

Introduction to Botany. Lecture 8

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September 14th, 2011

Outline

- 1 Questions and answers
- 2 Results of Lab 2
- 3 Origins of root tissues
- 4 Anatomy of root

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Previous final question: the answer

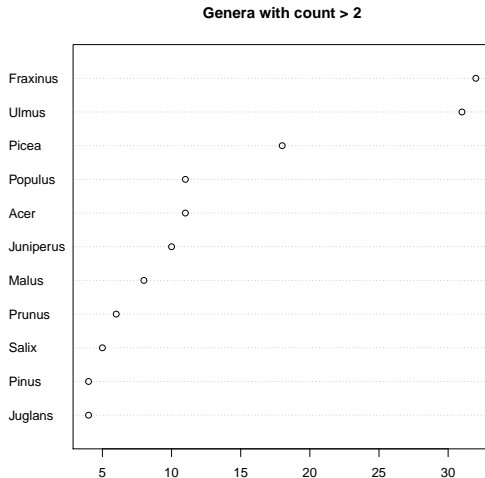
What are adventitious roots?

Previous final question: the answer

What are adventitious roots?

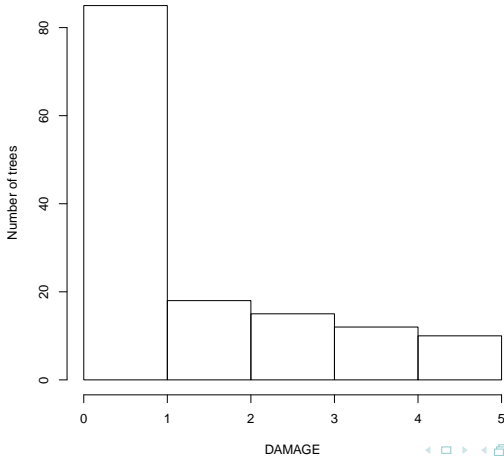
- Roots which grow from stem

Flood and trees: 149 trees were observed

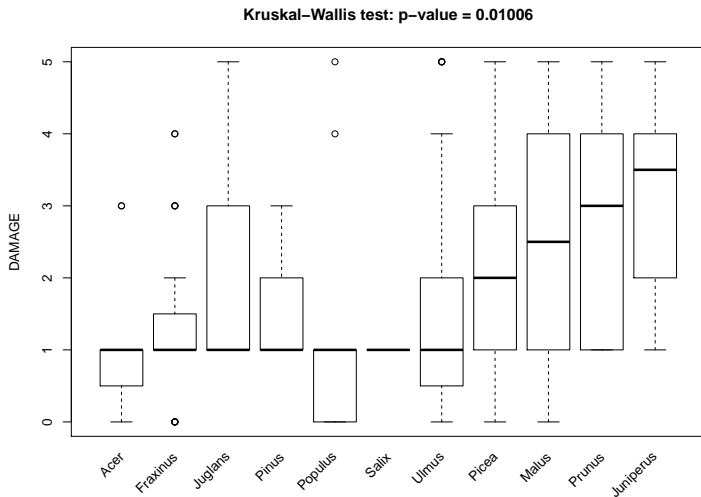


Flood and trees: damage

Average damage = 1.721

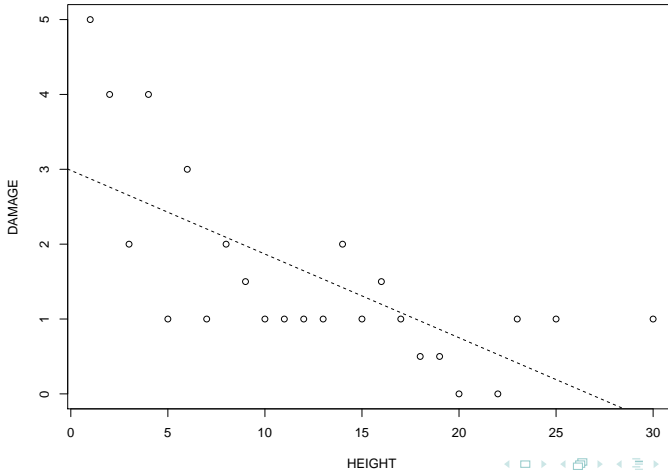


Flood and trees: damage vs. genera



Flood and trees: damage vs. height

Analysis of variation: $p\text{-value} = 0.0001972$



Necessary precaution

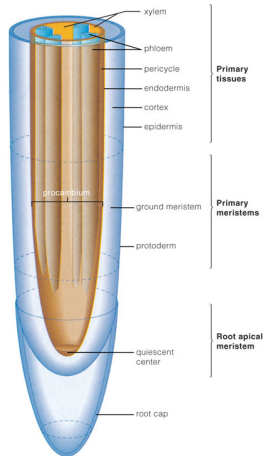
```
> kruskal.test(DAMAGE ~ GROUP, data=tr1)

Kruskal-Wallis rank sum test

data:  DAMAGE by GROUP
Kruskal-Wallis chi-squared = 17.4015, df = 11, p-value = 0.09655
```

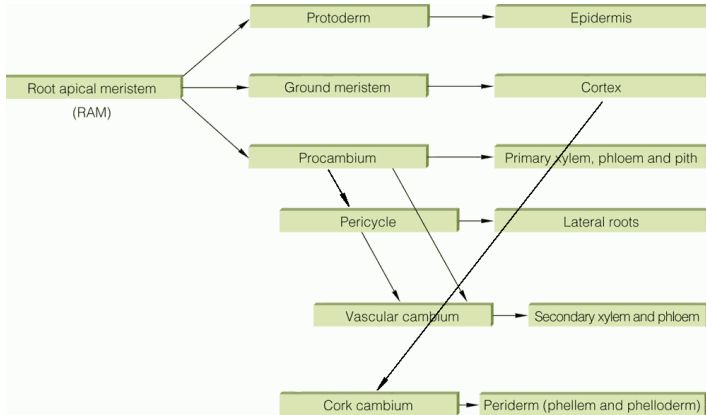
Fortunately, p-value is too large

Development of tissues



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Origins of tissues



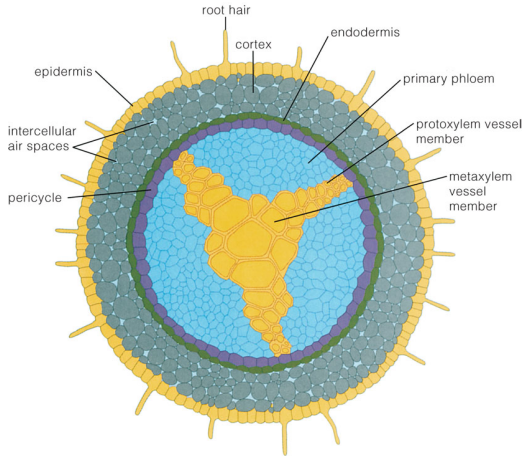
Periphery of root

- Rhizoderm (root epidermis): fast-degrading cells
- Cortex, which includes also:
 - Endoderm: 1-cell layer with specialized cell walls, located on the border with vascular cylinder
 - And (sometimes) exoderm: similar to endoderm but located just under rhizoderm
- In some plants (i.e., orchids), cortex modified into velamen

Root center: vascular cylinder

- Pericycle
- Vascular tissues located in the center
- No central hollow, central parenchyma presents in monocot roots

Anatomy of root



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Pericycle

- Long-lived parenchyma cells served as half-meristem
- Initiates development of lateral roots
- Contributes to vascular cambium
- Contributes to cork cambium

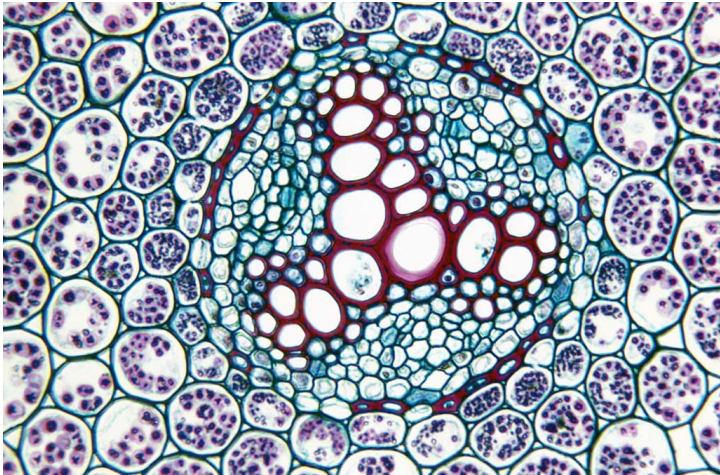
Development of lateral roots



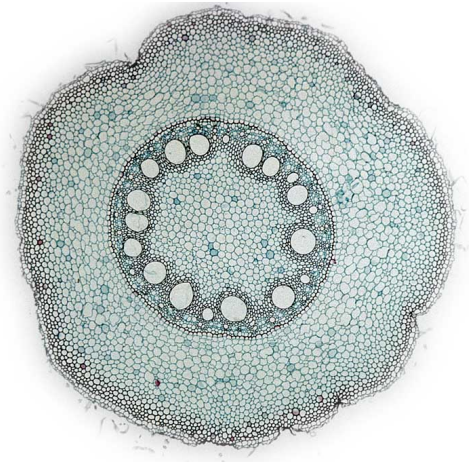
Vascular bundle

- Only one!
- Has radial (star-like) symmetry
- Protoxylem arranged in rays, multiple in monocots, 2-4 in other plants

Radial structure of root vascular bundle in buttercup (*Ranunculus* sp.)



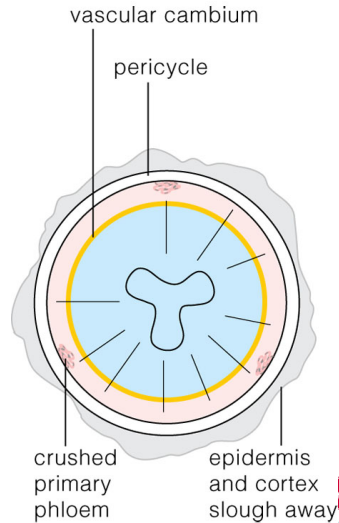
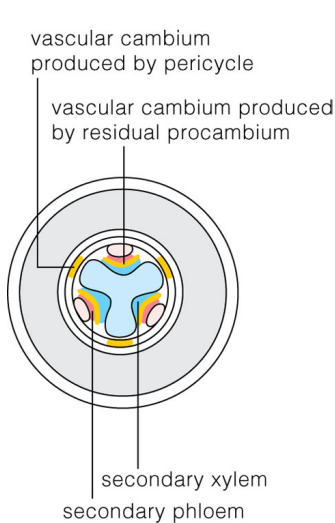
Root of monocot (*Zea mays*)



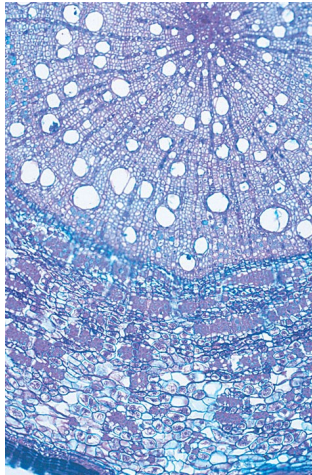
Secondary thickening

- Vascular cambium is produced by both pericycle and residual procambium (located between xylem and phloem)
- Cork cambium appears in cortex

Root thickening



Secondary root (*Quercus* sp.)



Summary

- Root differs from stem having rhizoderm, thick cortex, endoderm, long-lived pericycle and radially arranged primary vascular tissues
- Secondary thickening make root more similar to stem

Final question (1 point)

Final question (1 point)

What is a pericycle?

For Further Reading



J. E. Bidlack, Sh. H. Jansky.
Stern's introductory plant biology. 12th edition.
McGraw-Hill, 2011.
Chapter 5.



Th. L. Rost, M. G. Barbour, C. R. Stocking, T. M. Murphy.
Plant Biology. 2nd edition.
Thomson Brooks/Cole, 2006.
Chapter 7.