

Polysporangiophyta

Tracheophyta, dominacija sporofita,
lignifikacija, mehaničko tkivo, provodno tkivo,
endoderm ...

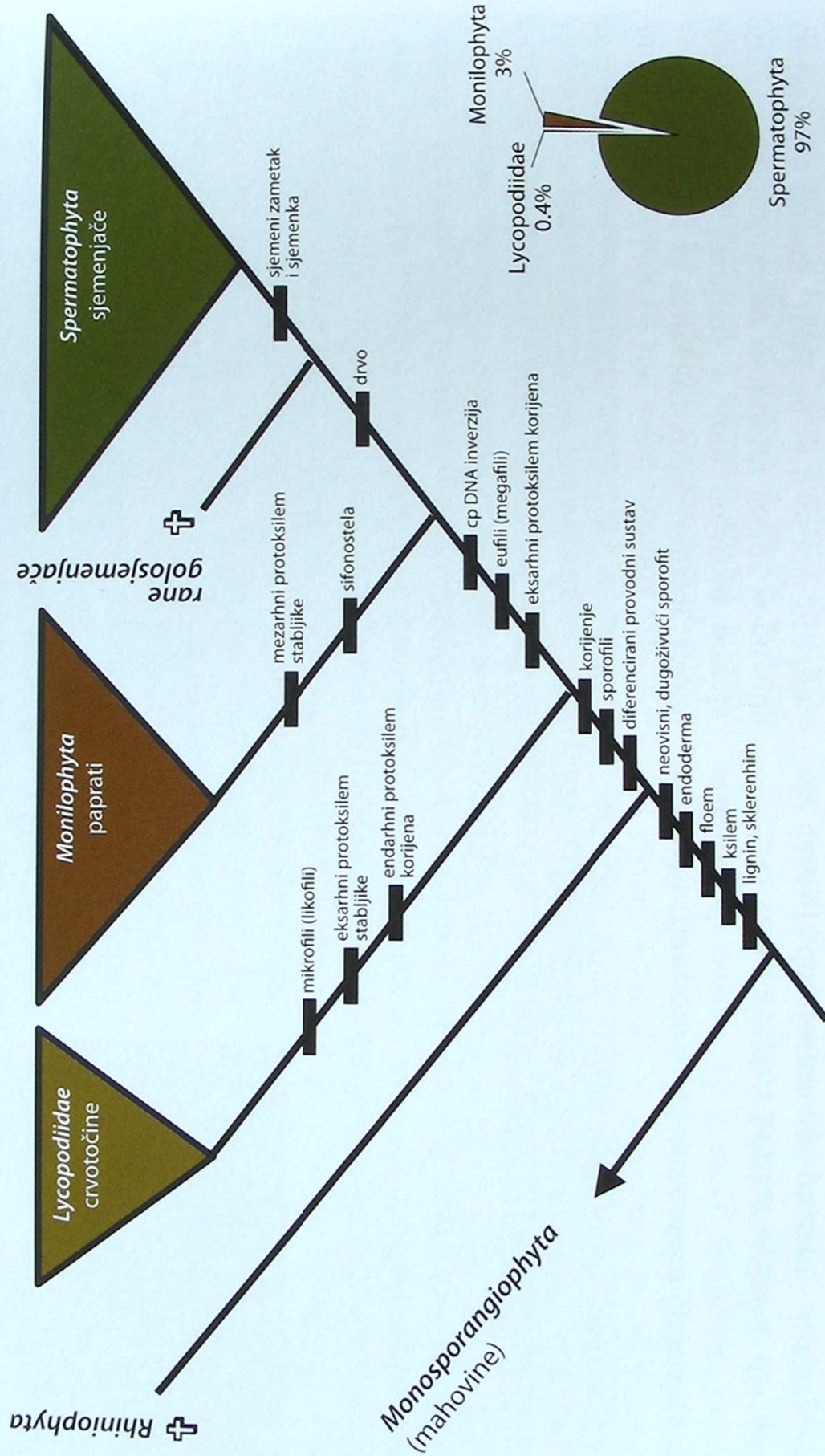
Polysporangiophyta

Tracheophyta, vaskularne biljke (Cormophyta)

Euphyllophyta, biljke s „pravim“ listovima

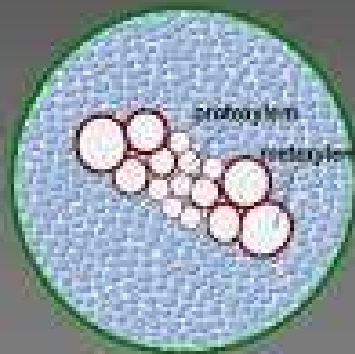
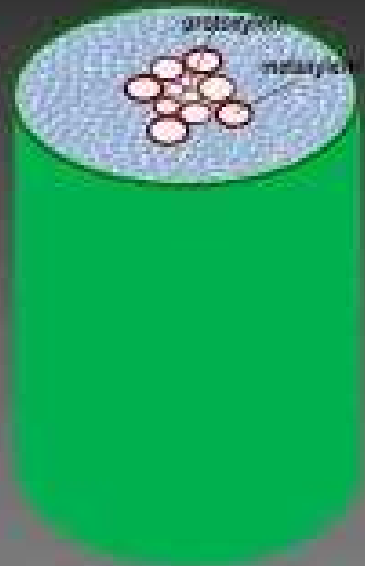
Tradicionalne papratnjače, Pteridophyta s. l.

Lignophyta, drvenaste biljke



Centrarhni tip

(protoksilem- stariji i manji elementu su u centru cilindra, a mlađi i voluminozniji naokolo)



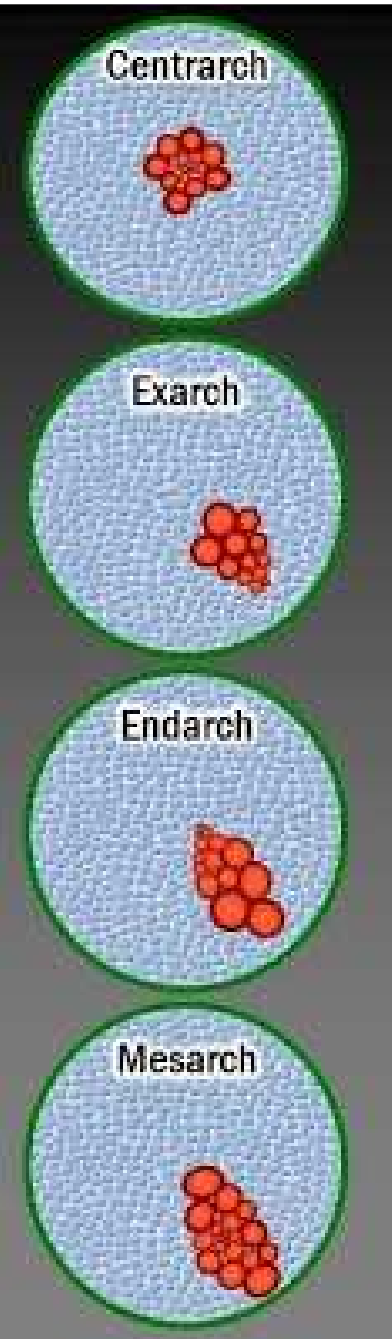
Endarhan tip

(protoksilem je u unutrašnjem dijelu, a metaksilem ka periferiji)

Razvoj ksilema

Egzarhan tip

(protoksilem je na periferiji, a metaksilem u unutrašnjosti)

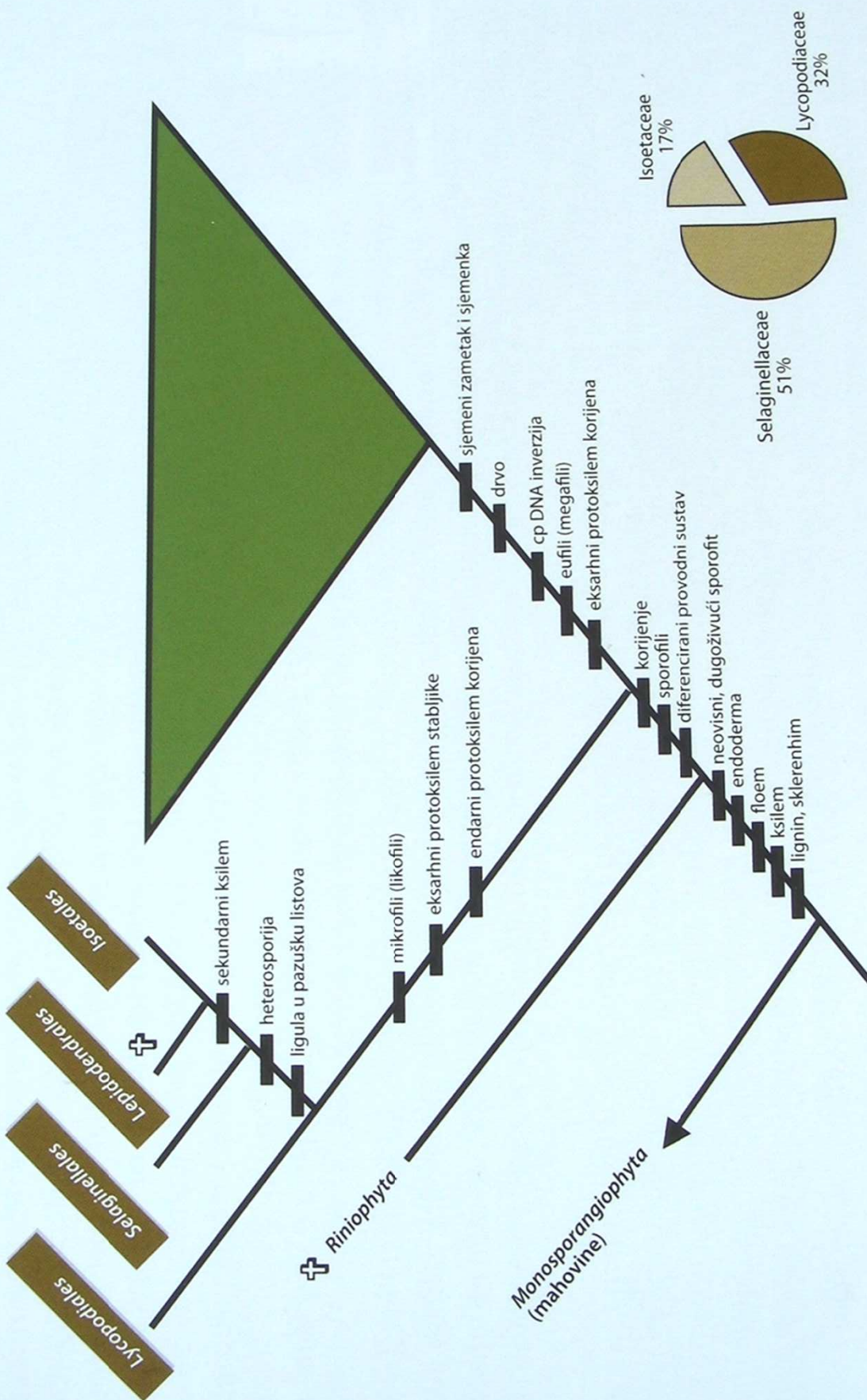


- **Centrarhan tip stele:** rinije.
- **Egzarhni:** stablo prečica, korijen sjemenjača.
- **Mezarhni:** listovi i stablo monilofita.
- **Endarhni:** stablo sjemenjača

Tracheophyta, vaskularne biljke

Lycopodiidae, biljke s mikrofilima

Euphyllophyta, biljke s „pravim“ listovima



Lycopodiidae

- Enacije (nisu vaskularizovane ili jesu samo pri osnovi), mikrofilii
- Ligula
- Sporofili, trofofilii
- Bubrežaste sporangije
- Strobilusi, sporonosne zone
- Izospore (dvopolni gametofit), heterospore (jednopolni gametofit)
- Dihotomija, nejednaka dihotomija
- Adventini korjени, bez korjenovih dlaka

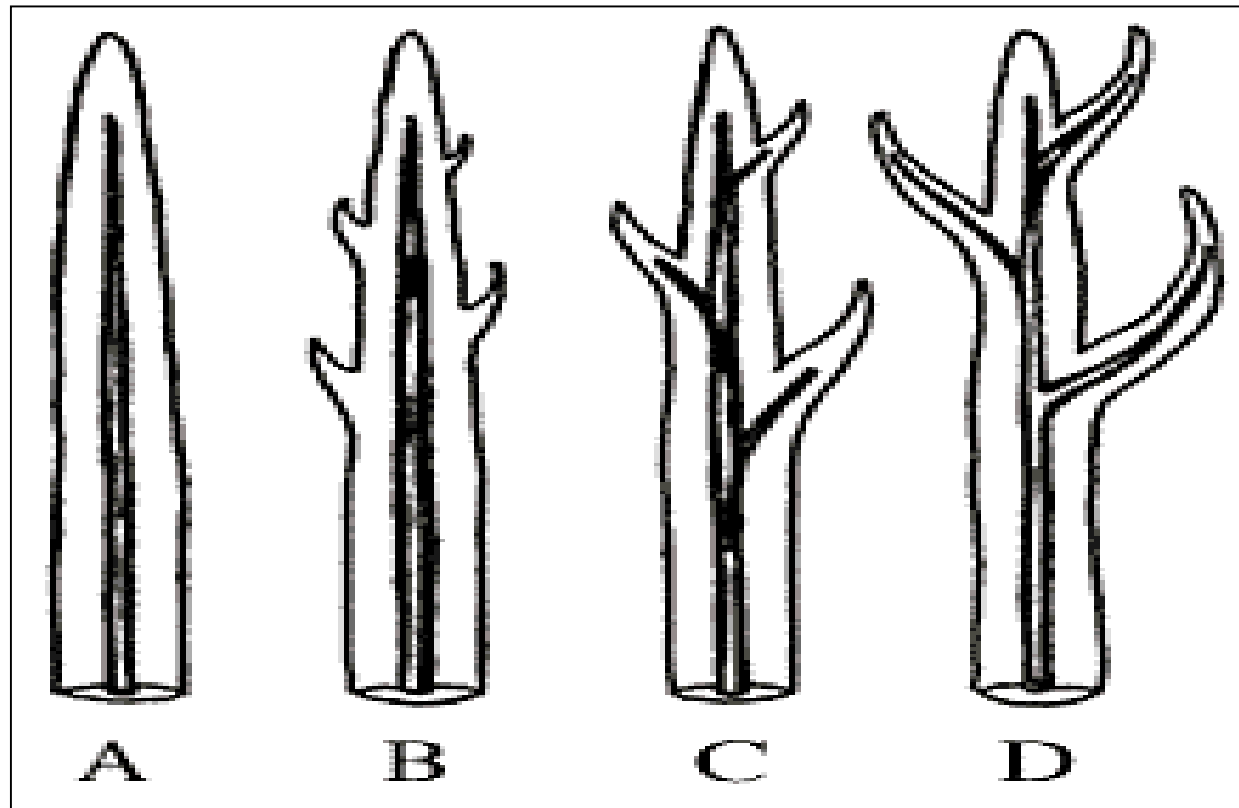
Vaskularizacija kod *Zosterophyllum*, *Sawdonia*, *Asteroxylon* i *Leclercqia* (Kenrick i Crane, 1997).

(A) *Zosterophyllum* (gola osovina, ovalna protostela),

(B) *Sawdonia* (enacije, bez provodnih elemenata)

(C) *Asteroxylon* (enacije sa provodnim elementima koji zalaze u njenu osnovu),

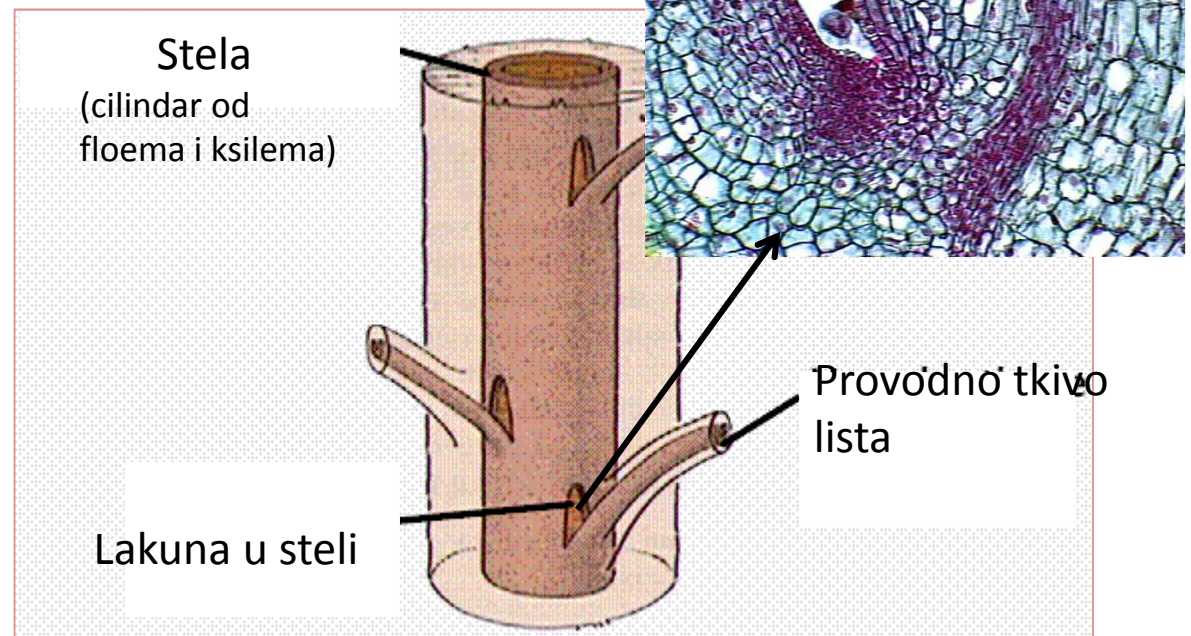
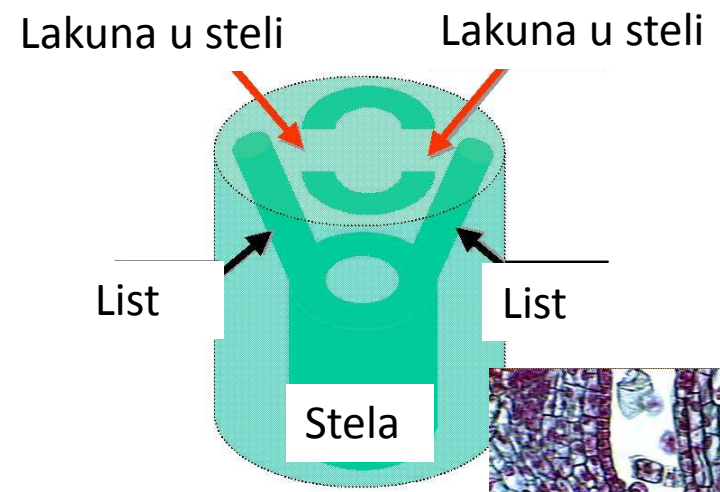
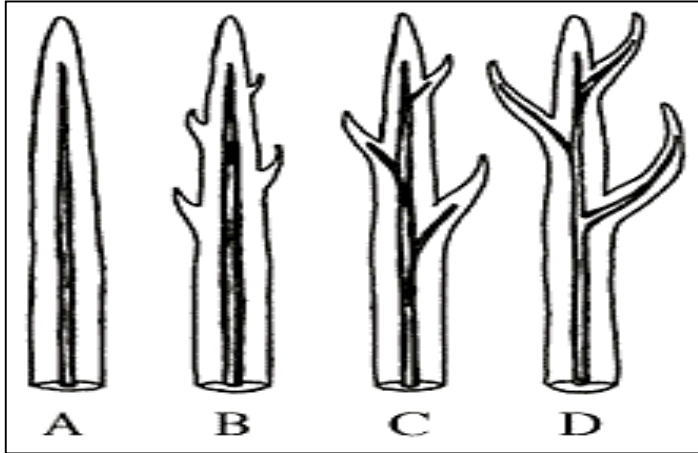
(D) *Leclercqia* (osovina sa vaskularizovanim mikrofilima).



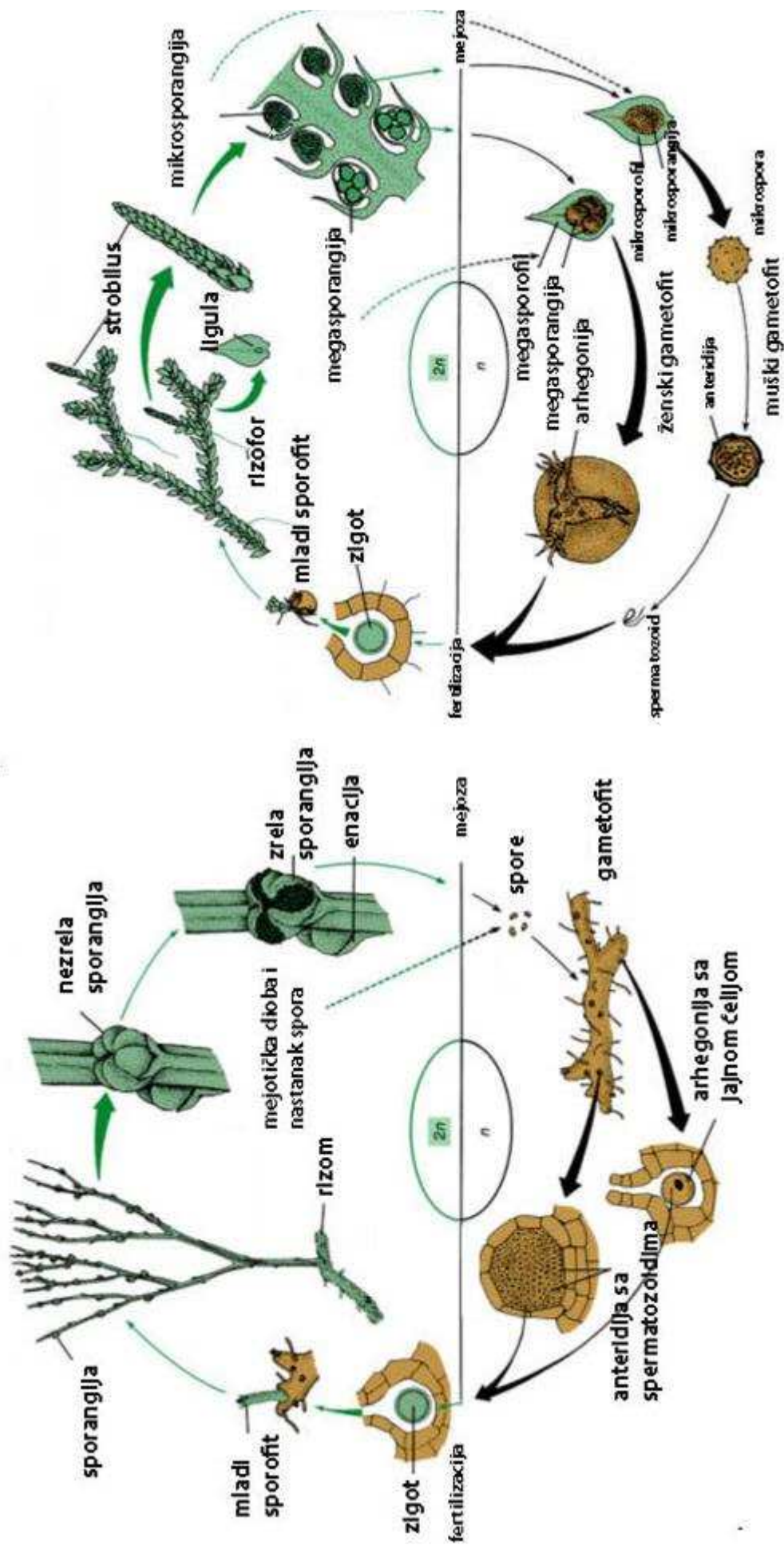
Enacije i mikrofilii- bez lakuna u steli

Telomni listovi- sa lakunama u steli

Enacije, mikrofilii- bez lakuna u steli



Ciklus razvića izo- i heterospornih prečica



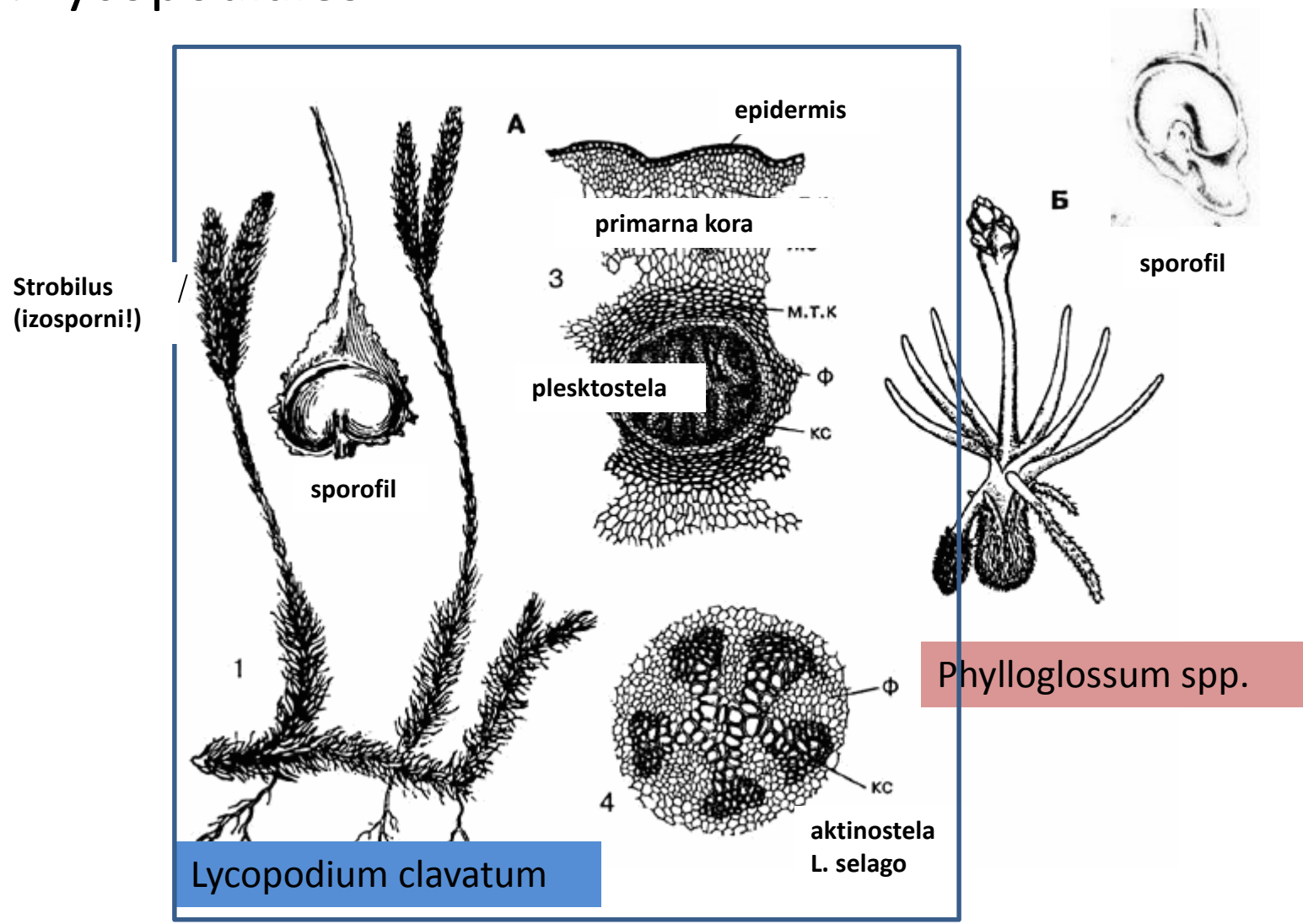
Jednodomo, jednopolno

Sporofit: Gamatofit generacija:

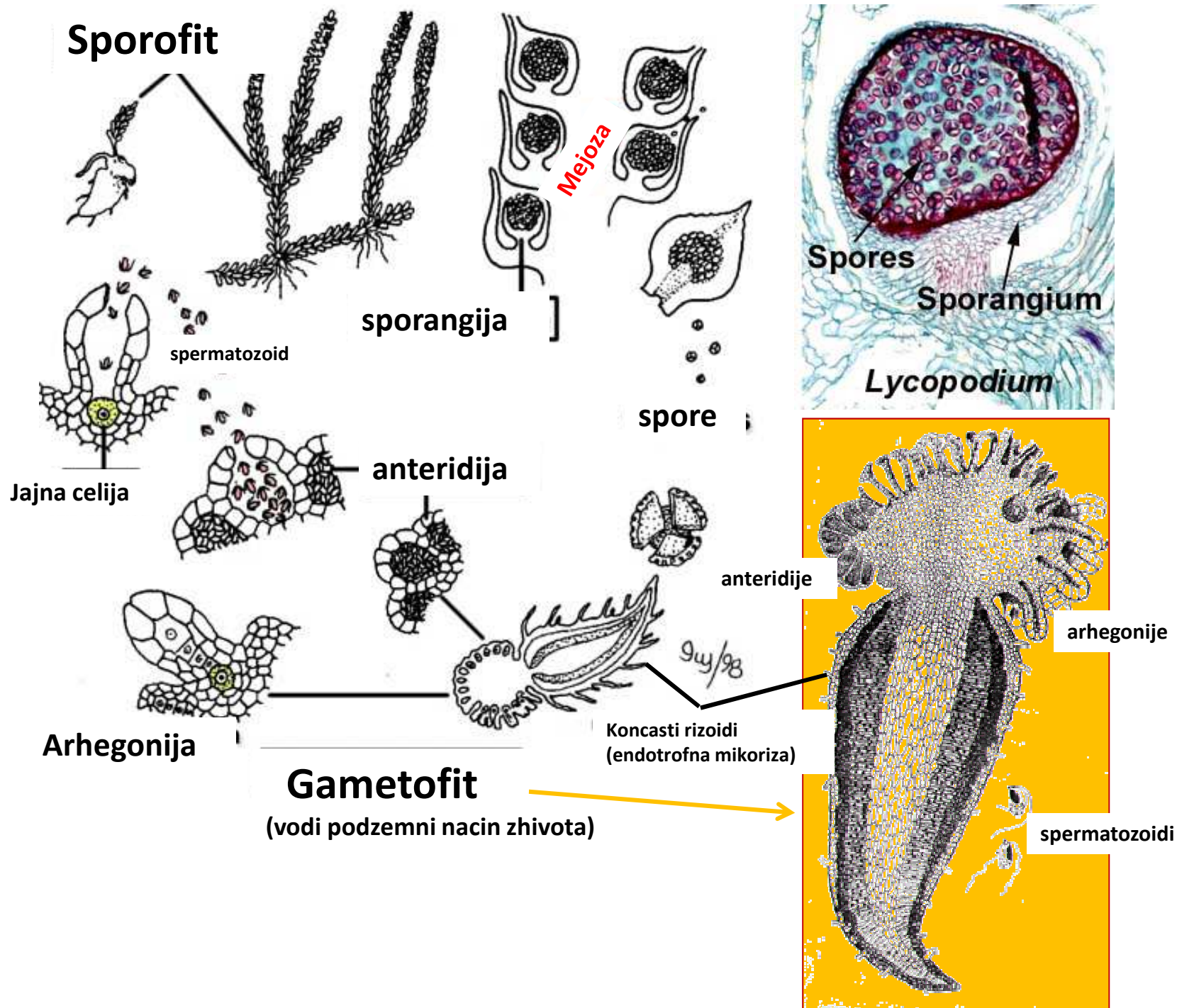
Recentni predstavnici

- o. Lycopodiales
- o. Selaginellales
- o. Isoetales

o. Lycopodiales



Lycopodium (*Huperzia*, *Phlegmariurus*), *Phylloglossum* ...



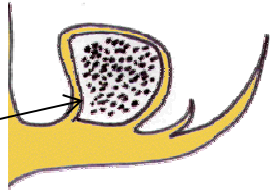
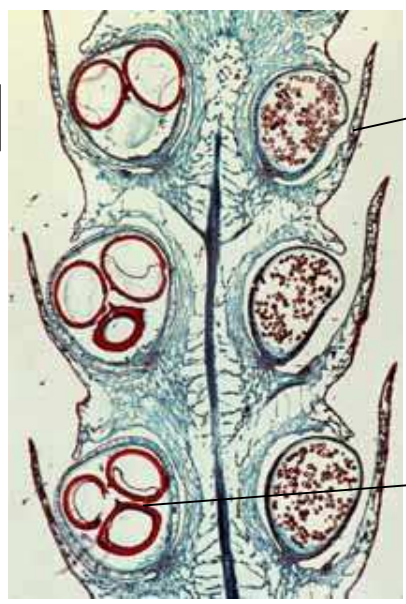
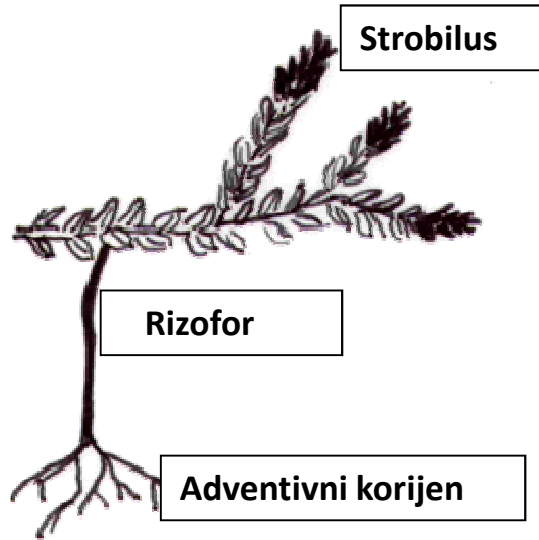


Huperzia selago (syn. *Lycopodium selago*)

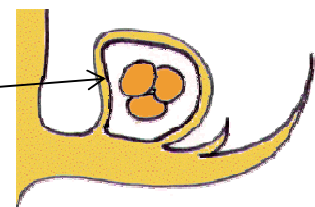


Lycopodium annotinum

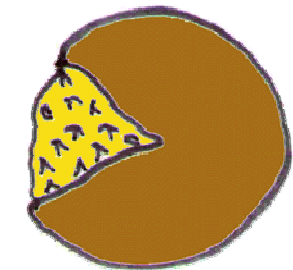
o. Selaginellales



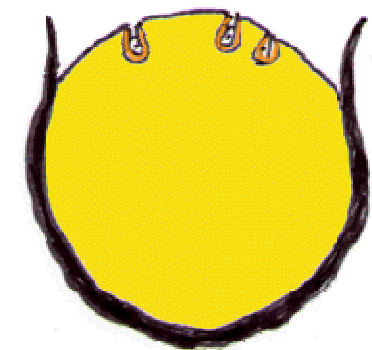
mikrosporangija



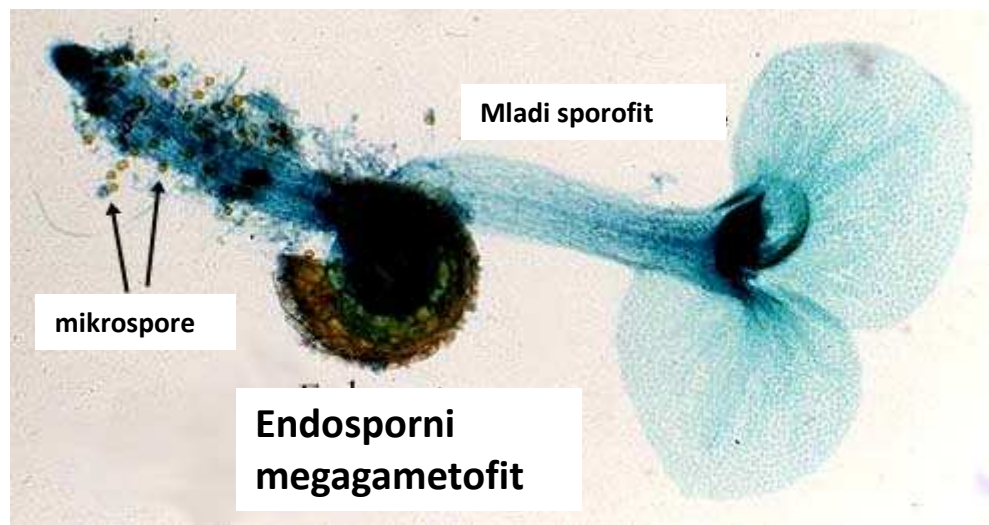
megasporangija



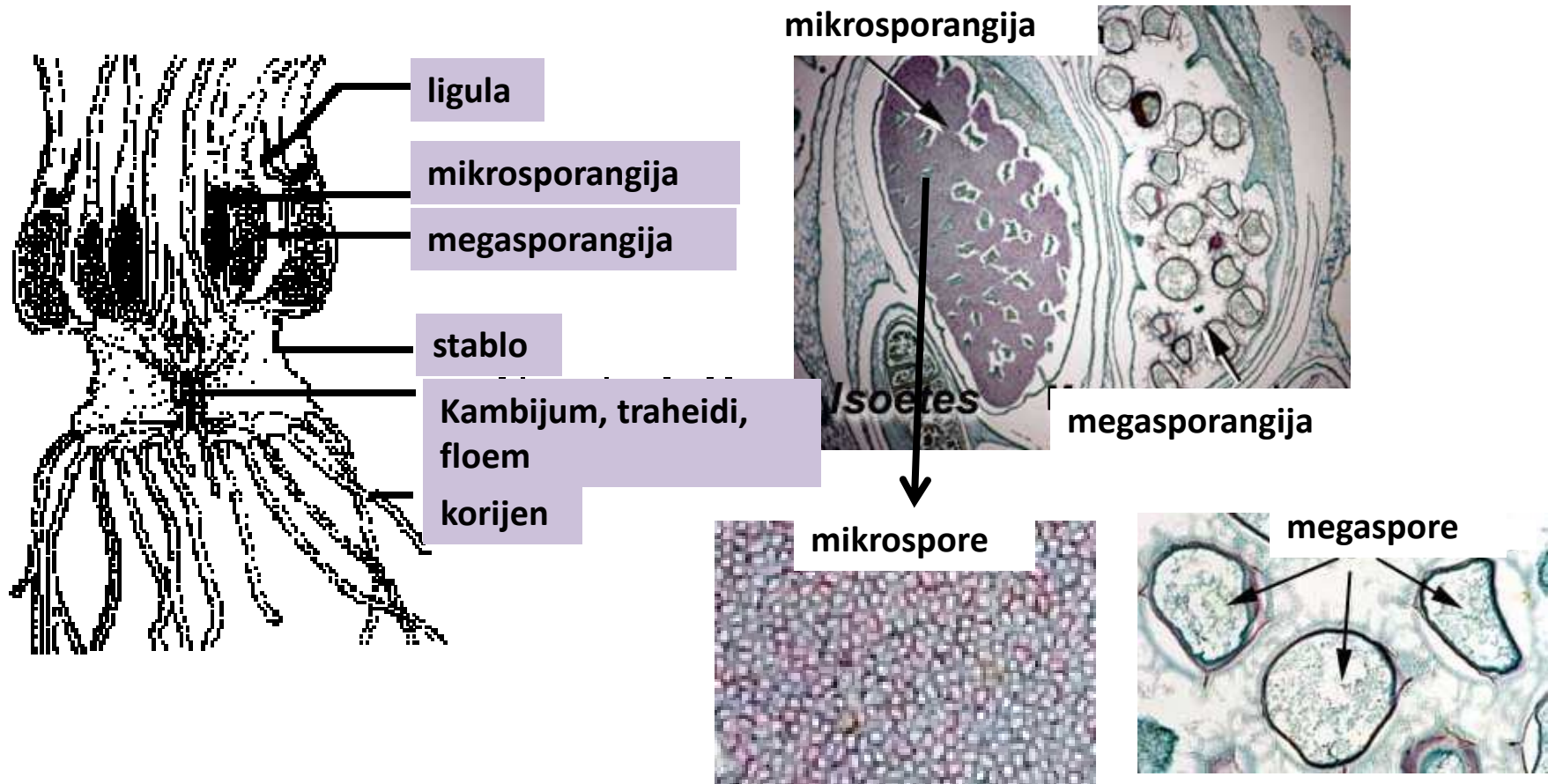
Mikrospore kojoj nastaje 128 ili 256 miliona spermatozoida



Megaspora sa megagametofitom (protalijum sa arhegonijama)



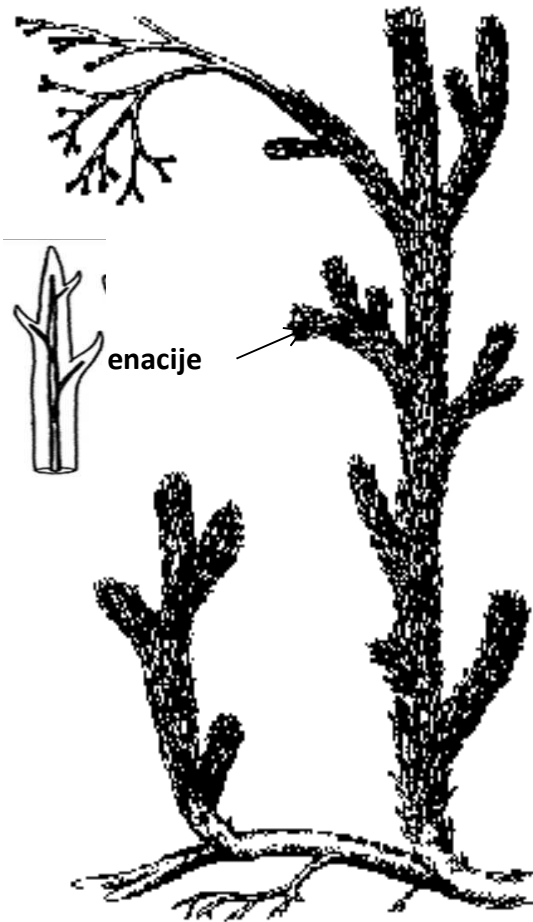
o. Isoetales



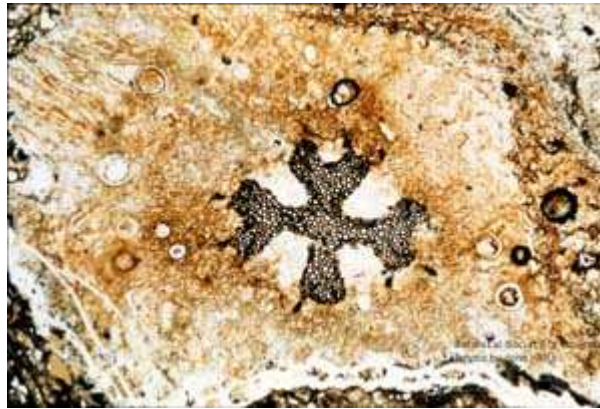
Fosilni predstavnici

- o. Asteroxylales (†)
- o. Protolepidodendrales (†)
- o. Lepidodendrales (†)

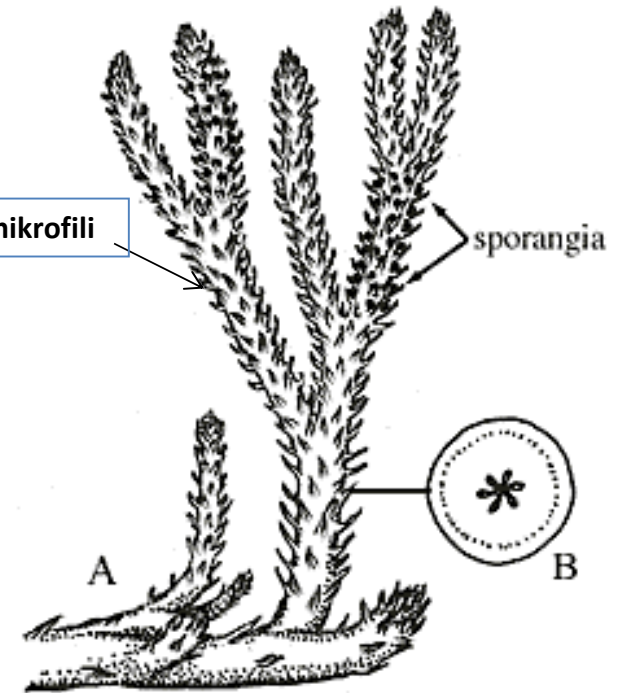
o. Asteroxylales (†)



Asteroxylon spp.

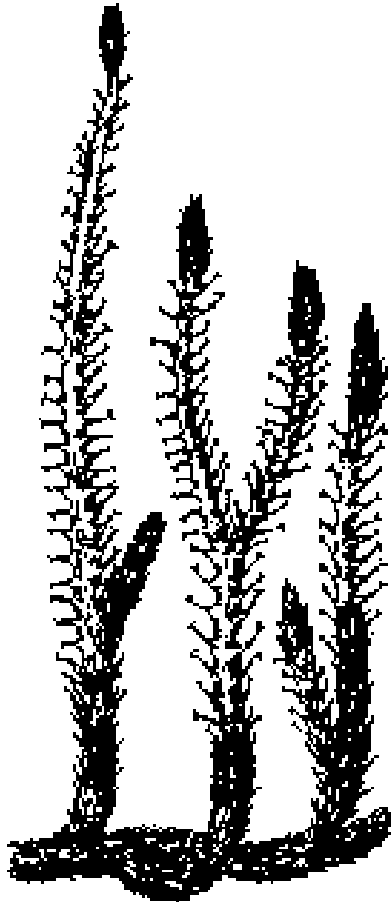


Presjek kroz stablo
(zvjezdasti ksilem, drvo).

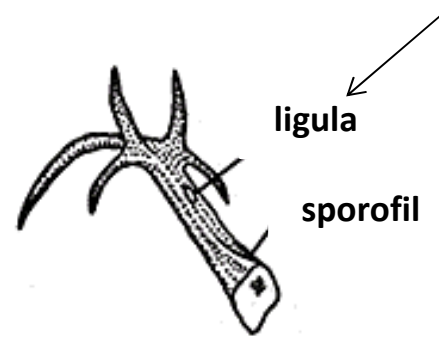


Drephanohycus spp.

o. Protolepidodendrales (†) (viljuškasti listovi)



Protolepidodendron spp.



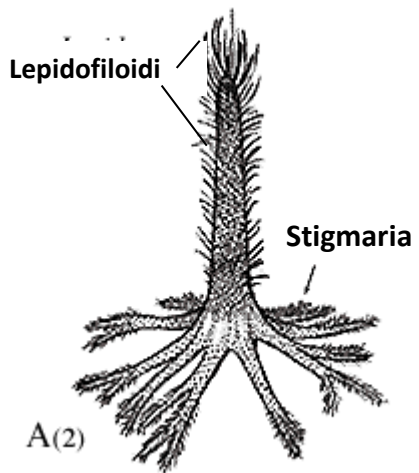
Kod recentnih prečica iz
klase Lycopodiopsida
ligula ne postoji!!!

Mikrofili *Leclercqia spp.*,
sporangija se nalazi
adaksijalno tačno ispod
jezička **ligule**.

Archaeosigillaria- još jedna izosporna prečica sa
ligulom!

o. Lepidodendrales (†)

Lepidodendron spp.
(razviće)



„korasto drveće“

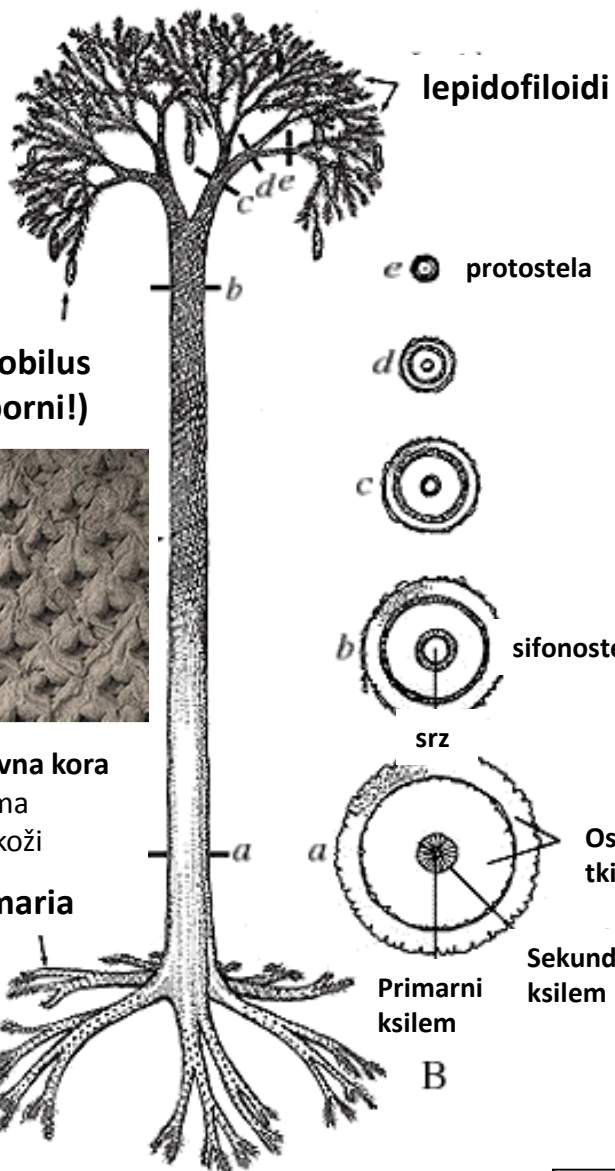
Lepidostrobilus
(heterosporni!)



Fotosistetički aktivna kora
sa lisnim jastučićima
nalik aligatorovoj koži

Stigmaria

A(3)

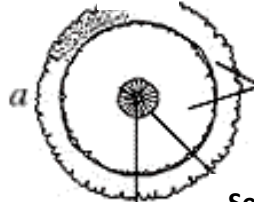


e ● protostela



sifonostela

srz



Osnovno tkivo

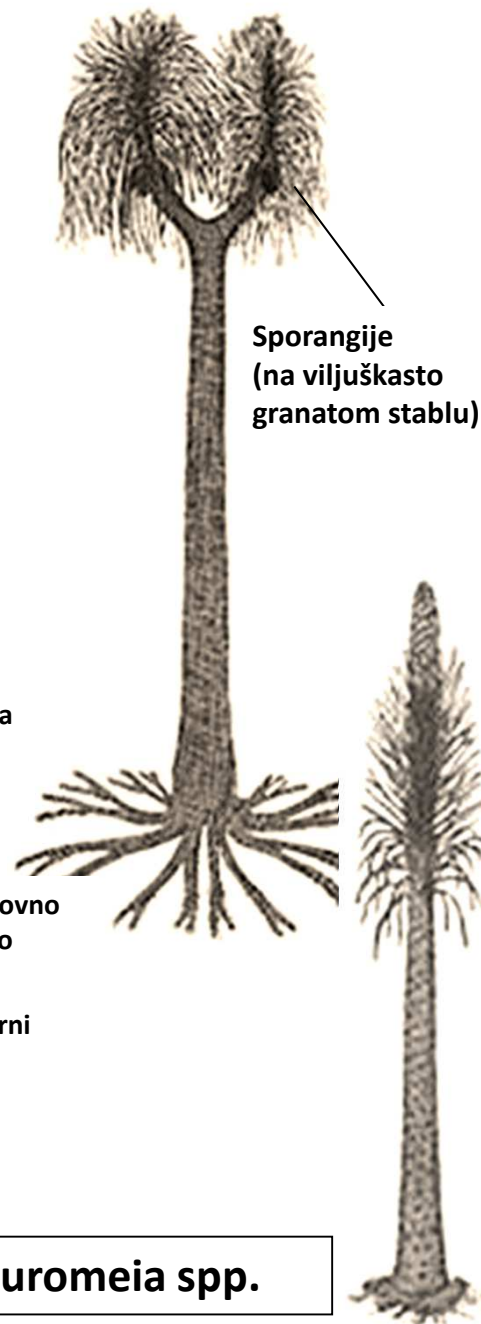
Primarni ksilem

Sekundarni ksilem

B

Monokarpne biljke!!!

Sigillaria spp.



Pleuromeia spp.

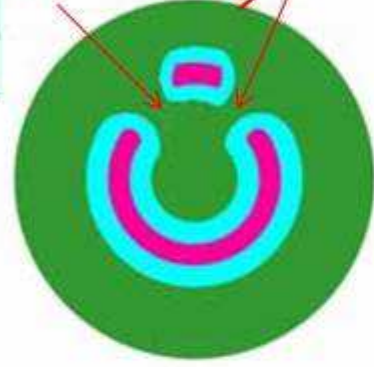
Euphyllophyta

Monilophyta

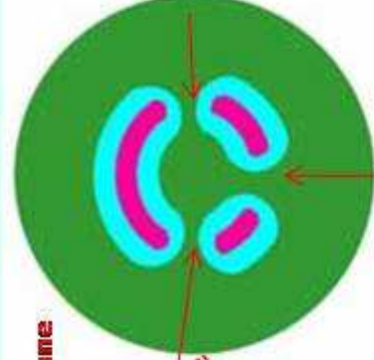
Spermatophyta

Sifonostela
Protostela

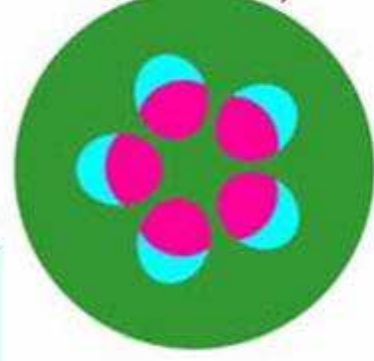
Tipovi sifonostele



solenostela



diktiostela



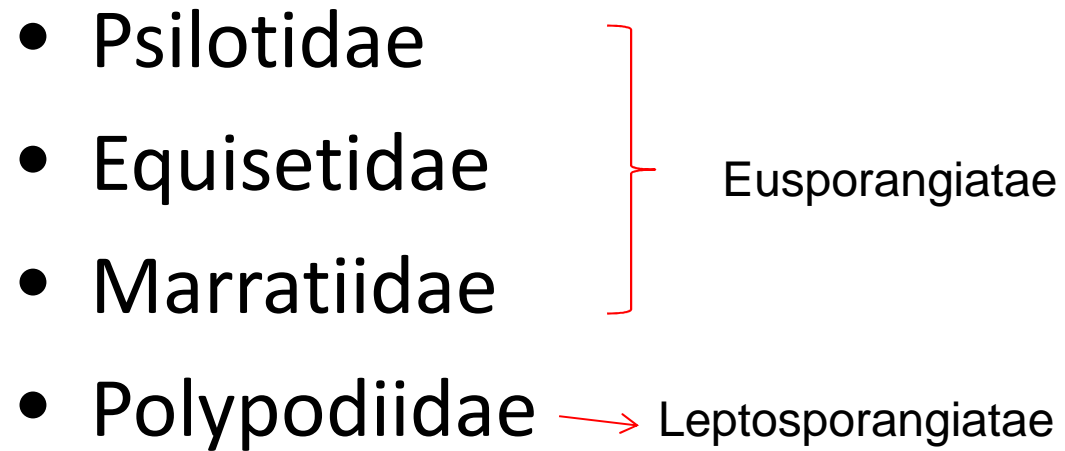
eustela

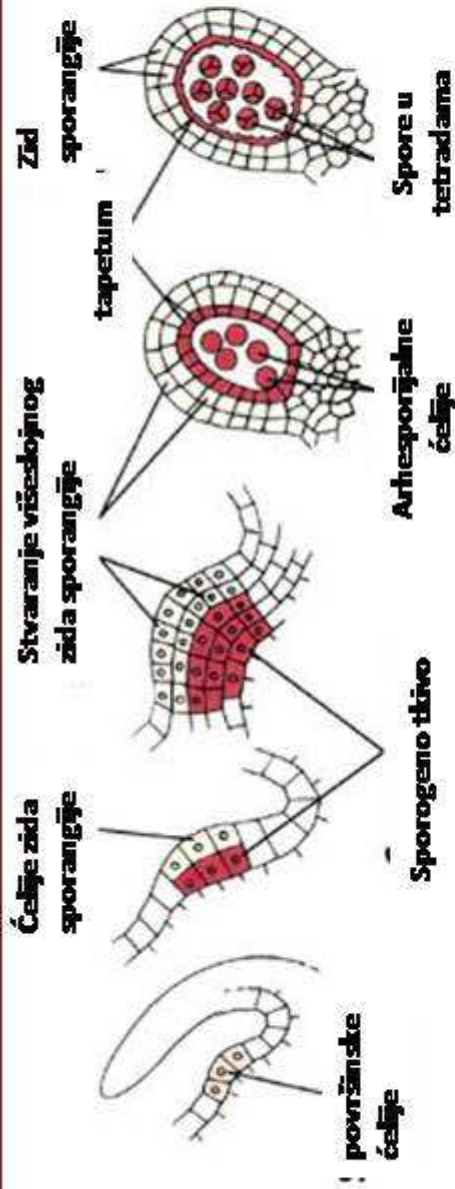
Nastala od ektofloične sifonostele

Nastali od amfifloične sifonostele

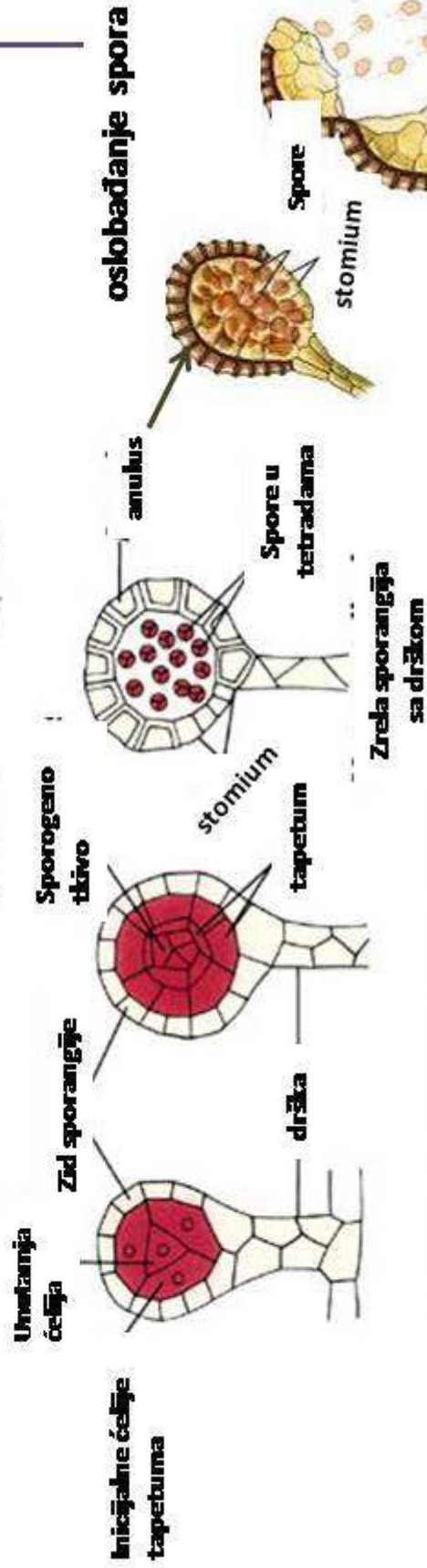
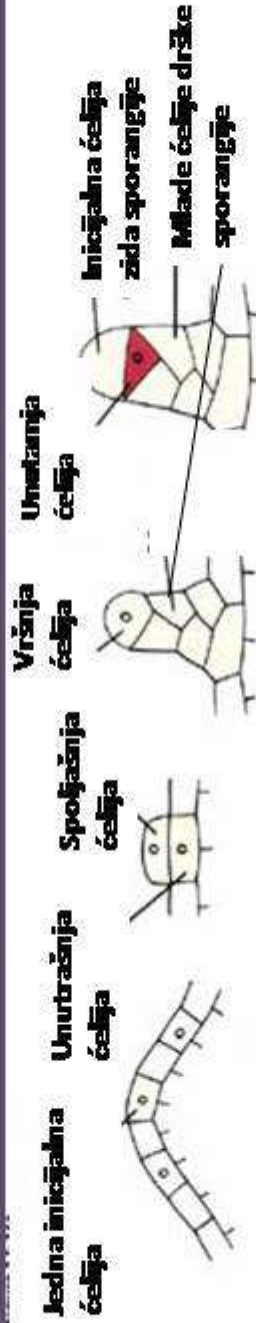
- **solenostela** – najprimitivniji tip sifonostele, u kojoj se javlja srž koja je okružena floemom i ksilemom (tipična za neke primitivne paprati).
- **diktiostela** – slična solenosteli, ali sa više lakuna u prstenu od floema u ksilema, na mjesti kojih se javljaju listovi (sreće se samo kod paprati).
- **eustela** – prsten od floema i ksilema je “razbijen” i diferenciran na provodne snopice, koji su kružno raspoređeni oko srži (tipičan za biljke sa sjemenom).

Monilophyta

- Psilotidae
 - Equisetidae
 - Marratiidae
 - Polypodiidae
- Eusporangiatae
- Leptosporangiatae
- 



Eusporangični razvoj



Leptosporangični razvoj

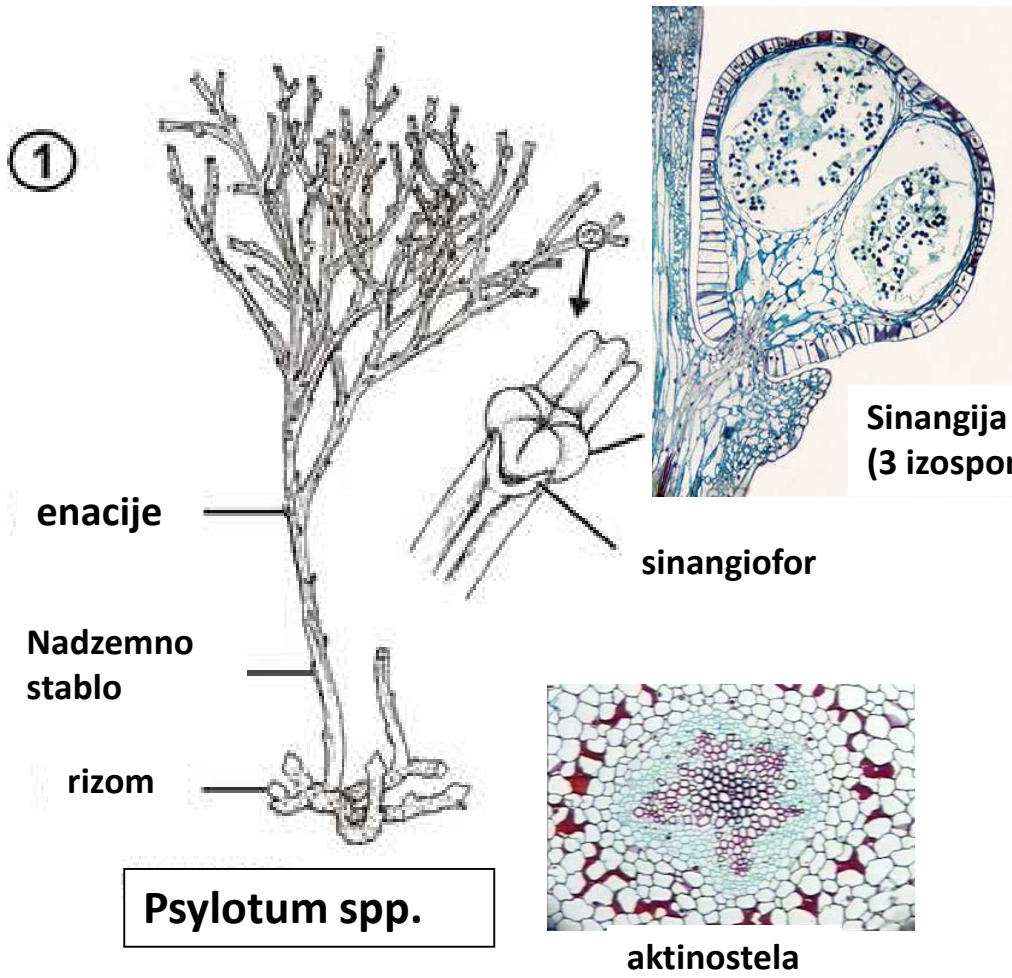
Psilotidae

(Divisio: Psilotophyta)

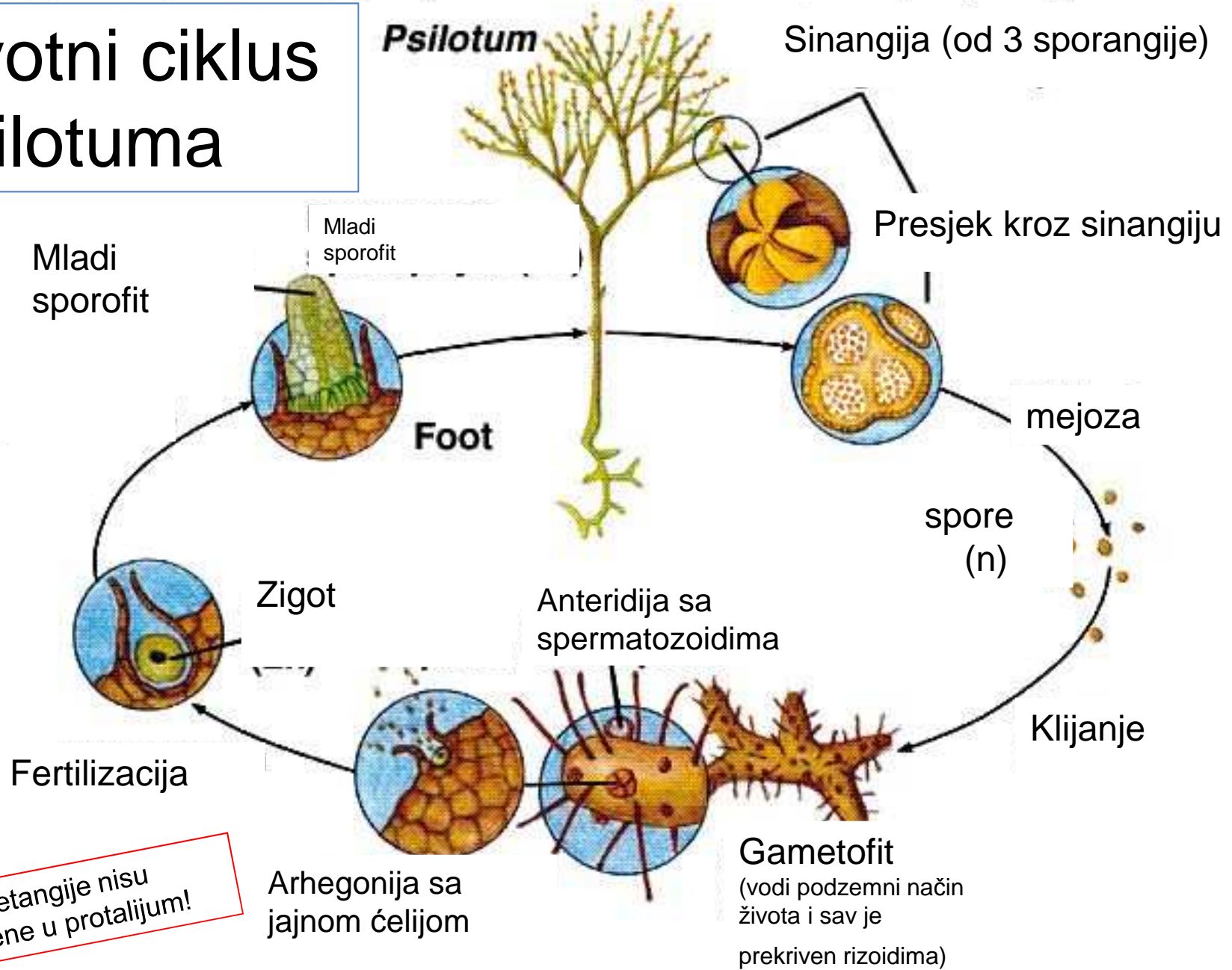
- Psilotales
- Ophioglossales

Psilotales

Potpuno odsustvo korjena!!!

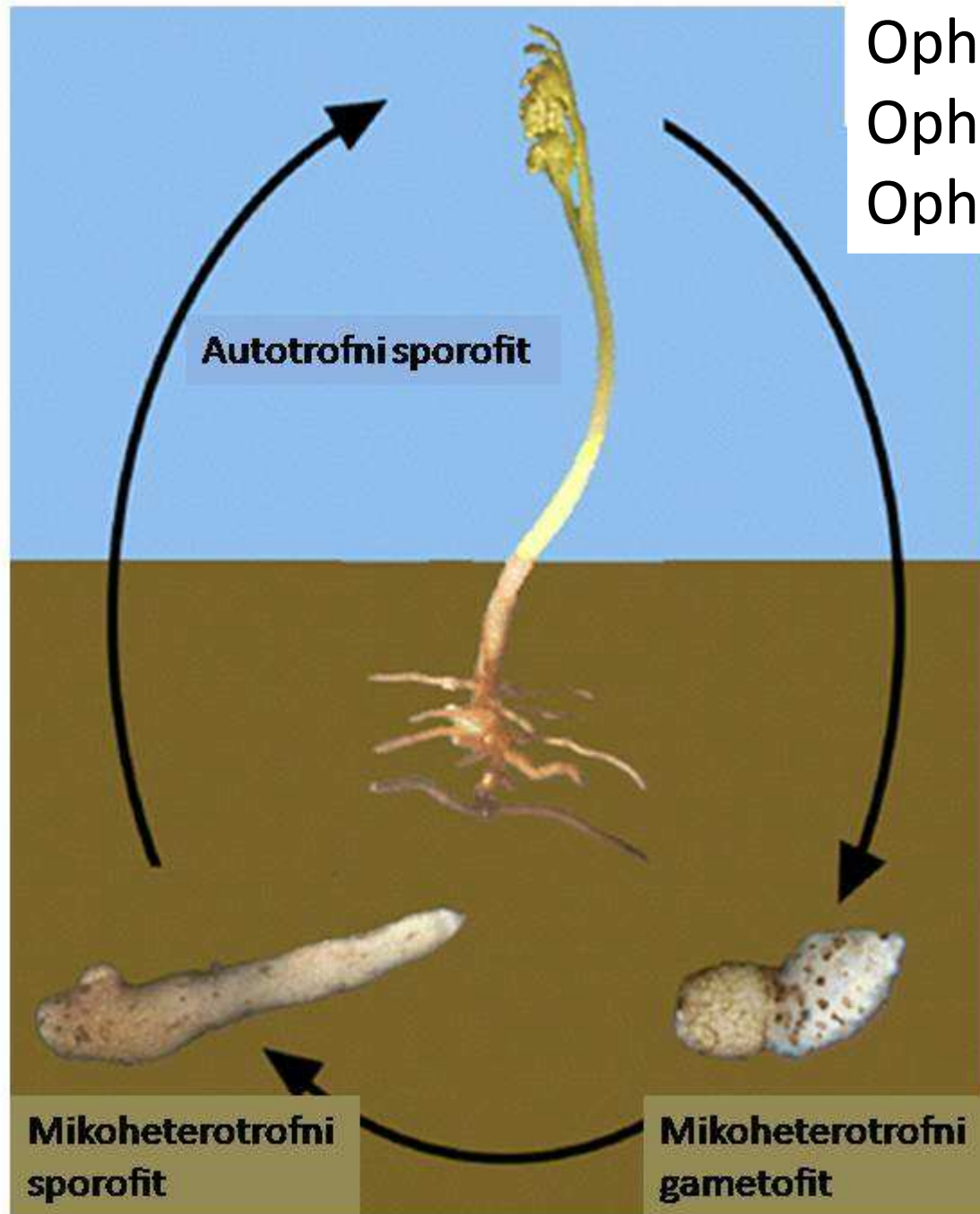


Životni ciklus Psilotuma



*Gametangije nisu uvučene u protalijum!

Ophioglossales
Ophioglossaceae
Ophioglossum vulgatum



Fam. Ophioglossaceae



Ophioglossum ssp.
Sporofil i trofofil jednostavni!



Botrychium lunaria
Sporofil i trofofil granati!