

ECCO XLII Meeting "Microbe & Microbiome Management for a Better Planet"

Session: Microbes for environmental sustainability, under a climate change scenario

Title: Harnessing Microbiomes for Drought-Resilient Agriculture: Insights from the BIOMEnext Project

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The global increase in water scarcity presents a major challenge to sustaining crop productivity. Lack of adequate water results in the degradation of the photosynthetic apparatus, interruptions in essential metabolic processes, increased production of free radicals, and compromised plant root structures. Drought is a key stress factor that directly affects the osmotic balance of plant cells. Within the BIOMEnext Project, innovative, composite, and eco-friendly farming systems have been evaluated to improve the resilience of Mediterranean fruit farming to climate change. Specifically, metagenomic analyses were conducted, characterizing the core rhizosphere and endophyte microbiomes and their predicted functions in four olive varieties (*Arbequina*, *Chemlal*, *Koroneiki*, and *Shengeh*) under wet and dry conditions during a one-year field experiment. DNA from both root endophytes and soil rhizosphere was extracted and sequenced using Oxford Nanopore technology, producing long reads of the *16S rRNA* gene. These long reads enabled species-level identification of the microbial composition using the Emu tool. Additionally, a novel tool was developed for functional annotation using PICRUST2 with long reads. A focus was placed on functions related to cold-heat stress, general stress and heat-shock, which are all functions often associated with drought resistance. Finally, PGP functions were also included in the research. This research allowed the identification of genera associated with these functions which, although not differing much at the functional level between the rhizosphere and roots, are completely different at the genus level. In fact, two core microbiomes has been defined, one for rhizospheric soils and one for roots, which are potentially involved in drought resistance.

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