



How root exudates alter gas diffusion in soil

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In soil, gas diffusion plays an important role for plant respiration, soil microbiology and greenhouse gas emissions. Several studies have shown the effect of water content on gas diffusion: High water contents strongly reduce gas diffusion through soil. The critical amount of water required to strongly limit gas diffusion varies with the type of soil. While diffusion in soils of various particle sizes and water contents have been studied in the past, still very little is known about the effect of root exudates on gas diffusion coefficient.

Aim of our study is to quantify the effect of mucilage on gas diffusivity in soil depending on water content: We mixed a sandy soil with various amounts of root exudates and water content and used the Currie method to measure the gas diffusion coefficient. We used mucilage extracted from chia seeds as a model of root exudates. For the gas diffusion measurements, we used carbon dioxide and measured the changes in CO₂ concentration over time.

Together with further studies, our experiments help to improve our knowledge about gas diffusion in the rhizosphere. We expect also that this method can be used to obtain certain information about the spatial arrangement of mucilage within the pore space.