Sampling root exudates – mission impossible?

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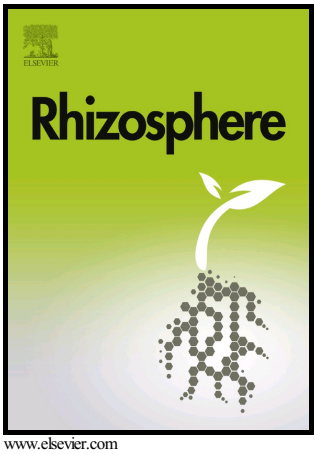

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Sampling root exudates – mission impossible?

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ABSTRACT

Accurate information about the quantity, quality and spatiotemporal dynamics of metabolite release from plant roots is vital to understanding the functional significance of root exudates in biogeochemical processes occurring at the root-microbe-soil-interface. Significant progress in analytical techniques nowadays allows us to gain a much better picture of the rich diversity of compounds that are present in root exudates, but ultimately the choice of exudation sampling strategy will determine the ecological significance of obtained exudation results. Unfortunately, in the past, little consideration has been given to the experimental strategy used to sample root exudates. To date, our knowledge on root exudation is mainly based on plants grown and sampled in nutrient solution culture (hydroponics). Despite the operational benefit of hydroponic systems, the question remains as to how ecologically relevant exudation results obtained under these artificial conditions are compared to soil environments, particularly in the context of exudate driven rhizosphere processes. The quantitative and qualitative measurement of root exudation in soil, however, is fraught with problems due to: (i) continual removal of exudates from solution by the microbial community; (ii) loss of exudates from solution due to their sorption to the solid phase; and (iii) simultaneous release of compounds from soil organic matter