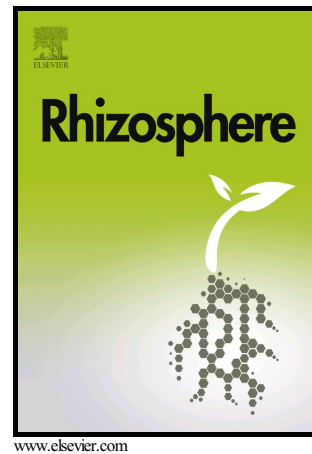


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Review Article

From data to knowledge: The future of multi-omics data analysis for the rhizosphere

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Abstract

The rhizosphere is the interface between the root system of a plant and its surrounding soil. The microbiome of the rhizosphere, which is the totality of all microbes present there, represents a complex microbial ecosystem that nourishes the terrestrial biosphere. To untangle the complexity of the rhizosphere, and of the rhizospheric microbiome in particular, an integrated multi-omics approach can be applied to reveal the composition of the rhizospheric microbiome (through 16S ribosomal amplicons and metagenomics), the functional properties of the microbiome (through metatranscriptomics and metaproteomics), and the signaling network within the rhizosphere (through metabolomics). The successful application of integrated multi-omics to rhizospheric science depends on the availability of rhizosphere-specific data and on the appropriate software used to analyze omics data from the rhizosphere. In this review, we analyze the availability of software suites that are normally applied to surrogate disciplines (e.g., soil and plants) but which can be used for rhizospheric science. We also identify potential issues, challenges, and opportunities for rhizosphere science.

Keywords: rhizosphere, multi-omics, metagenomics, metaproteomics, metabolomics

1. Introduction

Our intentions are to present a top-level view on how the emerging field of integrative multi-omics can be employed in rhizosphere science. In so doing, we discuss the challenges of obtaining rhizosphere omics data, the current lack of multi-omics studies targeting the rhizosphere directly, how multi-omics is applied to surrogate fields (e.g., soil and plant systems), and the future of integrated multi-omic data analysis. A separate review included in this issue covers the technologies and techniques of multi-omics.

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