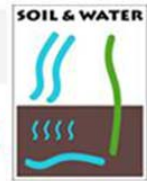


Teacher	Prof. Dr. Marian Kazda
Contact	Ulm University, Institute for Systematic Botany and Ecology marian.kazda@uni-ulm.de
Lectures	Introduction to soil-water relations Root structure and soil exploitation
Key words	Soil components, water in soil and soil water status, size of soil particles - texture and porosity, plant available water, water supply to plant roots, hydraulic lift. Root functions, root distribution in soil, definition of the rhizosphere, exploitation of the rhizosphere, water supply to plant roots, distribution of roots and soil nutrients.
Learning objectives	<p>The introductory lecture to soil-water relations should give the participants an overview about the soil - plant interaction in respect to soil water. As the students are coming from four different countries and different study backgrounds, it is necessary to give them a common base to follow the teaching of other lecturers.</p> <p>The learning objectives are to give them an introduction to soil components, soil water status and plant water availability. The water supply in water-limited ecosystems is a key parameter for plant productivity. The students shall gain the ability to analyze key factors for water supply to plants also regarding root architecture and to understand constrains in dry environments.</p> <p>The lecture "Root structure and soil exploitation" builds up on the previous teaching giving an introduction to soil-water relations. Roots as a hidden part of the plant must fulfil various functions securing plant growth and stability. They are building the rhizosphere, a space in close vicinity of the roots with various biotic and abiotic interactions. Students will be provided with basic rules of root distribution in soil and will get insight into root architecture and its relation to the uptake of water and nutrients.</p> <p>The main aim is to provide understanding of the biotic part of the soil processes and to give the overview of roots as an integral part of the ecosystem. The students then be able to understand all important issues regarding plant roots and their functions.</p>



Main subjects

The lecture “Introduction to soil-water relations” covers the following subjects:
- Introduction to soil components and the description the soil as a three phases system consisting of (1) the solid phase, (2) the liquid phase and (3) the gaseous phase.

- Soil water status, especially considering the soil water potential
- Establishing connection between soil texture and porosity and providing a link to plant water availability
- Water uptake and plant transpiration, especially in water-limited ecosystems
- How is the water supply to plant roots linked to soil hydraulic conductivity
- Water supply to plants with contrasting root architecture (link to the second lecture on plant roots)
- Hydraulic lift and water re-distribution in dry environments

The main topics of the lecture “Root structure and soil exploitation” are:

- Root functions as water and nutrient uptake and plant anchoring in the soil
- Interaction with biotic and abiotic soil environment
- Vertical root distribution and root architecture
- Distribution of roots and soil nutrients
- Nutrient uptake from soil patches
- Root architecture and soil exploitation
- Root clustering in natural soils for optimized exploitation of aggregated resources

Relevance to EduSaPMan

The introductory lecture is scheduled as one of the first within the Summer School. Based on the knowledge, the participants shall further understand plant reactions to water stress. Also excessive water supply and flooding are related to gas distribution in soils and therefore directly linked to lectures dealing with wetlands. Basic knowledge about soil-water relations is also valuable for understanding of lectures on soil degradation and about the sustainable use of soils.

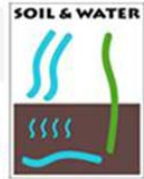
The lecture on root functions, distribution and architecture held mainly close to the end of the summer school integrates many of these approaches and is bridging them towards plant use of soil water and nutrients.

The knowledge provided in this lecture gives the basic understanding of plant - soil relations. Such knowledge enables the participating students to understand below ground processes and to link them to questions of soil management and sustainable land use.

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v Českých Budějovicích
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in České Budějovice



Eesti Maaülikool
Estonian University of Life Sciences

Recommended literature

- Blume, H.-P. (et al.): Scheffer/Schachtschabel Soil Science, Springer 2016
- Hakeem, et al. (Eds.): Soil Science: Agricultural and Environmental
Prospectives, Springer 2016
- Schulze, Beck, Müller-Hohenstein: Plant Ecology, Springer 2005, 702 p.
- Gregory, P.J.: Plant Roots: Growth, Activity and Interactions with the Soil, Wiley-
Blackwell 2006
- Zobel, R.W.: Roots and Soil Management: Interactions between Roots and the
Soil, American Society of Agronomy 2005
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