Crop growth and Development and Environment

The Roots, the Hidden Half

- Temporal trends in root growth and development
- Effects of environmental factors on root growth and development.

Environment - Crop Growth
Root Growth and Development

Temporal Trends in root growth, development and distribution

Maize

2 Weeks
7 Weeks
14 Weeks

Environment - Crop Root Growth
Temporal Trends in Root Growth and Development

Fig. 1. Relation of plant age to root density at five soil depths during first 21 days.

Environment - Crop Growth
Root Growth and Development – Mass Partitioning - Acock

Fig. 4-5. A hypothetical scheme for partitioning C between organs on plants.
Deficient aeration of soil root not only reduces root growth but also reduces the absorption of water and minerals.

The decrease in water absorption is caused chiefly by an increase in the resistance to radial movement into roots, but a decrease in the osmotic driving force (probably resulted a decreased uptake of salt).

There are wide differences among species of plants in respect to the effects of flooding on water absorption.
Environment - Crop Growth
Root Growth and Developmental – Mass Partitioning - Cotton

\[ \text{Biomass Partitioning} \]

Days after Emergence

Figure 16: The effect of plant age on biomass partitioning of biomass to roots and aboveground parts (Johnson et al., 1990).

Environment - Crop Growth
Root Growth and Developmental – Mass Partitioning - Cotton

\[ \text{Proportion of Plant Biomass} \]

Temperature, °C

Figure 17: The role of temperature on cotton plant partitioning among different organs (V. R. Rety et al., 1994).

Environment - Crop Root Growth and Development
Concluding Remarks

- Progress has been made in recent years in understanding crop root growth and developmental responses to environmental stresses.
- However, quantitative relationships between root growth and developmental responses and environmental stresses are still inadequate.
- New techniques are needed to quantify the responses.
- Models systems may be useful to test hypothesis and validate certain assumptions.