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Microdialysis as a novel tool for in-situ monitoring of diffusive fluxes of plant-available nitrogen

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Plant nitrogen (N) acquisition is strongly controlled by the availability of inorganic and organic N in the soil solution and by biogeochemical processes in the rhizosphere. However, until now it was hardly possible to reliably estimate plant-available N in soil microsites in-situ, mainly due to the lack of adequate methodologies. Here we present a novel and innovative microdialysis technique for the disturbance-free estimation of diffusion-induced plant available N. The results gained by microdialysis are qualitatively and quantitatively compared with lysimeter and soil extraction techniques and highlight the advantages of this novel technique.
Microdialysis proved to be a suitable tool for monitoring plant available N fluxes in soil at an outstanding spatial (millimeters to centimeters) and temporal (minutes to hours) resolution. The different methods for soil N sampling resulted in significantly different results. In lysimeter and soil extraction samples inorganic N was found at highest concentrations while results from microdialysis revealed that free amino acids were contributing most to the total plant-available N pool. After establishment in the field, microdialysis will provide valuable information about the dynamics of plant-available N compounds in soils, such as diffusion rates, adsorption to soil particles and turn-over rates in soil microsites.