

Introduction to Botany. Lecture 25

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Outline

- 1 Questions and answers
 - Quiz
- 2 Leaf
 - Ecological adaptations of leaves
- 3 Stem and shoot
 - Plant body



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Questions and answers

Quiz



Final question (2 points)

Why are sclerophytes typically spiny?



Final question (2 points)

Why are sclerophytes typically spiny?

- They need more defence
- They need secondary cell walls
- They need less surface



Leaf

Ecological adaptations of leaves

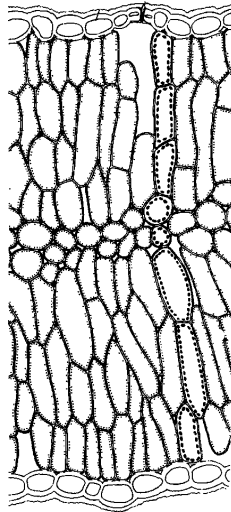
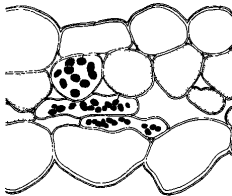


Plants and light

- Sciophytes
- Heliophytes



Sciophyte and heliophyte



Oxalis acetosella and *Sylphium laciniatum*

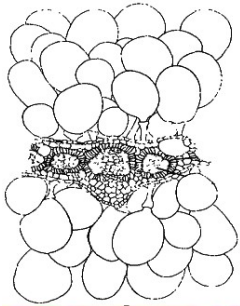


Leaves and soil

- Halophytes (accumulate, excrete or avoid NaCl)
- Nitrate halophytes (grow on soils rich of NaNO_3)
- Oxylophytes (grow on acidic soils)
- Calciphytes (grow on chalk soils rich of CaCO_3)



Leaf of salt-accumulating halophyte



Atriplex prostrata



Leaves and substrate

- Psammophytes (grow on sand)
- Petrophytes (grow on rocks)
- Rheophytes (grow in fast springs)



Rheophyte



Macarenia clavigera from Venezuela



River with rheophytes



They are flowering, too



Podostemum ceratophyllum (may be found even in ND!)



Podostemum in North Carolina



Leaves and metabolism

- Mycoparasites
- Hemiparasites
- Phytoparasites (root and stem)



Mycoparasite



Triuris hyalina from South America



Hemiparasite



Krameria parvifolia from southern Texas



Root parasite



Hydnora africana from South Africa



Stem parasite



Cuscuta europaea from Germany



Stem and shoot

Plant body



Structure of plant body: the first glance

- Shoot system (aboveground part: stems, leaves, buds, flowers, fruit)
- Root system (below-ground part: main roots and branches)
- Exceptions:
 - Some mosses and even ferns have only shoot system
 - Liverworts and hornworts frequently have only leaf-like thallus



Types of plant body

- **Thallus** (flat, with non-differentiated organs)
- **Shoot** body (roots are absent)
- **Bipolar** body (root and shoot systems)

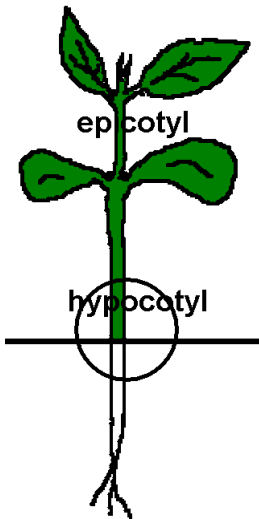


Organs of bipolar plant

- **Leaf:** flat lateral organ with restricted growth
- **Stem:** axial aerial organ with continuous growth
- **Root:** soil organ modified for absorption
- **Floral unit (FU):** stable element of generative system



Non-organs



- *Hypocotyl*: transition between stem and root
- *Epicotyl*: first internode of plant
- *Bud*: shoot “embryo”
- *Fruit*: temporary structure, ripe FU
- *Seed*: chimeric structure, has two or three genotypes

Organ systems: final

- Shoot system: vegetative and generative
- Root system



Origin of tissues and organs of plants

- Land colonization. Challenge: drying. Response: **epidermis** and **parenchyma**. Thallus body plan.
- New level of competition. Response: shoot body plan. Problem: big weight. Solution: **collenchyma**.
- Competition grows again. Response: grow higher. Weight grows. Response: use dead cells in **sclerenchyma**.
- Competition grows again. Response: grow faster. Solution: **meristems**.
- Size of plant is too big for plasmodesmata transportations. Solution: vascular tissues, **xylem** and **phloem**. Here plants with sporophyte dominance win the competition.
- Size of plant is too big for osmotic absorption of water. Solution: **absorption tissues**, roots, bipolar body plan. Now they are independent from water as much as possible—with an exception of generative system...
- Shoot system make leaves, stems and **branches**. Plants are facing new challenge!



Summary

- Water deficit results in either sclerophyte or succulent adaptations
- Water excess results in hygrophyte or even hydrophyte adaptations



Final question (2 points)



Final question (2 points)

What is FU?



For Further Reading



A. Shipunov.

Introduction to Botany [Electronic resource].

Mode of access:

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

