

Root Systems
October 6, 2009 PMB 102/IB101

Evolution

- Earliest evidence of roots with fossil Lycopod plants, about 400 million years ago. Believed at least two separate events leading to roots
- Root transformed (originated) from a shoot dichotomy or *de novo*

Consider roots from a structure/function approach

-Symplastic versus apoplastic systems

-functions

- anchoring plant
- storing foods
- uptake of water and nutrients

Structural Principles for maximizing absorption

- maximizing effective absorptive interface for water
- locating absorbing elements near relevant interface
- thin permeable cell wall
 - rhizodermis
 - modifications = root hairs
- mutalistic associations
 - mycorrhizae
 - ectomycorrhizae
 - endomycorrhizae
- adaptations for increasing water uptake
 - Velamen
 - found in many epiphytes, such as orchids
 - Casparian Strip
 - near universal feature of most roots

-Other root adaptations/modifications

- Contractile roots
- Xeric adaptations

-Lateral or Branch Roots

- Originate in pericycle
 - opposite protoxylem pole
 - involves several cells
 - not randomly arranged
- Periodicity in production
- Emergence of lateral through cortex

-Interactions with other organisms

- Haustoria
 - found in many parasitic plants (e.g., mistletoe)
- Nodules

If time...

The root cap

Root embryogenesis

Root meristem Architecture