

Introduction to Botany. Lecture 24

Alexey Shipunov

Minot State University

October 28, 2016



1 Questions and answers

- Quiz

2 Leaf

- Modifications of leaf
- Anatomy of leaf
- Ecological adaptations of leaves



1 Questions and answers

- Quiz

2 Leaf

- Modifications of leaf
- Anatomy of leaf
- Ecological adaptations of leaves



Questions and answers

Quiz



Final question (3 points)

Please draw the leaf:

- With petiole
- 1st level: pinnately lobed, obovate; 2nd and further levels absent
- Cordate base
- Acuminate tip
- Smooth margin
- Acrodromous venation



Leaf

Modifications of leaf



Goethe's theory of modification



Famous German poet and writer Johann Wolfgang Goethe is also a founder of plant morphology. He invented an idea of “primary plant” (“Urpflanze”) where all organs were modifications of one primordial organ.



Leaf modifications

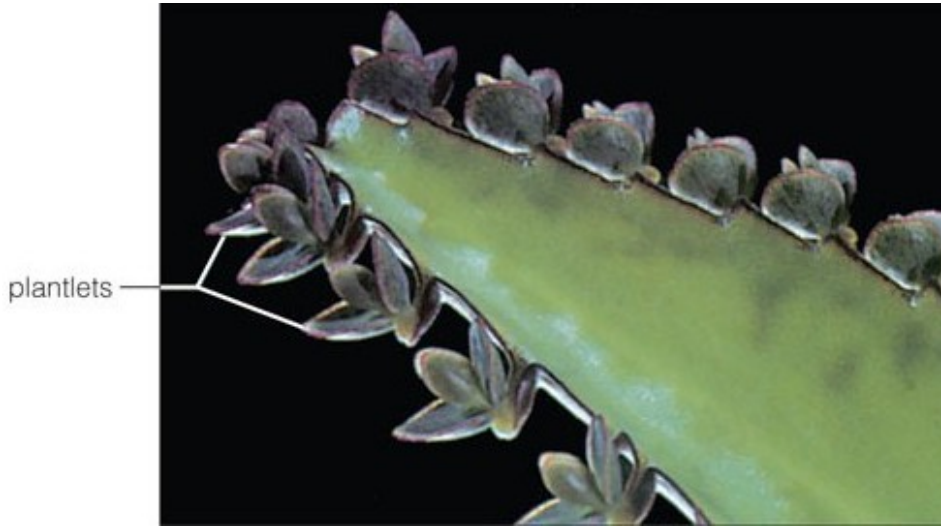
- Spines
- Tendrils
- Succulent leaves
- Traps
- Plantlets



Tendrils of sweet pea (*Lathyrus odoratus*)



Plantlets on the leaf of *Kalanchoe pinnata*



Leaf of Venus flytrap (*Dionaea muscipula*)



Everything is possible when plant needs nitrogen!



Venus flytrap in work



Urn leaf of yellow pitcher plant (*Sarracenia flava*)



Sarracenia flava on Buttercup Fields, Mississippi



Prey in the urn



Urn leaf of purple pitcher plant (*Sarracenia purpurea*)



Hairs prevent insects from climbing out of leaf



“Cobra Lily” (*Darlingtonia californica*)



Sticky tape leaf of butterwort (*Pinguicula* sp.)



Leaf margins are slowly rolling



Sticky tape/trap leaf of sundew (*Drosera intermedia*)



Leaves are constantly open and close and finally digest the glued insects



Table of modifications

<i>Function</i>	Stem / shoot	Leaf	Root
Expansion		Plantlets	
Storage		Succulent leaves	
Photosynthesis		DEFAULT	
Defense		Spines, scales	
Support		Leaf tendrils	
Interactions		Traps, “sticky tapes”, urns	

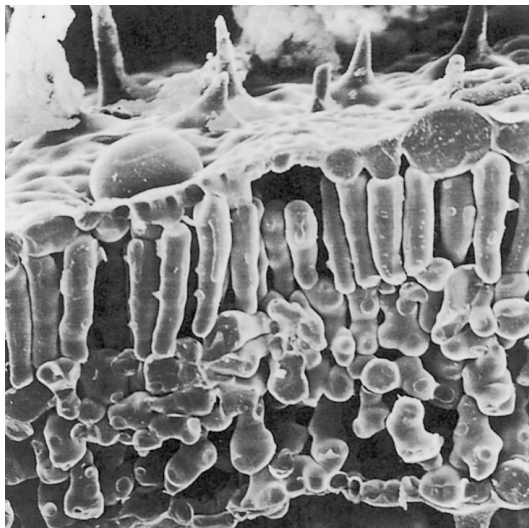


Leaf

Anatomy of leaf



Palisade and spongy cells



palisade
mesophyll

spongy
mesophyll

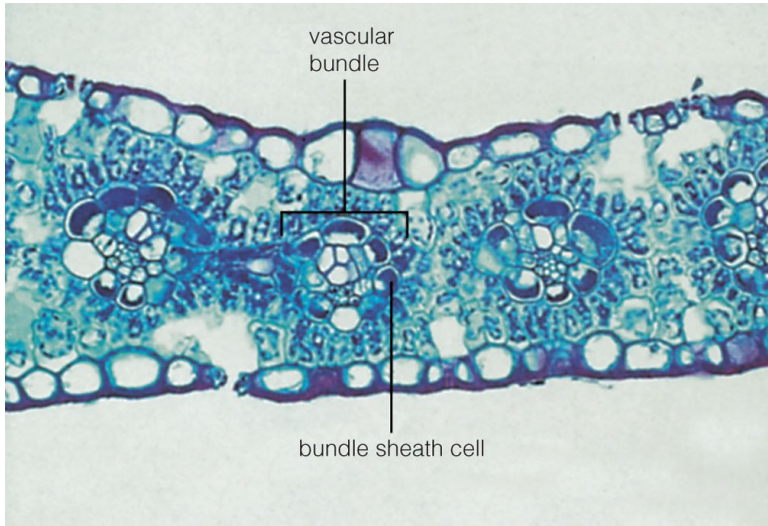


Veins/vascular bundles

- Phloem typically faces downwards, xylem—upwards
- Bundles of C₄-plants have additional bundle sheath cells



Bundle sheath cells



Leaf

Ecological adaptations of leaves



Plants and water

- Xerophytes: sclerophytes and succulents (stem and leaf)
- Mesophytes
- Hygrophytes
- Hydrophytes



Leaf succulent (*Crassula argentea*)



mesophyll
cells



Xerophyte leaf—needle of pine (*Pinus contorta*)

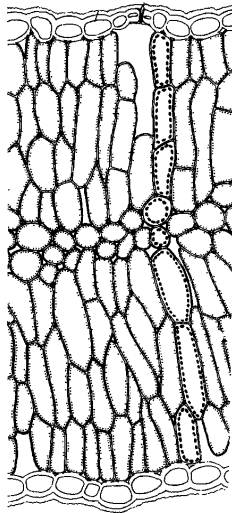
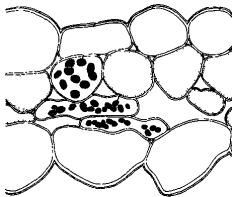


Plants and light

- Sciophytes
- Heliophytes



Sciophyte and heliophyte



Oxalis acetosella and *Sylphium laciniatum*

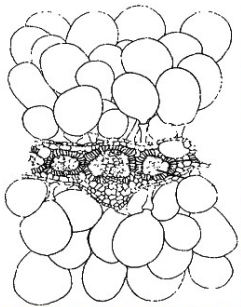


Leaves and soil

- 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



Summary

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



Final question (1 point)



Final question (1 point)

In *Begonia* leaves, which mesophyll is prevalent, spongy or palisade?



For Further Reading



A. Shipunov.

Introduction to Botany [Electronic resource].

2016.

Mode of access:

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

