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Nota di contenuto	Contents; Contributors; Preface; 1: Soil as a Biological System; Introduction; Main characteristics of soil as a biological system; Soil biota and their functions in soil; Microbial diversity, soil functions and the holistic approach; The omics approaches in soil; 2: Functional Genomics Analysis of Key Bacterial Traits Involved in Rhizosphere Competence; Introduction; Bacterial species specifically selected by the rhizosphere; Bacterial functions enriched in the rhizosphere; Motility and chemotaxis: early phase traits required for rhizocompetence Microbial growth in the rhizosphere: the contribution and relevance of central metabolismDenitrification: a promising model linking microbial metabolic flexibility and community structure; Surviving in the rhizosphere: the relevance of stress and detoxification traits; Secretion systems: important functional traits involved in rhizosphere competence; Secondary metabolism: specialized functions involved in competitive rhizosphere fitness; Conclusions and future directions; 3: Soil Metagenomics - Potential Applications and Methodological Problems; Introduction Metagenomics for fostering our understanding of soil habitatsA case

study - the metagenomics assessment of the chitinolytic process in soil; Metagenomics for bioexploration; The search for novel chitin-degrading enzymes - a case study; Outlook; 4: Screening Phylogenetic and Functional Marker Genes in Soil Microbial Ecology; Introduction; Marker genes as biomarkers; Phylogenetic and functional marker genes; Methodologies for marker gene screening in soil samples; Primer and probe designing (non-protein-coding sequences and protein-coding sequences) strategies
Experimental design for screening of the bacterial 16S rDNA marker gene with short read producing high-throughput sequencing technologiesConcluding remarks and potentials; 5: Soil Metatranscriptomics; Introduction; The experimental and bioinformatic workflow; Recent achievements in metatranscriptomics; Conclusions and outlook; 6: Soil Proteomics; Introduction; Soil proteomics; Specificity of soil proteomics; Conclusions; 7: Soil Volatile Organic Compounds as Tracers for Microbial Activities in Soils; Introduction; Soil smells?; Volatiles produced by microorganisms; Volatiles from plant roots
Microbial volatiles affecting plant growthDegradation of VOCs; Retention, emission and measurement; Methods of VOC measurement; Microbial mass products; Conclusions; 8: Proteogenomics: A New Integrative Approach for a Better Description of Protein Diversity; Introduction; The current proteomic tools and approaches; Genome annotation of soil microflora gains in number but not in quality; Proteogenomics, mapping proteome data onto genome sequence; N-terminomics, new tools for an avalanche of results.; Contribution of proteogenomics to a better assessment of soil microflora; Concluding remarks
9: Analysis of Soil Metagenomes using the MEtaGenome ANalyser (MEGAN)

Sommario/riassunto

Soil is a unique biological system with an abundant microflora and a very high microbial diversity capable of performing multiple key ecosystem functions. The detection of genes in soil has improved the knowledge of unculturable microorganisms and led to a greater understanding of potential soil metabolic pathways. Further advances in understanding soil functionality are being realized by harnessing omics technologies, such as metagenomics, metatranscriptomics, proteomics, and volatilomics. The next challenge of systems biology and functional genomics is to integrate the information from omic