

Introduction to Botany. Lecture 28

Alexey Shipunov

Minot State University

November 9, 2016



1 Questions and answers

- Quiz

2 Root

- Water transport in roots
- Diversity of roots



1 Questions and answers

- Quiz

2 Root

- Water transport in roots
- Diversity of roots



Questions and answers

Quiz



Final question (2 points)

What is exodermis (exoderm)?

- Cell layer between rhizodermis and cortex.



Root

Water transport in roots



Rhizodermis and osmosis

- The existence of root hairs dramatically increases the surface of absorption
- Every root hair cell increase the internal concentration of large molecules, typically organic acids
- Process of concentration requires ATP
- As a result, osmosis water flow starts from soil to root cells

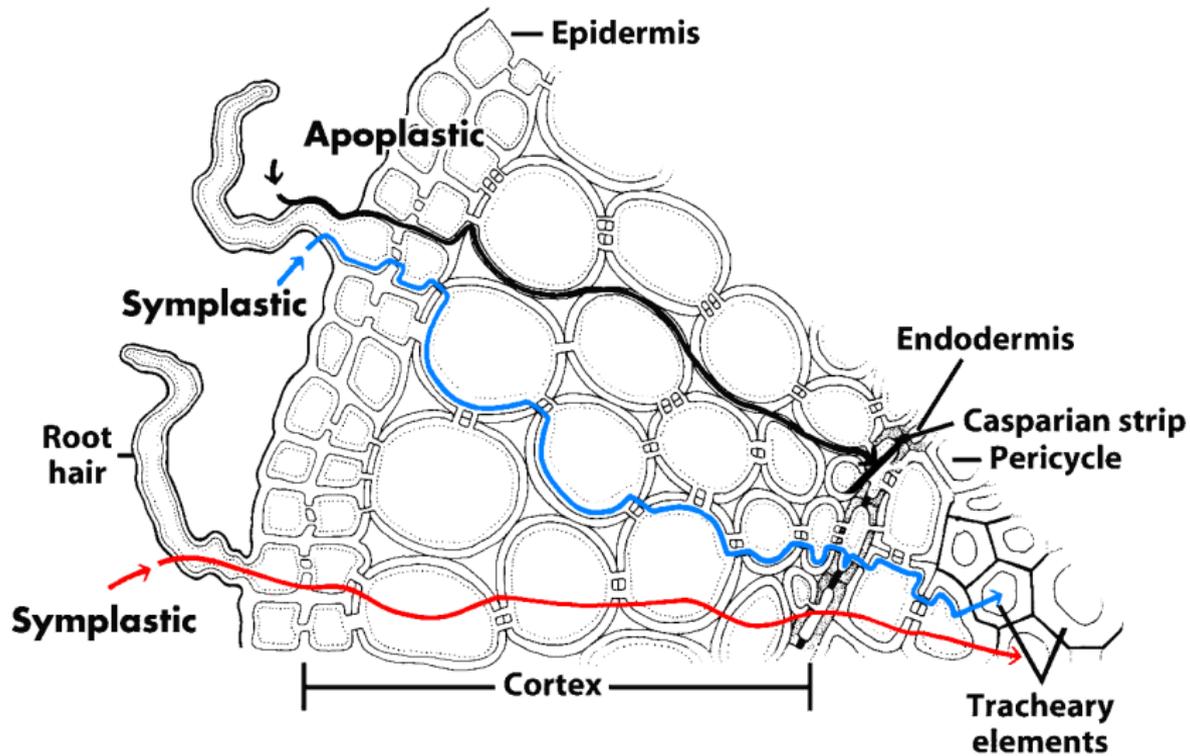


Endodermis and root pressure

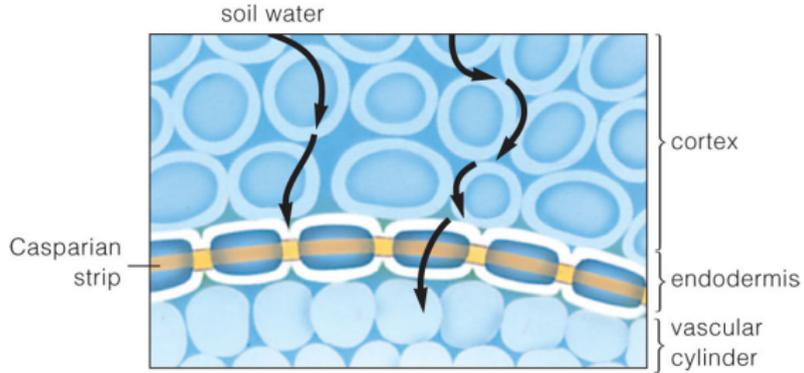
- From rhizodermis to endodermis, transport of water is both symplastic and apoplastic
- In the endodermis cells, Caspari stripes stop apoplastic transport and therefore forced symplastic transport
- This is a high-energetic process requires ATP
- As a result, water will be pushed up from root: this is the root pressure



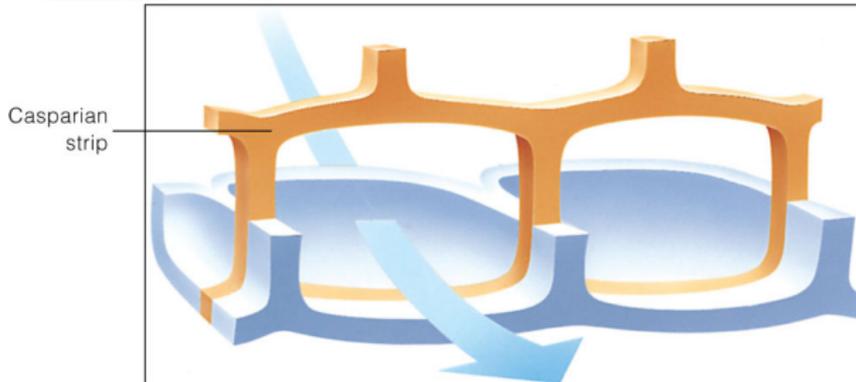
Apoplastic and symplastic transport in the root



Casparian strips



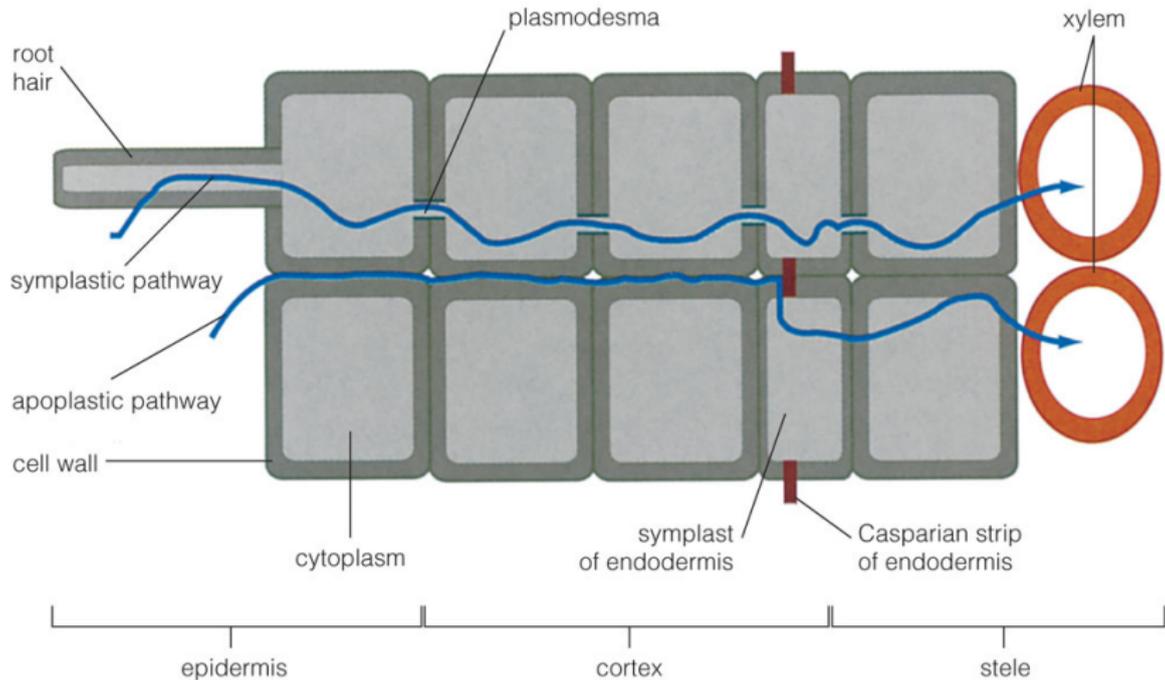
© 2006 Brooks/Cole - Thomson



© 2006 Brooks/Cole - Thomson



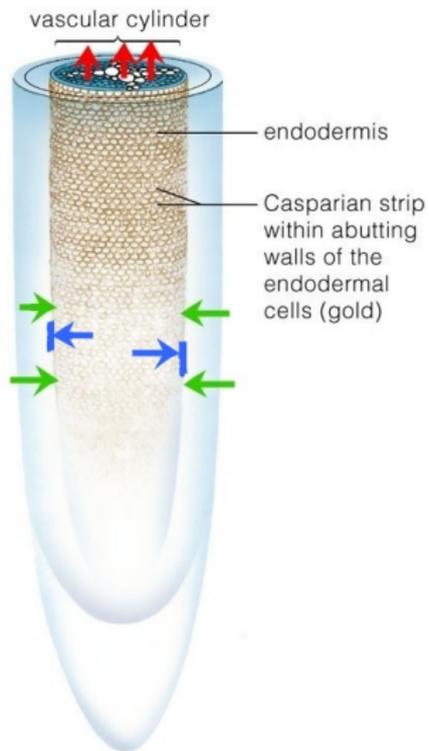
How Casparian strips are working



© 2006 Brooks/Cole - Thomson



Origin of root pressure



Water flow in plants

- Plants need water:
 - To supply photosynthesis
 - To cool via transpiration
 - To obtain required minerals
- Water flows because of:
 - Root pressure
 - Capillarity force
 - Transpiration “suction”



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, *A Armoracia officinalis*—horseradish)
- Supportive roots (many tropical plants)
- Defensive, spiny roots (ivy)
- Photosynthetic roots (some orchids)



Summary

- Root hairs, Casparian strips, capillarity and transpiration work together to make water flow in plant.
- Root-related part of water flow is the **root pressure**.
- Roots have not less modifications than leaves.



Final question (3 points)



Final question (3 points)

Please explain the role of endoderm in roots.



For Further Reading



A. Shipunov.

Introduction to Botany [Electronic resource].

2016.

Mode of access:

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

