Andhra Pradesh, Karnataka, Kerala, Maharashtra, Tamilnadu.

Red List Category: Endangered (E)

4. *Cycas darshii* R.C.Srivast.&B.Jana, *Ind. Journal of Plant Sciences* 3(2):151-153.2014

Distribution: Andaman & Nicobar Islands, AJC Bose Indian Botanical Garden, Howrah.

Red List Category: Data Deficient (DD)

5. ***Cycas indica*** D D Pant ex A.Lindstr. &K.D.Hill, *Telopea* 11(4): 481-483, fig. 3. 2007;
https://cycadlist.org/taxon.php?Taxon_ID=140

Cycasswamyi Rita Singh & P.Radha *Cycas swamyi* D D Pant, *nom.nud*

Distribution: Karnataka

Red List Category: Data Deficient (DD)

6. ***Cycas nathorstii*** J.Schust., Engler, *Pflanzenr.* 99: 76, fig. 10e. 1932. https://cycadlist.org/taxon.php?Taxon_ID=172

Distribution: Tamil nadu

Red List Category: Vulnerable (VU)

7. ***Cycas nayagarhensis*** Rita Singh, P.Radha & Khuraijam, *Asian J. Conserv. Biol.* 4(1): 3-14, figs. 4-6.
2015; https://cycadlist.org/taxon.php?Taxon_ID=674

Distribution: Odisha

Red List Category: Data Deficient (DD)

8. ***Cycas orixensis*** (Haines) Rita Singh & Khuraijam, *Asian J. Conserv. Biol.* 4(1): 3-14, figs. 1- 3. 2015;
https://cycadlist.org/taxon.php?Taxon_ID=673

Distribution: Odisha

Red List Category: Data Deficient (DD)

9. ***Cycas pectinata*** Buch.-Ham., Mem. Wern. *Nat. Hist. Soc.* 5(2): 322-323. 1826;
https://cycadlist.org/taxon.php?Taxon_ID=183

Cycas circinalis subsp. vera var. *pectinata* (Griff.) J.Schust. *Cycas jenkinsiana* Griff. *Cycas pectinata* var. *pectinata*

Distribution: Assam, Manipur, Meghalaya, Sikkim, West Bengal.

Red List Category:Vulnerable (VU)

10. ***Cycas pschannae*** R. C.Srivast. & L. J. Singh, *Int. J. Curr. Res. Biosci. Plant Biol.* 2 (8): 35-37.
2015,

Distribution: Andaman & Nicobar Islands. Planted in AJCB IBG, Shibpur, Howrah (WB).

Red List Category: Data Deficient (DD)

Cycas andaemanica K. Prasad, M.V. Ramana, Sanjappa & B.R.P. Rao *Cycas dharmrajii* L.J. Singh

11. *Cycas revoluta* Thunb., Verh. Holl. MaatschWeetensch. *Haarlem* 20(2): 424, 426-427.1782.

https://cycadlist.org/taxon.php?Taxon_ID=191

Cycas revoluta var. *planifolia* Miq. *Cycas revoluta* var. *prolifera* Siebold & Zucc. *Cycas revoluta* var. *robusta* Messeri *Epicycasmiquelii* (Warb.) de Laub. *Cycas revoluta* var. *revoluta*

Distribution: A native of Japan. Introduced in India as ornamental plant but still restricted to gardens; **No wild population recorded so far from India.**

Red List Category: Data Deficient (DD)

12. *Cycas seshachalamensis* P.V.C.Rao, N.V.S.Prasad, P.M.Babu, K.Prassad & Prasanna, *Asian J. Conservation Biol.* 5(1): 55-58, figs. 1-2. 2016; https://cycadlist.org/taxon.php?Taxon_ID=815

Distribution: Andhra Pradesh (Tirupati Circle).

Red List Category: Data Deficient (DD)

13. *Cycas sainathii* R.C.Srivast. *Indian J. Pl. Sci.* [Jaipur] 3(1): 109-110, pl. 1. 2014; https://cycadlist.org/taxon.php?Taxon_ID=595

Distribution: Andaman & Nicobar Islands. Planted in AJCB IBG, Shibpur, Howrah (WB) and Saharanpur Botanical Garden (UP)

Red List Category: Data Deficient (DD)

14. *Cycas sphaerica* Roxb., *Fl. Ind.* (Roxburgh) 3: 747. 1832; https://cycadlist.org/taxon.php?Taxon_ID=217

Distribution: Andhra Pradesh, Karnataka, Odisha, Tamilnadu.

Red List Category: Data Deficient (DD)

15. *Cycas zeylanica* (J.Schust.) A.Lindstr. & K.D.Hill, *Novon* 12(2): 238. 2002; https://cycadlist.org/taxon.php?Taxon_ID=241

Cycas rumphii subsp. *zeylanica* J. Schust.

Distribution: Sri Lanka, India (Andaman & Nicobar Islands)

Red List Category: Vulnerable (VU)



MORPHOLOGY

- Columnar stem
- Crown of pinnately compound leaves
- Some sps. have underground tuberous stem
- normally unbranched,
- bulbils





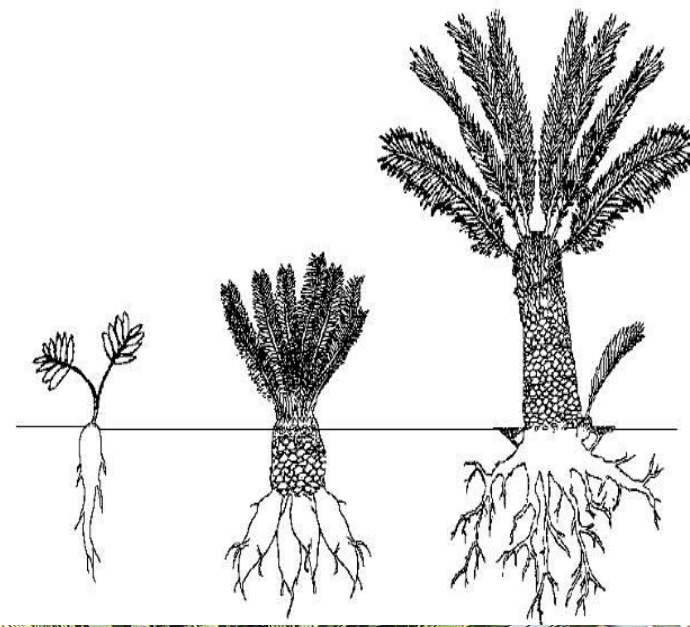
- armour of persistent leaf bases
- rhomboidal in shape and arranged spirally
- Combined with periderm give insulating qualities

Leaf

- dimorphism
- Foliage leaves – large green unipinnately compound leaf with long rachis and short petiole, single midrib running the entire length, circinate vernation, ramental hairs on young leaves
- Cataphylls – small leaves with reduced lamina, presence of ramental hairs



Primary **root** system - tap root system, later replaced by adventitious roots



coralloid root
apogeotrophic with
cyanobacterial infection



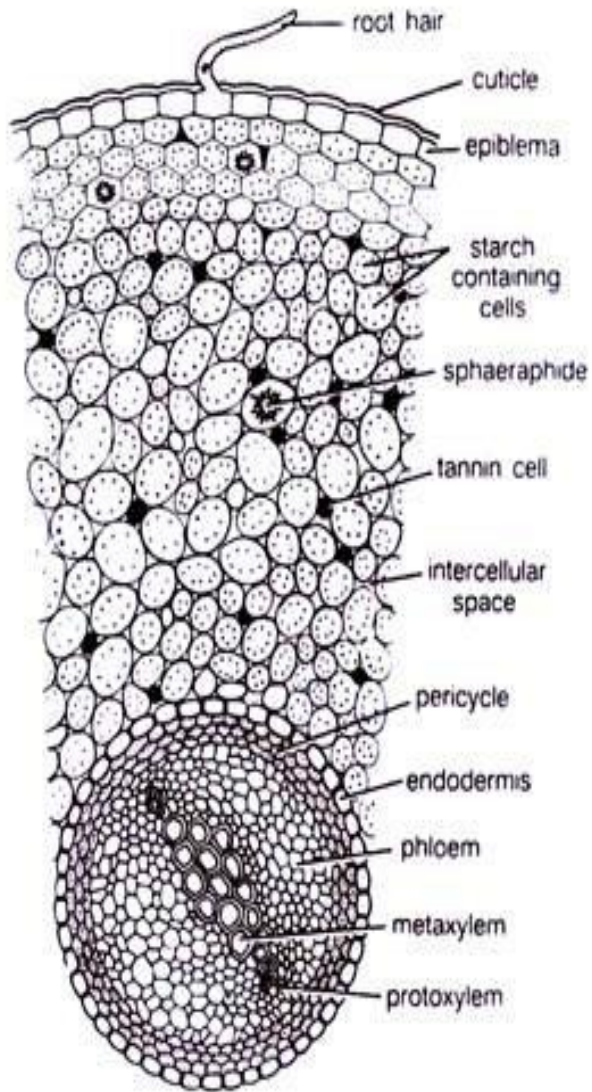


Fig. 8.16. *Cycas revoluta*. T.S. normal root (Young)

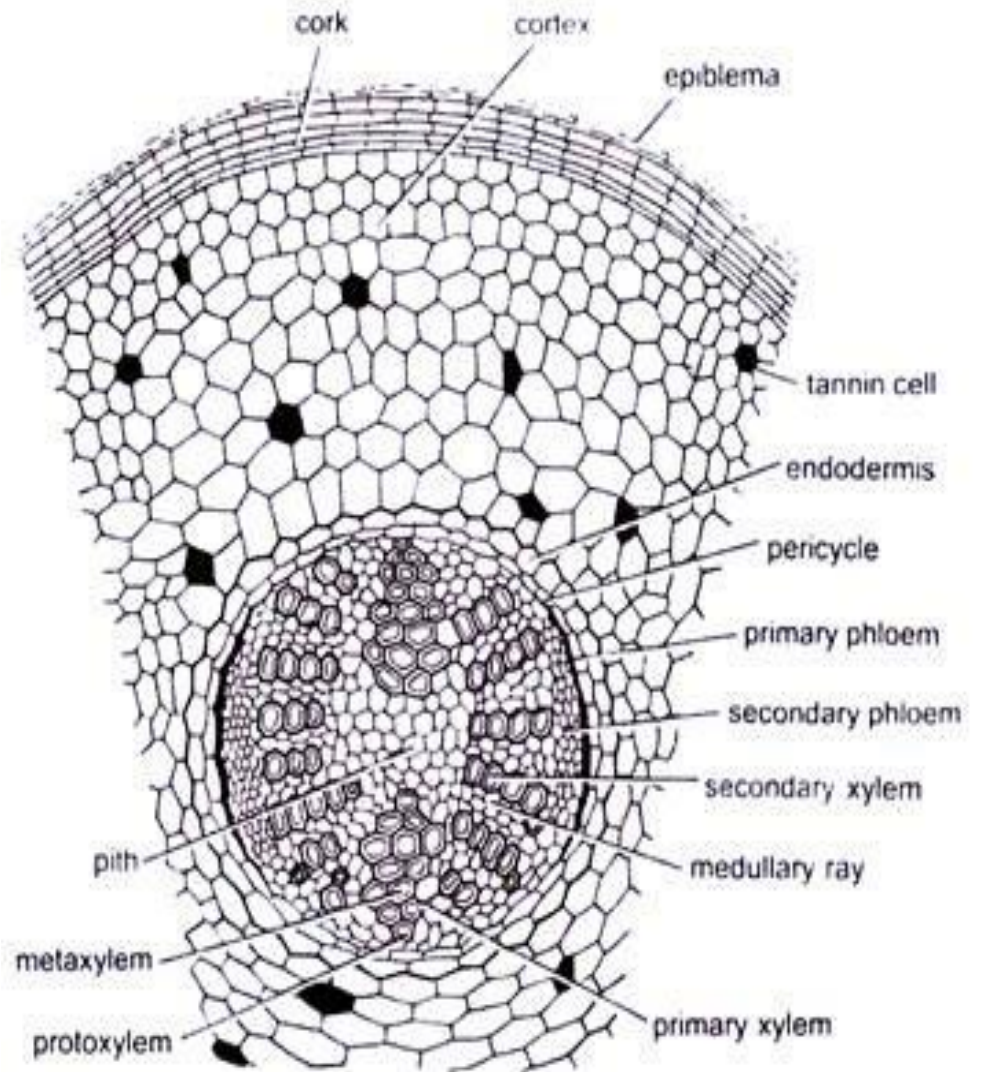
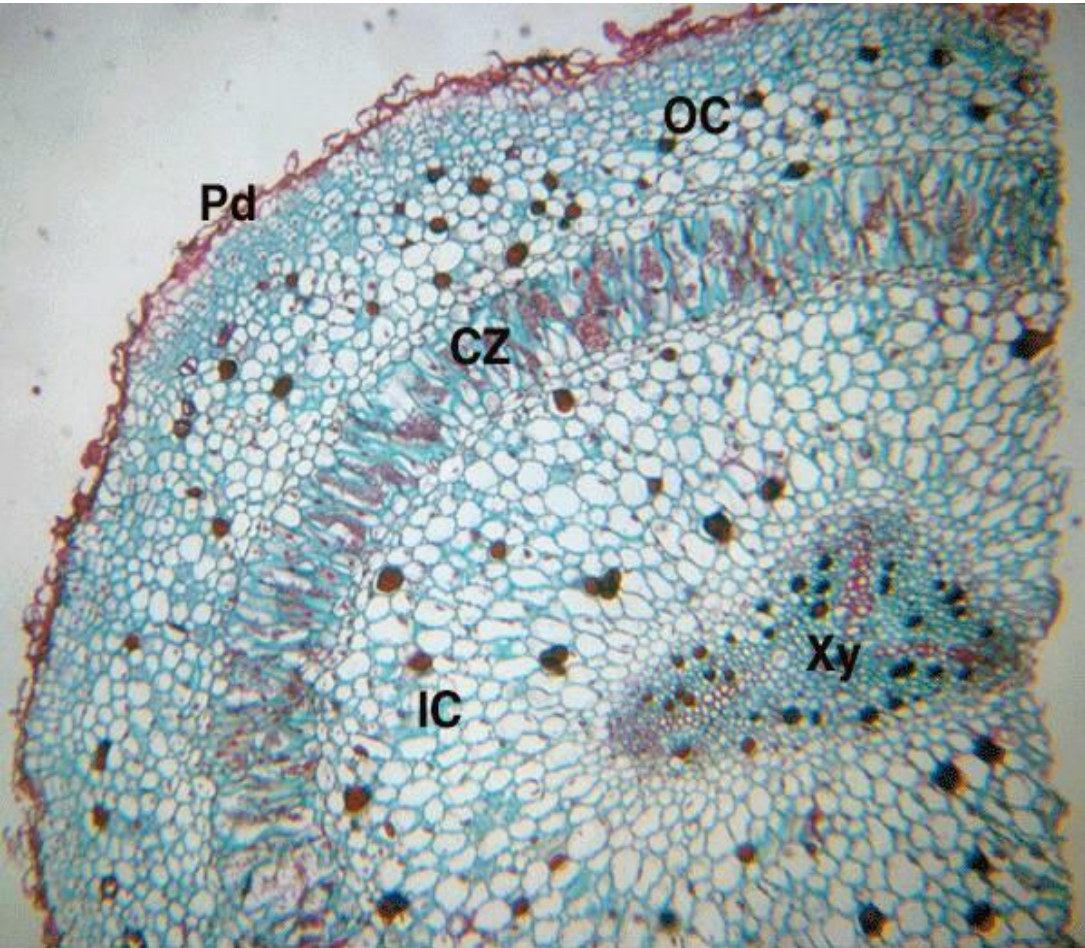
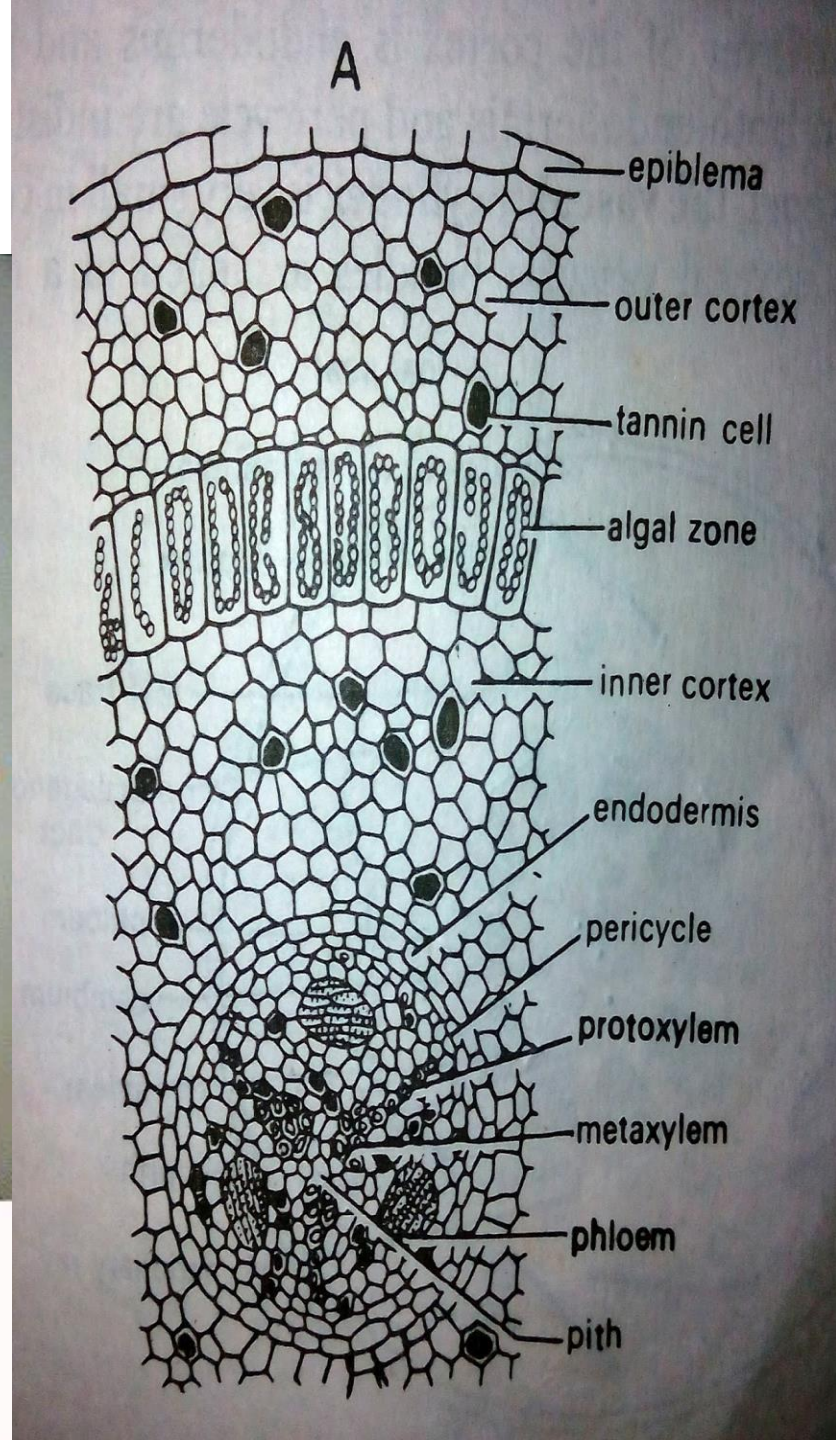


Fig. 8.17. *Cycas revoluta*. T.S. normal root (old).

Coralloid root

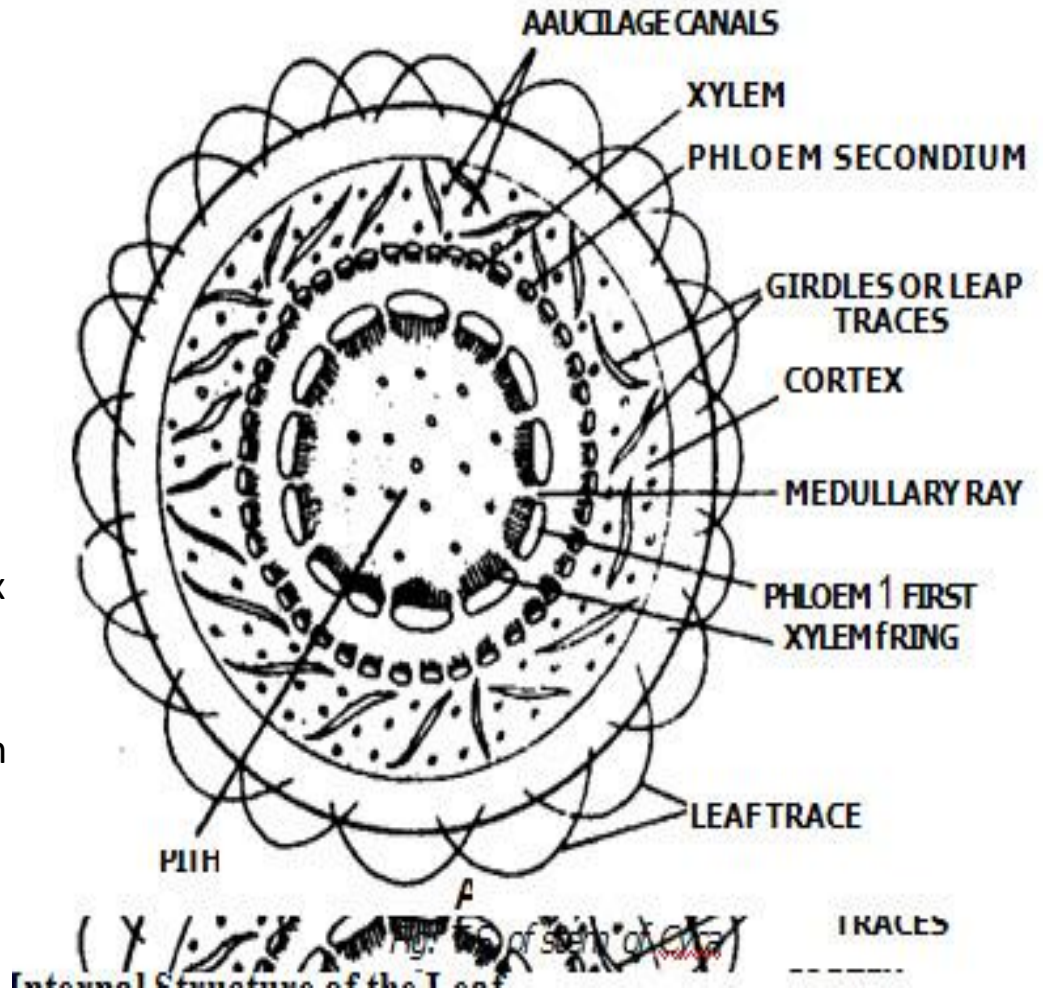


Cross-section of a coralloid root showing cyanobacterial zone (CZ), triarch xylem (Xy), inner (IC) and outer (OC) cortex, and periderm (Pd).

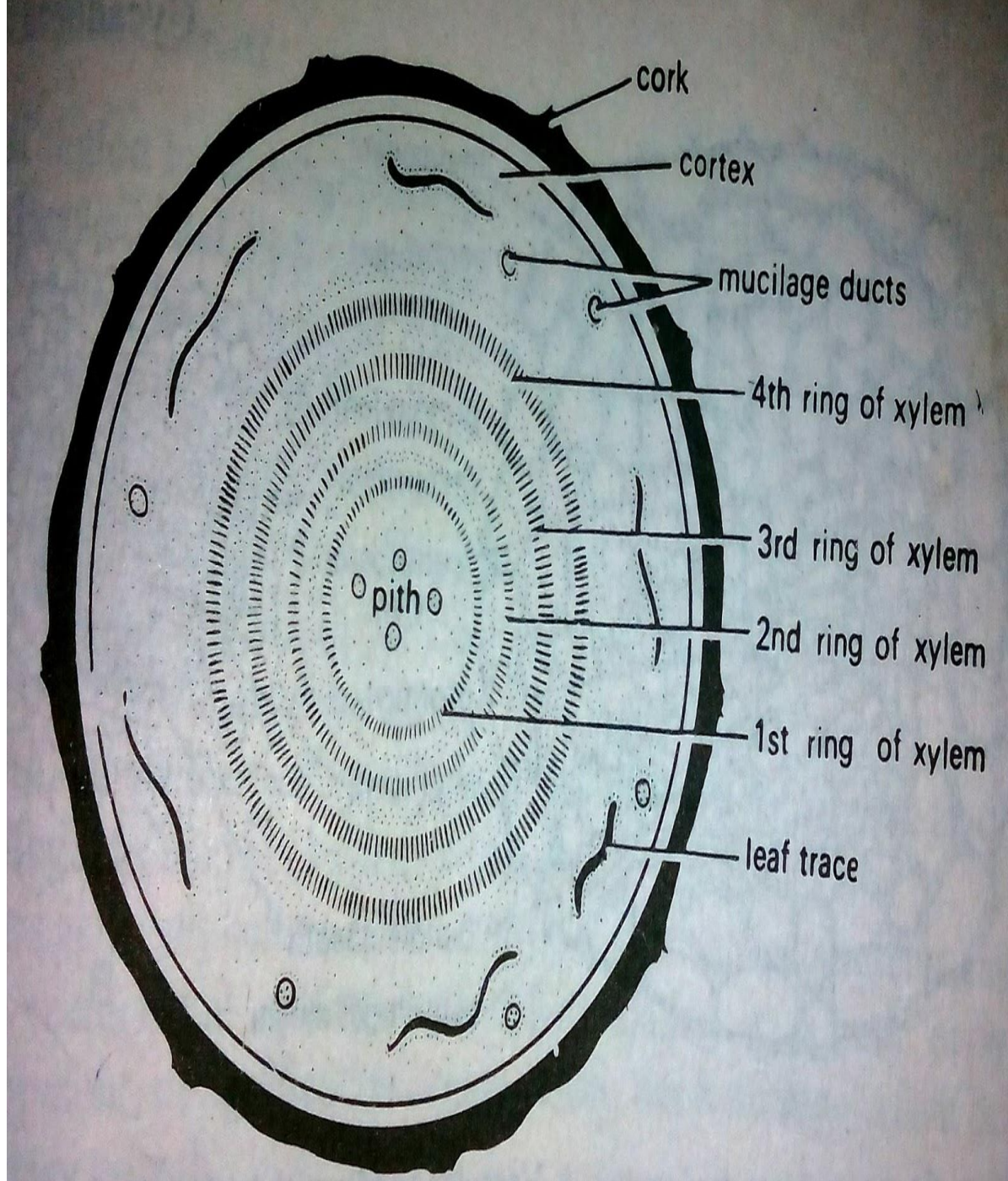


Stem

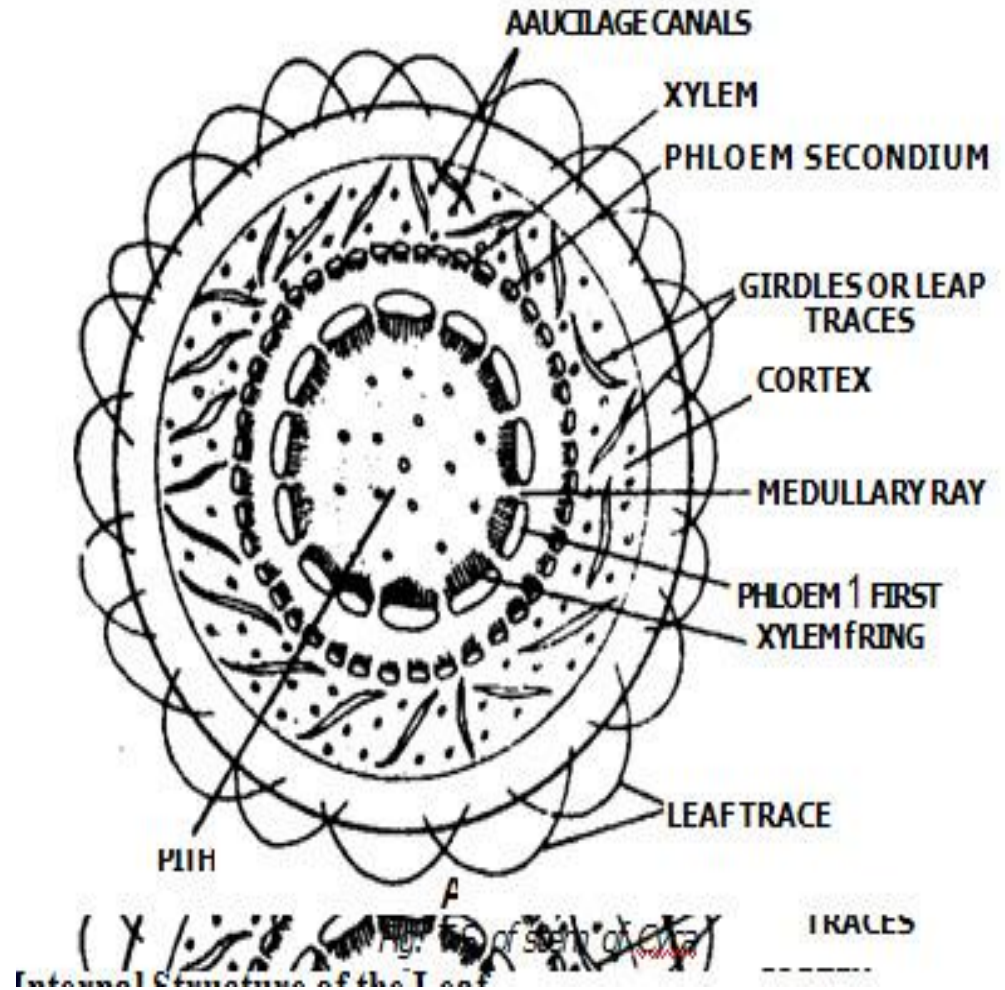
- Irregular in outline due to persistent leaf base
- Manoxylic wood with central pith
- Central pith large surrounded by numerous small vascular bundle followed by wide paranchymatous cortex broad medullary rays connect pith and cortex
- The paranchymatous cells fully filled with starch, commercially exploited – **Sago**
- Vascular bundles collateral, open and endarch



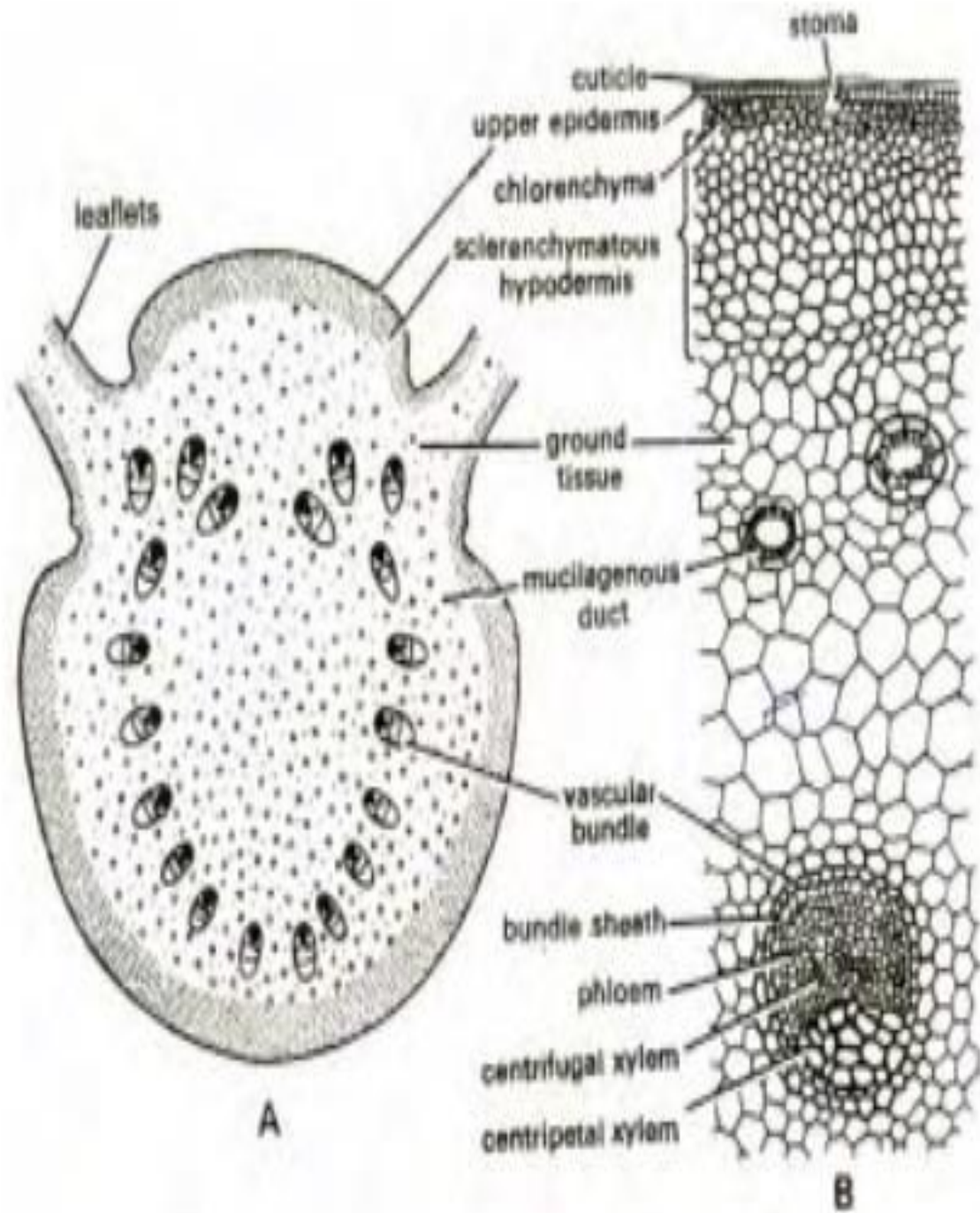
- Secondary thickening is normal in the beginning but later it shows some abnormalities
- Cycas stem is monoxyletic in the beginning but becomes polyxyletic later as a result of accessory rings of cambia that arise in the cortex
- The second vascular cylinder is wider than the first and the subsequent vascular cylinders are narrower than these two and diminish towards the periphery
- Medullary rays uniseriate to multiseriate



- Leaf traces are visible, originate from the primary vascular cylinder – two type of traces are there , direct traces and girdling leaf traces
- Mucilage canals are common (may be shizogenous or lysogenous)branched forming a network
- Xerophytic character

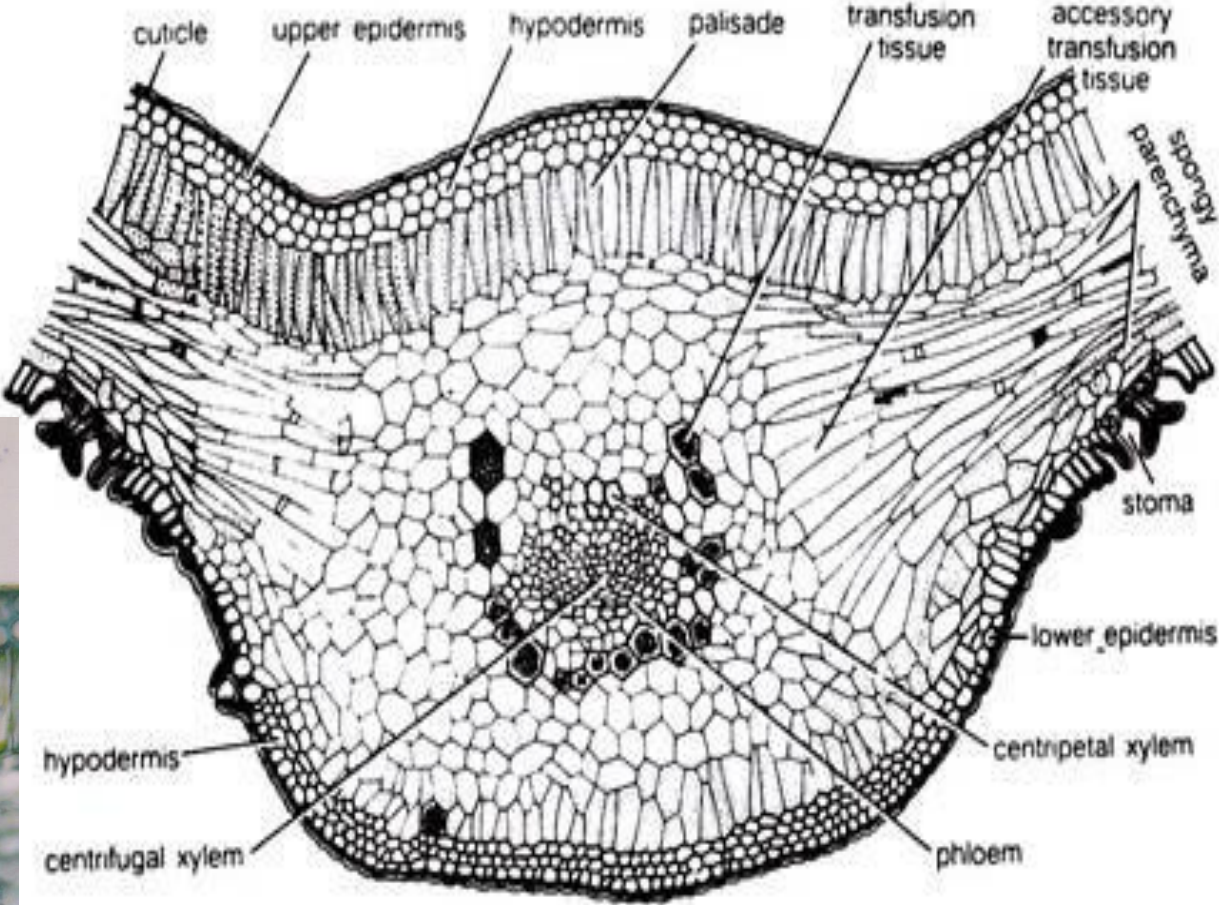


Rachis



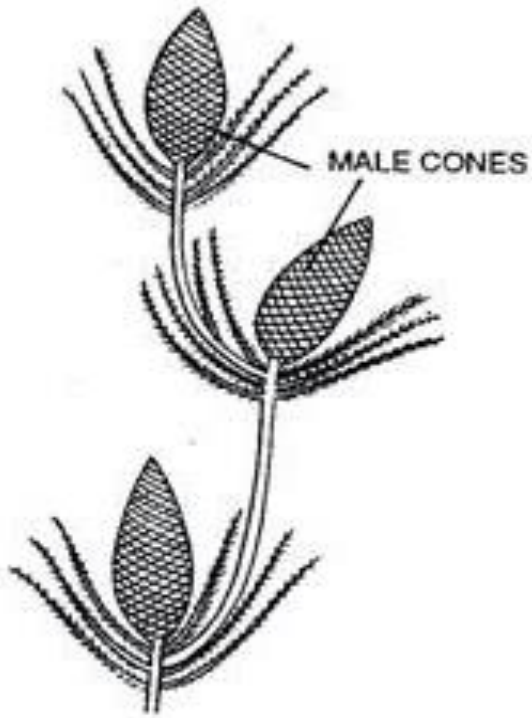
ANATOMY

Leaflet



Reproduction

- Dioecious
- Male and female plants cannot be distinguished in the early stage

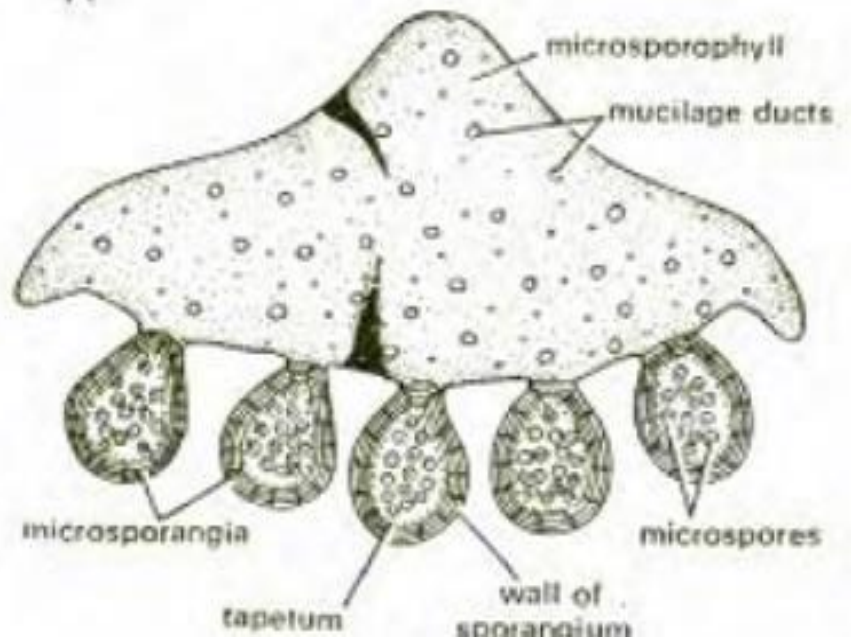
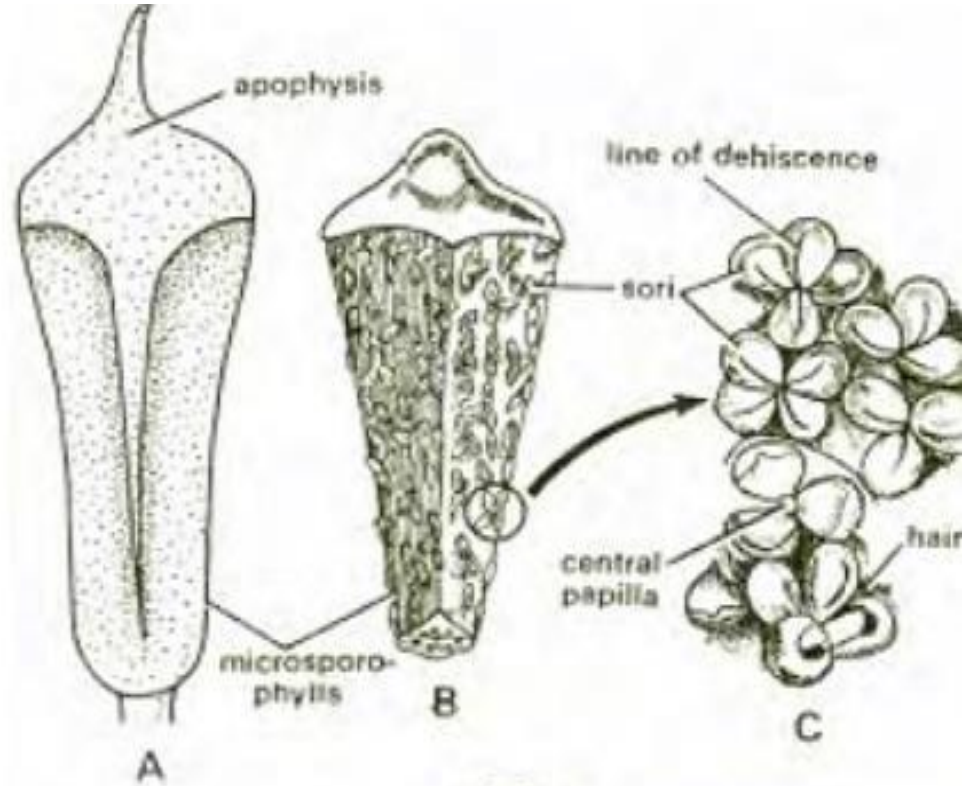


Male cone

- Large oval shaped
- Terminal
- Cone dome
- Sporophylls are arranged in a spiral manner



- Each sporophyll has a rhomboidal stalk, central fertile region and apical sterile apophysis
- Sori
- Soral hairs



- eusporangiate type
- 4-5 layered exothecium
- tapetum
- pollen grains liberated at 3 celled stage
- Sperms are produced from the antheridial cell (body cell) which are flagellated (motile) antherozoids are largest among the plant kingdom.

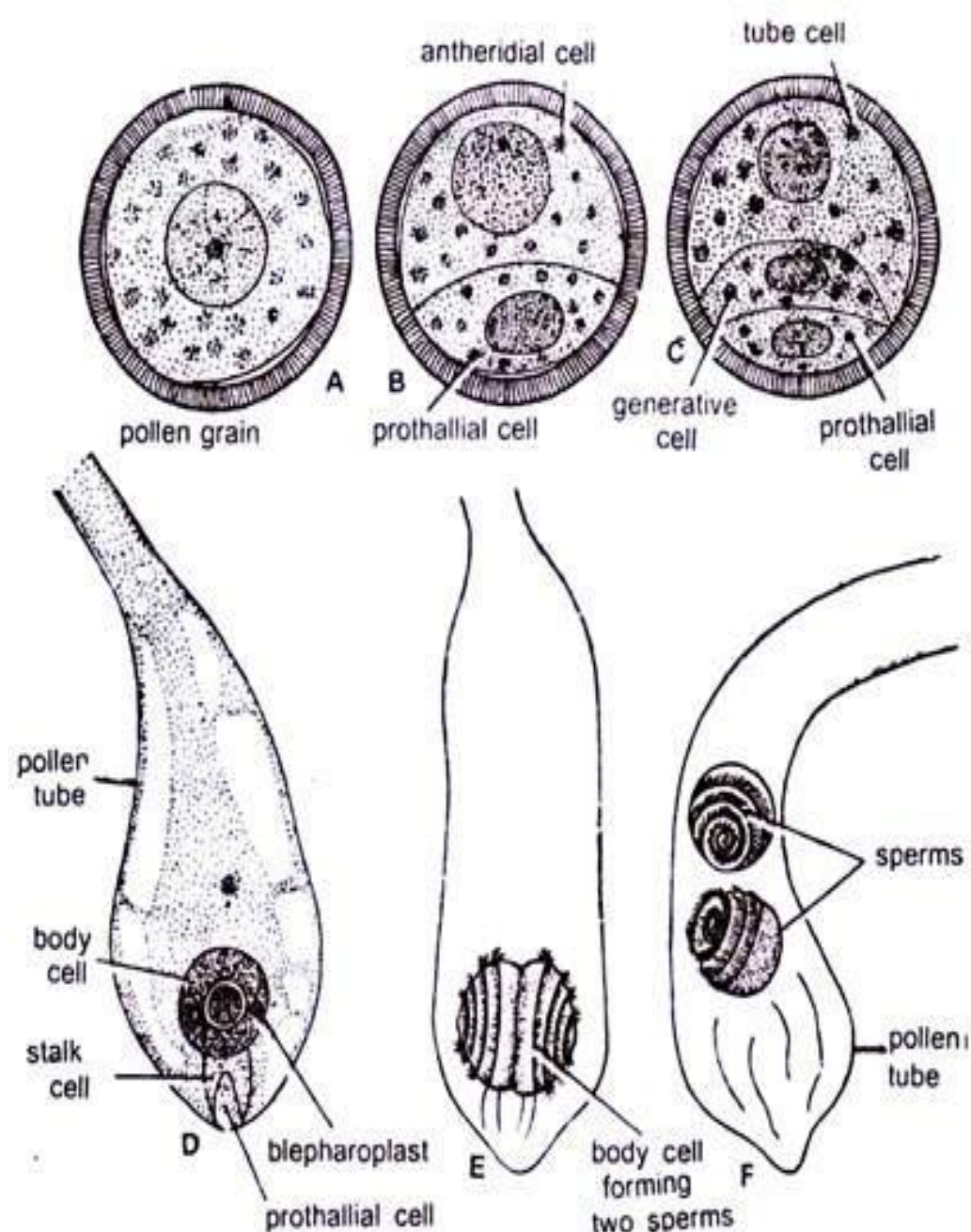


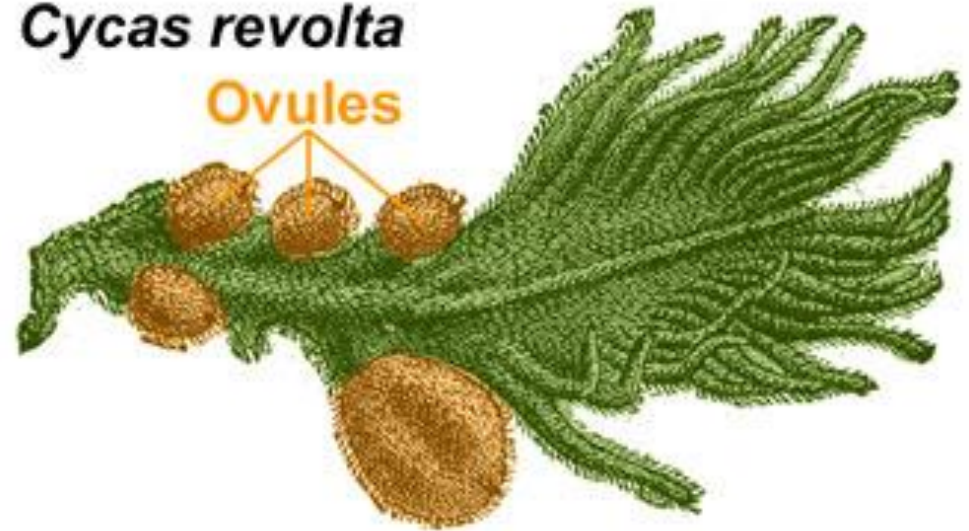
Fig. 8.45 A-F, Cycas. Development of male gametophyte.



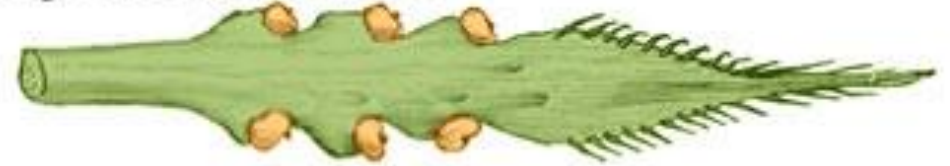
Female cone

- Megasporophylls are loosely arranged
- basal stalk and an expanded region with serration
- 2 – 10 ovules are present on the lateral side
- Nucellus
- three layered integument (outer fleshy, middle stony and inner fleshy)
- nucellar beak
- pollen chamber

Cycas revolta



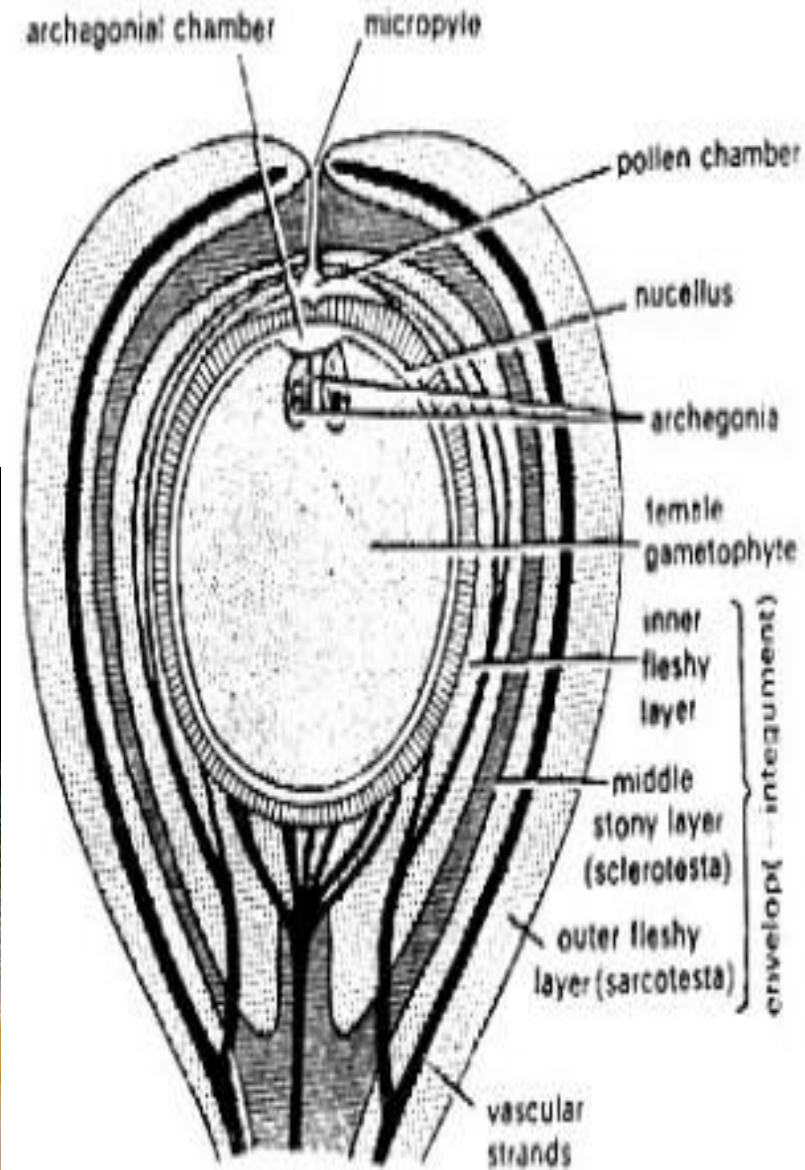
Cycas circinalis



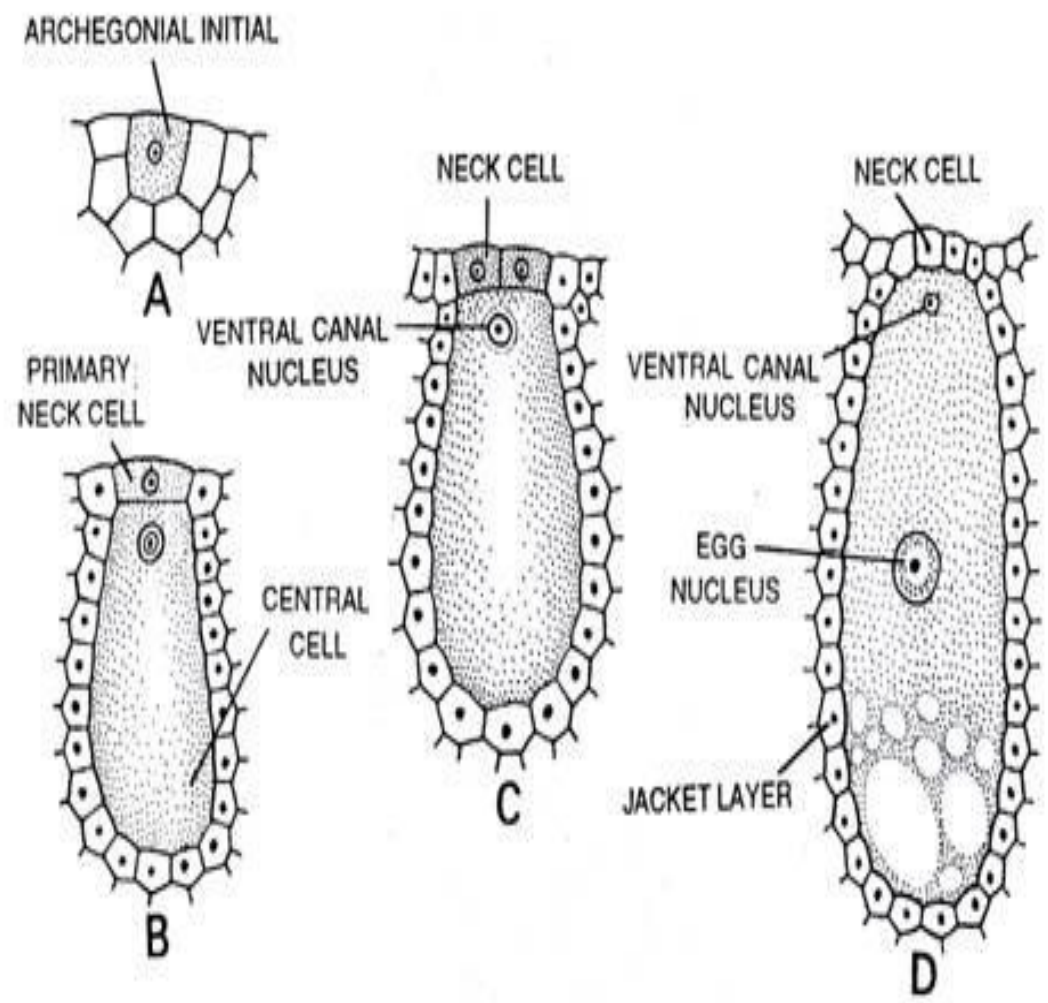
Cycas normanbyana



- supplied with two vascular traces
- megaspore mother cell
- functional megaspore
- Female gametophyte (endosperm)



- Archegonia consists of two celled neck, a venter canal nucleus and an egg nucleus
- An archegonial jacket is formed from the gametophytic tissue
- the number of archegonia ranges from 2 - 8
- Egg of Cycas is the largest among the plant kingdom



- **Embryo** dicotyledonous, germination epigeal

