AGRY 515 2012

- Root morphology – individual root to whole root system scale
- Types of architecture
- Environmental modification of morphology and architecture
- Definition of the rhizosphere

Fig. 1. Root Apical Region

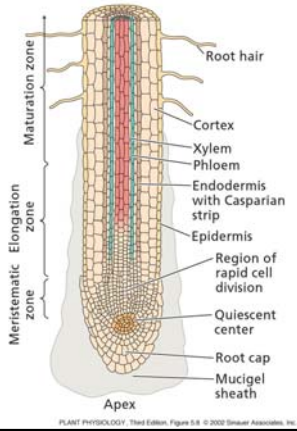
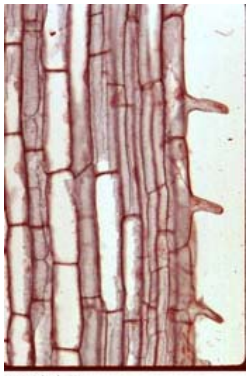
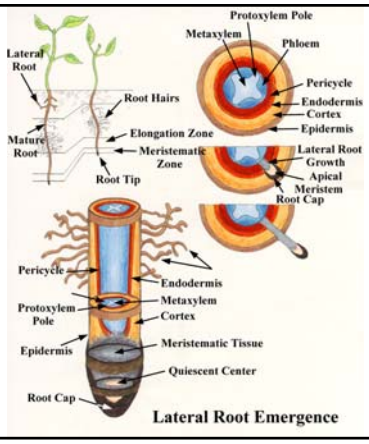


Fig. 2. Root Hairs



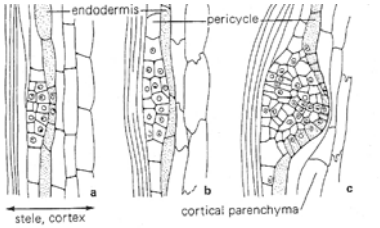
Curtis, Lersten, and Nowak, 2002

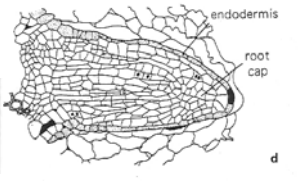
Fig. 3. Lateral root initiation



Rochester Institute of Technology, General Biology, 2004

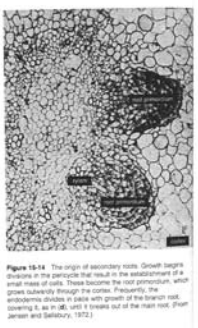
Fig. 4 Later root initiation schematic

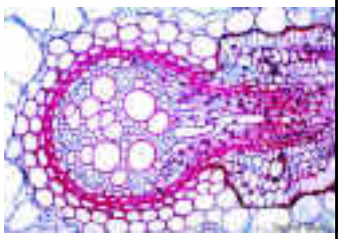




Salisbury and Ross, 1985

Fig. 5. Lateral root initiation pictures





D. Webb, U. Of Hawaii, BTNY 410

Salisbury and Ross, 1985

Fig. 6. (Fig. 13.3) Hormones

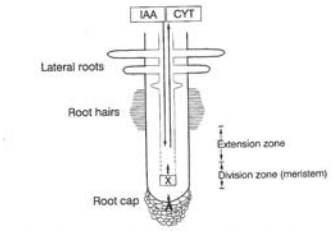


Fig. 14.3 Main features of root morphology, and some aspects of interactions in a growing root (IAA = indolylacetic acid, auxin; CYT = cytokinins; X = unidentified growth modulating compound, ABA?).

Marschner, 1995

Fig. 7. (Similar to Fig. 13.4)
Types of root systems

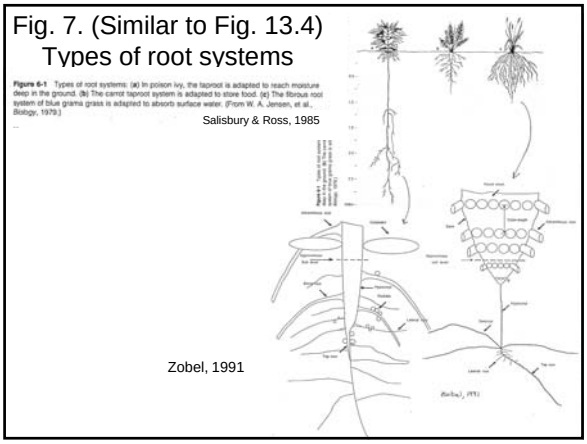


Figure 6-1 Types of root systems: (a) In poison ivy, the taproot is adapted to reach moisture deep in the ground. (b) The carrot taproot system is adapted to store food. (c) The fibrous root system of blue grama grass is adapted to absorb surface water. (From W. A. Jensen, et al., Biology, 1979.)

Salisbury & Ross, 1985

Zobel, 1991

Fig. 8.

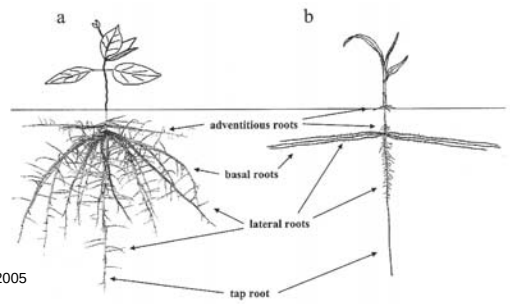


Fig. 7.4a, b. Herbaceous root systems, typified by common bean, a dicot (a), and maize, a monocot (b)

Lynch, 2005

Fig. 9

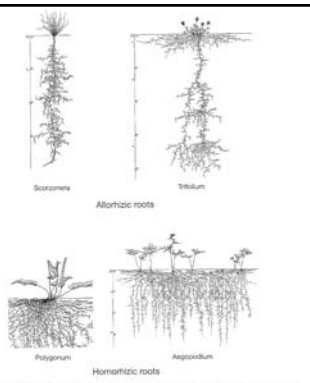
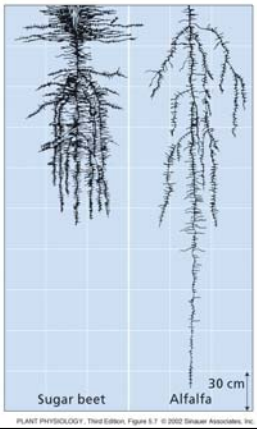


Fig. 1.7. Basic types of root systems. In plants with *allorhizic* roots, the root system develops from the primary root which produces one or more cylindrical main roots (e.g. *Scorzonera villosa*). Lateral roots may spread near the soil surface as in *Trifolium trichocephalum*. In plants with a typical *homorhizic* root system the roots arise from basal shoots or from rhizomes (*Polygonum bistorta*) or runners (*Aegopodium podagraria*). (From Kutschera and Lichtenegger 1992)

Larcher, 1995

Fig. 10



PLANT PHYSIOLOGY, Third Edition, Figure 5.7 © 2002 Sinauer Associates, Inc.

Fig. 11

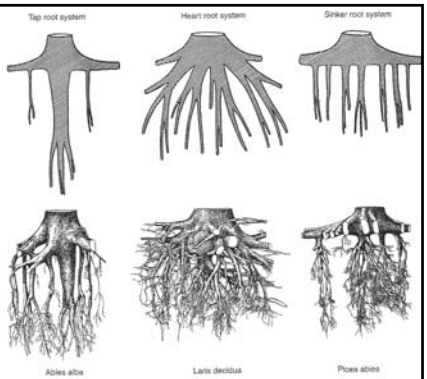


Fig. 1.8. Root systems of conifer trees of the temperate zone. *Abies alba* has a *tap root* system, *Larix decidua* a *heart root* system, *Picea abies* a *sinker root* system. (After Kostler et al. 1968). In tropical forests and on oxygen-deficient soils, trees may develop special types of roots, such as *stilt roots, tabular roots* and *buttress roots*. (Richards 1979; Longman and Jenik 1987).

Larcher, 1995

Fig. 12. (Fig. 13.7 shows d)
Environmental modification

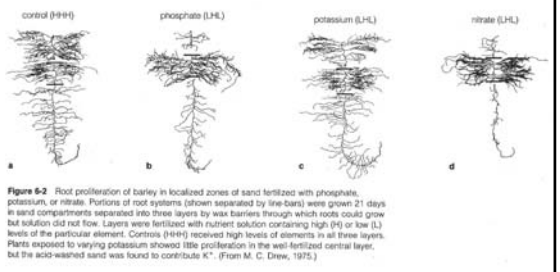


Figure 6-2 Root proliferation of barley in localized zones of sand fertilized with phosphate, potassium, or nitrate. Portions of root systems (shown separated by line-bars) were grown 21 days in sand compartments separated into three layers by wax barriers through which roots could grow but solution did not flow. Layers were fertilized with nutrient solution containing high (H) or low (L) levels of the particular element. Controls (HHH) received high levels of elements in all three layers. Plants exposed to varying potassium showed little proliferation in the well-fertilized central layer, but the acid-washed sand was found to contribute K+. (From M. C. Drew, 1975.)

Salibury and Ross, 1985

Fig. 13. (Fig. 13.5) Genetic differences

Lynch, 2005

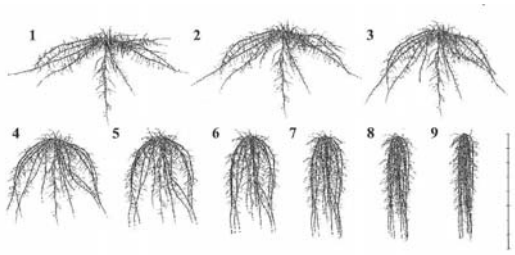


Fig. 7.5. Simulated common bean root systems differing in basal root gravitropism (gravitropic set point angle, or GSA) but identical in other regards. Such variation in basal root gravitropism is evident among genotypes, and in responsive genotypes is regulated by phosphorus availability. (Ge et al. 2000)

Fig. 14.
G X E

Lynch, 2005

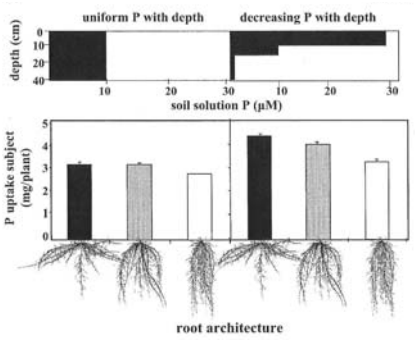


Fig. 7.12. Effect of root architecture on phosphorus acquisition from uniform and stratified soil in simulated common bean root systems. Each value is the mean of four replicates. Shallower root systems can acquire more phosphorus, especially when phosphorus is concentrated in the topsoil. (Ge et al. 2000)