Soil chemistry, and foundation for soil health.

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Soil Health

Definition.

"*the capacity of soil to function as a living system, with ecosystem and land use boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality, and promote plant and animal health*" ***(FAO, 2008)***

Soil Chemistry

Components of soil chemistry

Parent materials – primary minerals – quartz, etc.

Soil texture – sand, silt and clay particles.

Organic matter, air and water, soil pH and chemical properties (CEC, N, P, K, etc.).

Root system

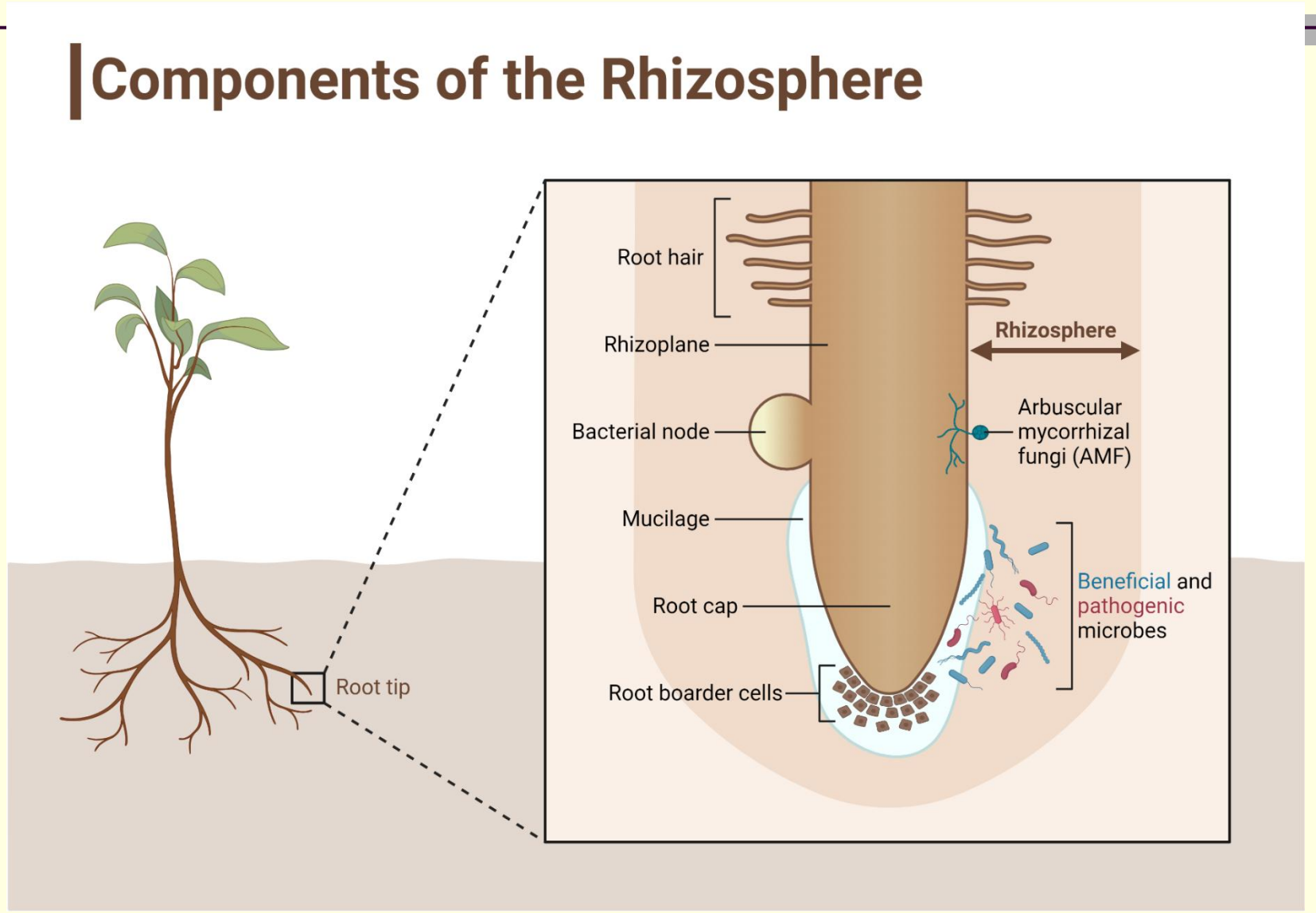
Soil microbiology – mainly bacteria and fungi

Soil solution

Soil structure and aggregate stability.

Importance of soil health assessment with agricultural intensification.

Where does the chemistry happen



Substances found in plant root exudates

Substances found in plant root exudates

Category	Substances Identified
Sugar	Glucose, fructose, maltose, galactose, ribose, xylose, rhamnose, arabinose, raffinose, sucrose, fucose, oligosaccharides
Amino acid and amide	Leucine/isoleucine, valine, γ-amino butyric acid, glutamine, α-alanine, β-alanine, asparagine, arginine, serine/homoserine, glutamic acid, aspartic acid, glycine, tryptophane, cystine/cysteine, phenylalanine, threonine, tyrosine, lysine, proline, methionine, cystathionine, histidine
Organic acid	Oxalic, malic, acetic, propionic, butyric, valeric, citric, succinic, fumaric, glycolic, tartaric, malonic, galacturonic, hydroxyglutaric, adipic, glucuronic
Growth factor	Choline, inositol, pyridoxine, ρ-amino benzoic acid, η-methyl nicotinic acid, biotin, thiamine, niacin, pantothenate
Phenolic acids and coumarin	Caffeic acid, cinnamic acid, protocatechuic acid, ρ-hydroxybenzoic acid, vanillic acid, syringic acid, ρ-coumaric acid, scopoletin, salycilic acid, ferulic acid, coumarin, o-coumaric acid
Enzyme	Invertase, amylase, protease, phosphatase, polygalacturonase
Nucleotide and flavonone	Flavonone, adenine, guanine, uridine, cytidine
Fatty acid	Stearic, oleic, linoleic, linolenic acids, palmitic
Protein	Green fluorescent protein, human placental alkaline phosphatase, bacterial xylanase
Sterol	Cholesterol, campesterol, stigmasterol, sitosterol
Others	Auxins, fluorescent substances, hydrocyanic acids, organic phosphorus compounds, vitamins, photosynthesis inhibitors, germination stimulators, bacterial stimulants and inhibitors, fungal growth stimulants, hydroxamic acids, sorgoleone (mitotic inhibitor), polypeptide

Who or what does it.

- Soil microbiology
  - Bacteria and fungi
  - Enzymes - biological proteins, C/N
  - Doubling time in soil.
- Root exudates
  - The number and importance
- Soil chemistry and biological activity
  - Driver of chemical change and nutrient cycling.
  - Decomposition, mineralization, nitrification and biological nitrogen fixation.

What happens.

Decomposition processes

Humus formation - Humification

Salinity and sodicity

Combination of fundamental components.

Movements due to concentration gradients

Any Questions ?????