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Thema
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Bodenorganismen-Pflanzen Interaktionen

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Titel
Role of soil spatial organization for replant disease

Abstract
Apple replant disease (ARD) is a complex phenomenon that affects young trees in replanted orchard sites causing necrotic lesions on roots, stunted tree growth and reduced yields (1). One assumption to explain this phenomenon is that through soil cultivation spatial organization/differentiation created by previous crops is lost and hence new roots cannot grow in favorable sites or avoid unfavorable sites. Unfavorable conditions could be high toxin concentrations, signaling substances or high number and abundance of pathogens. The aim of our work is to detect the spatial distribution of possible ARD causing factors, both in the bulk soil and in the rhizosphere.
Therefore 4 different treatments consisting of acryl glass cylinders filled with undisturbed ARD soil (intact field structure), homogenous ARD soil, sterilized homogenous ARD soil and virgin homogenous soil without expression of ARD (control) are established. The ARD and control soil were taken from Ellerhoop in southern Schleswig-Holstein. On each cylinder an apple seedling (M 26) is planted and grown for 4 weeks in a climate chamber. In situ measurements of roots and shoots were conducted during the experiment, i.e. determination of leaf area and SPAD value (amount of chlorophyll in leaves), extraction of soil solution. Furthermore apple root growth is observed in situ by X- ray computed tomography. After CT scanning, the observed root growth can be analysed in relation to soil structure and conclusions can be drawn on ARD causing factors and their spatial distribution in the soil. In addition, roots and shoots were sampled destructively after termination of the experiment. Destructive sampling enables the determination of leaf areas and root length and root diameters classes with WinRHIZO. Further chemical analysis of bulk and rhizosphere soil, nutrient analysis of shoots and determination of pH, conductivity and chemical compounds of soil solution will be conducted.
The experimental approach and first results on root and shoot growth in the different treatments will be presented.

Literatur
[1] Rumberger, A., Merwin, I. A., & Thies, J. E. (2007). Microbial community development in the rhizosphere of apple trees at a replant disease site. Soil Biology and Biochemistry, 39(7), 1645-1654.