

Introduction to Botany. Lecture 29

Alexey Shipunov

Minot State University

November 14, 2016



Outline

- 1 Questions and answers
 - Quiz
- 2 Root
 - Diversity of roots
- 3 Plant diversity
 - Systematics
 - Kingdom Vegetabilia, land plants
 - Phylum Bryophyta: mosses



Outline

- 1 Questions and answers
 - Quiz
- 2 Root
 - Diversity of roots
- 3 Plant diversity
 - Systematics
 - Kingdom Vegetabilia, land plants
 - Phylum Bryophyta: mosses



Outline

- 1 Questions and answers
 - Quiz
- 2 Root
 - Diversity of roots
- 3 Plant diversity
 - Systematics
 - Kingdom Vegetabilia, land plants
 - Phylum Bryophyta: mosses



Questions and answers

Quiz



Final question (2 points)

Please explain the role of endoderm in roots.

- Converts all incoming apoplastic transport into symplastic.
- Does not allow water to go outside of vascular cylinder and therefore creates the root pressure.



Root

Diversity of roots

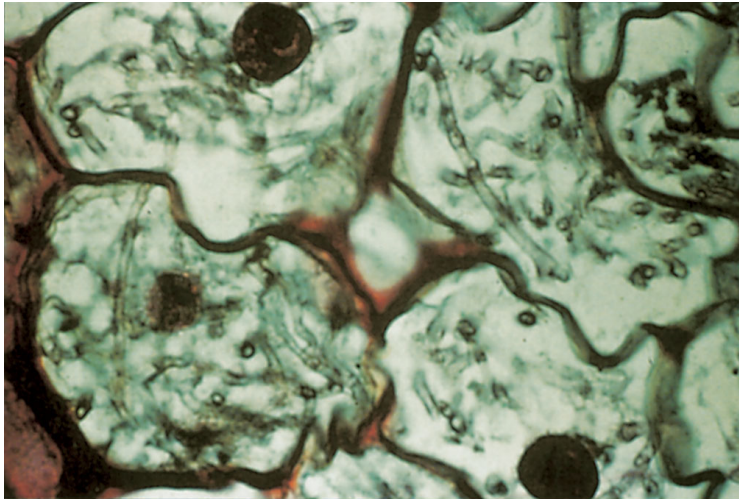


Modifications of roots

- Adventive buds with root origin (many plants)
- Mycorrhizae: endotrophic (grasses, orchids) and ectotrophic (trees)
- Haustoria (parasites like *Cuscuta*—dodder plant)
- Root nodules (legumes, Fabaceae family)
- Contractile roots (*Hyacinthus* spp.—hyacinth, *Taraxacum* spp.—dandelion)
- Storage roots (*Daucus carota*—carrot, *Armoracia officinalis*—horseradish)
- Supportive roots (many tropical plants)
- Defensive, spiny roots (ivy)
- Photosynthetic roots (some orchids)



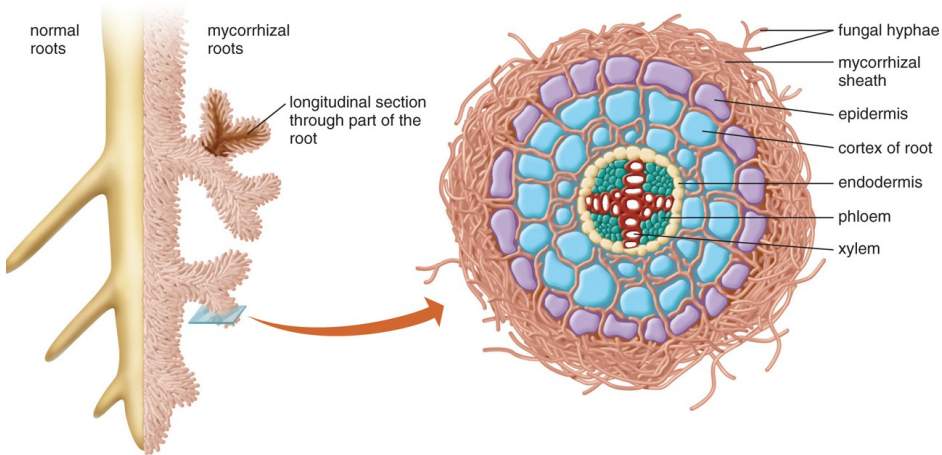
Endotrophic mycorrhizae in *Corallorhiza* orchid



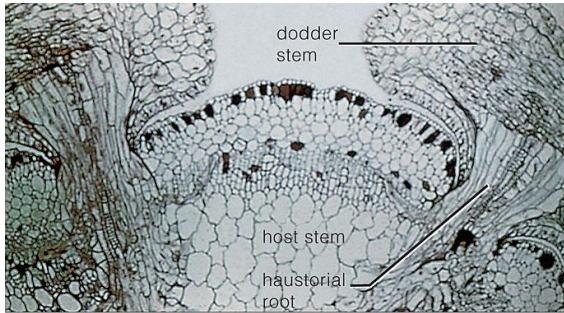
© 2006 Brooks/Cole - Thomson



Ectotrophic mycorrhizae of trees



Haustoria of *Cuscuta* (dodder)



Nodulated roots of soybean (*Glycine max*)



Contractile roots of *Hyacinthus orientalis*



© 2006 Brooks/Cole - Thomson



Supportive roots of mangrove plants



Supportive roots of *Pandanus* sp.



Defensive spiny roots of ivy (*Hedera* sp.)



Photosynthetic aerial roots of orchids



Table of modifications

Function	Stem	Leaf	Root
Expansion	...	Plantlets	Adventive buds
Storage	...	Succulent leaves	Storage roots
Photosynthesis	...	DEFAULT	Some aerial roots
Defense	...	Spines, scale	Root spines
Support	DEFAULT	Leaf tendrils	Aerial and contractile roots
Interactions	...	Traps, "sticky tapes", urns	Mycorrhizae, haustoria, nodulated roots



Plant diversity

Systematics



Basics of systematics

Terms covered:

- Systematics = taxonomy
- Species, taxonomic hierarchy
- Taxon, rank = category, classification
- Kingdom, phylum, class, order, family, genus, species
- Subclass, subfamily and other intermediate ranks
- Subspecies and cultivars



Biological nomenclature

Terms covered:

- Binomial name, species epithet, reference = citation
- Synonyms, priority (older names have preference), starting dates (1753 for plants)



Examples

		Example 1	Example 2
Kingdom	Regnum	Vegetabilia	Animalia
Phylum	Phylum	Spermatophyta	Chordata
Class	Classis	Angiospermae (Magnoliopsida)	Mammalia
Order	Ordo	Liliales	Primates
Family	Familia	Asparagaceae	Hominidae
Genus	Genus	<i>Chlorophytum</i>	<i>Homo</i>
Species	Species	<i>Chlorophytum comosum</i> (Thunb.) Jacq. 1862	<i>Homo sapiens</i> L.

Species name

<u>Chlorophytum</u>	<u>comosum</u>	<u>(Thunb.)</u>	<u>Jacq.</u>	<u>1862</u>
<i>Genus name</i>	<i>Species epithet</i>	<i>First author</i>	<i>Second author</i>	<i>Year of description</i>

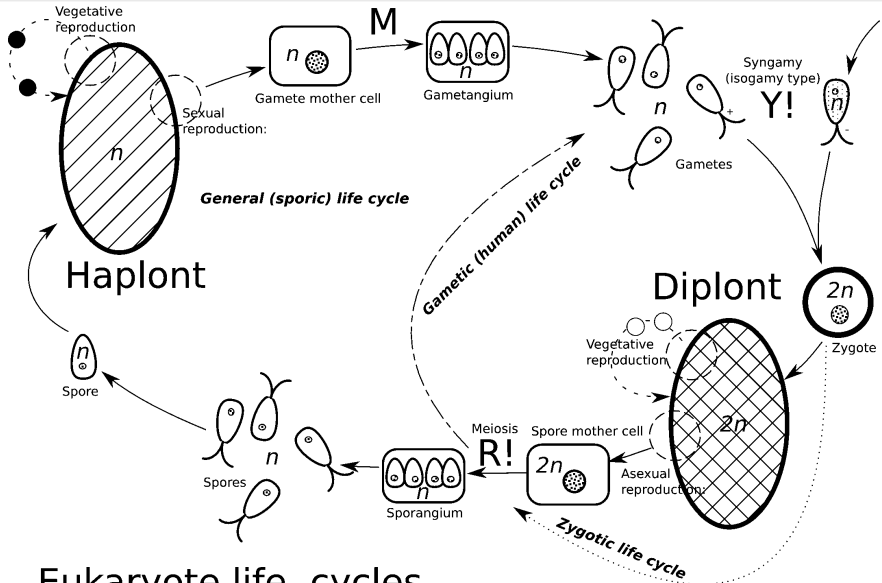


Plant diversity

Kingdom Vegetabilia, land plants



General life cycle



Eukaryote life cycles



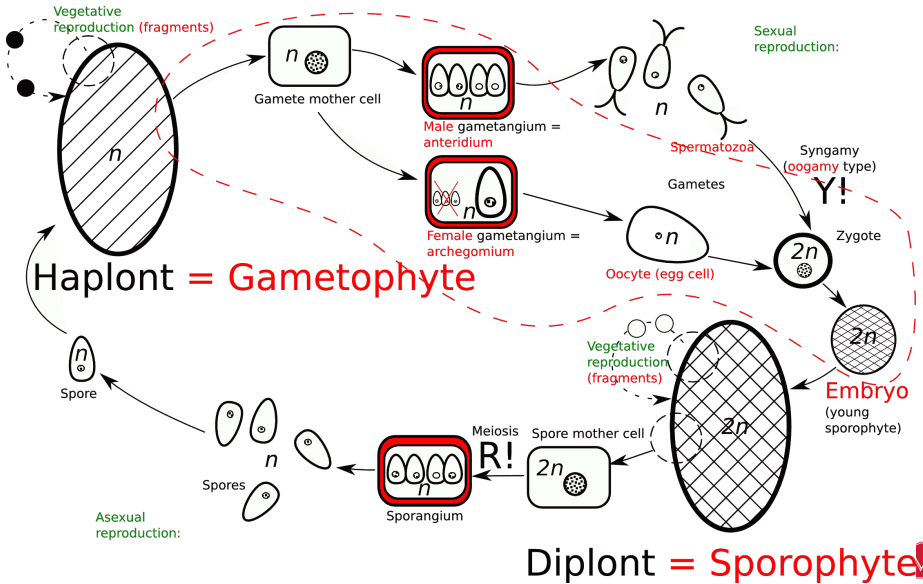
Life cycle of land plants

Terms covered:

- Sporophyte and gametophyte
- Gametangia: archegonium and antheridium
- Spermatozoa and oocyte (egg cell)
- Embryo and parasitic sporophyte
- Predominance of sporophyte or gametophyte



Life cycle of land plants: differences



Three main phyla

- **Bryophyta**: gametophyte predominance
- **Pteridophyta**: sporophyte predominance, no seed
- **Spermatophyta**: sporophyte predominance, seed



Plant diversity

Phylum Bryophyta: mosses



Bryophyta

- $\approx 20,000$ species
- Sporic life cycle with gametophyte predominance*
- Sporophyte reduced to sporogon (sporangium with seta), usually achlorophyllous, parasitic
- No roots, only rhizoid cells (long hairy dead cells capable for apoplastic transport)
- Poikilohydric plants
- Gametophyte starts development from protonema



Protonema



Life cycle of mosses

Covers: sporogon, biflagellate spermatozoa, the conflict between water cross-fertilization and wind distribution of spores which may be considered as “evolutionary dead end”.



Summary

- Bryophyta (mosses) are Vegetabilia with the predominance of gametophyte in the life cycle.



Final question (1 point)



Final question (1 point)

What is sporophyte?



For Further Reading



A. Shipunov.

Introduction to Botany [Electronic resource].

2016.

Mode of access:

http://ashipunov.info/shipunov/school/biol_154

