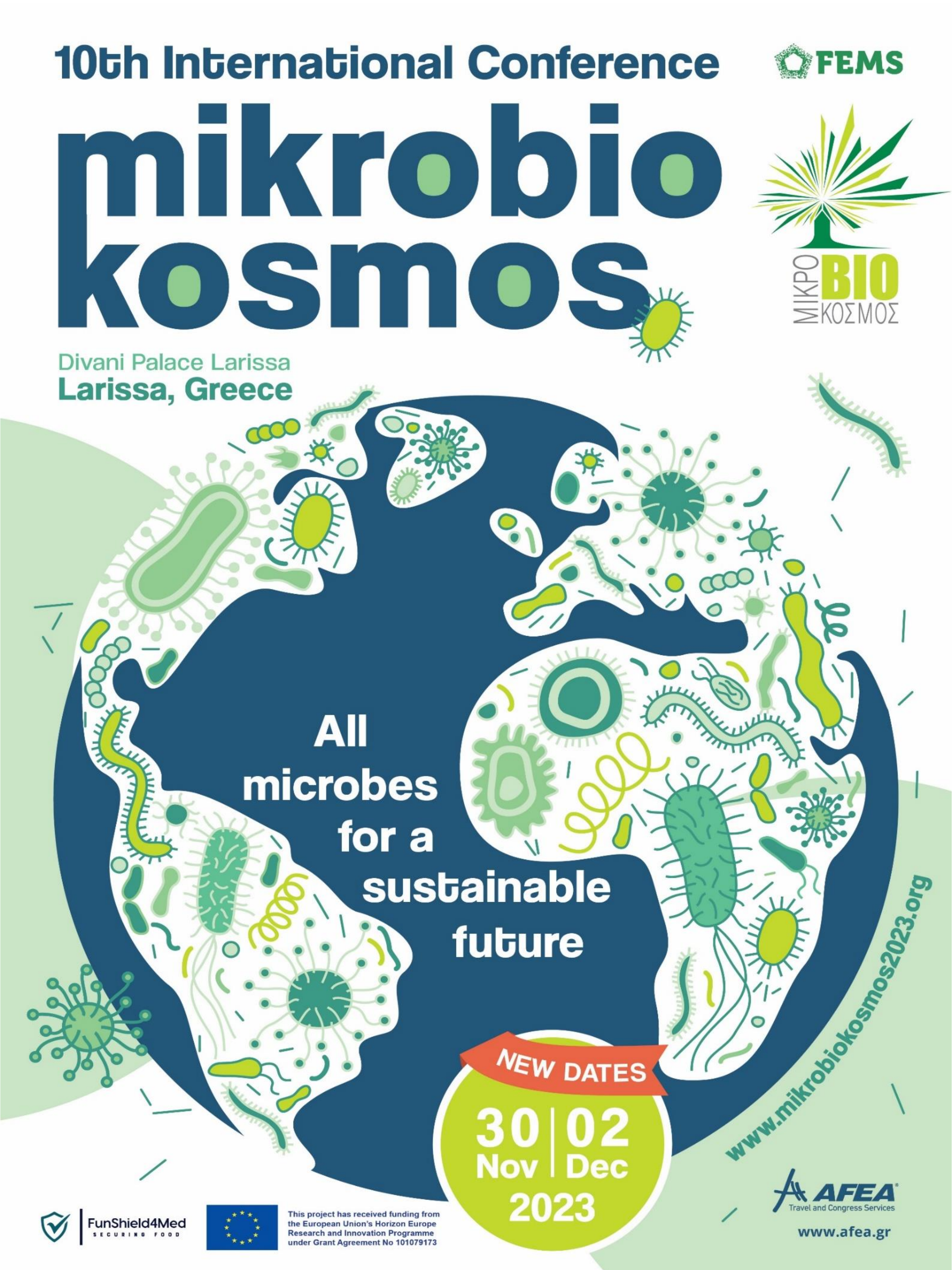

ABSTRACT BOOK

PP017

EXPLORING THE BIOCHEMICAL MODE OF ACTION AND SPECTRUM OF ACTIVITY OF SYNTHETIC AND BIOLOGICAL NITRIFICATION INHIBITORS

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The direct inhibition of soil ammonia-oxidizing microorganis (AOM) using synthetic nitrification inhibitors (SNIs) along with N fertilizers, is a well-established strategy for improving nitrogen (N) use efficiency in agricultural ecosyste and restricting groundwater and atmospheric pollution. In addition, functionally similar plant derived compounds that inhibit nitrification, called biological nitrification inhibitors (BNIs), have recently received increasing attention as safer and potentially more effective alternatives to SNIs. However, the efficacy of NIs in regulating soil N transformations is highly variable across soils and often suboptimal due to the variable sensitivity of soil AOM to different NIs, and the dependency of NIs performance on the composition of the metabolically active AOM community in soil. Importantly, while the inhibition mechanis of commercially available SNIs, and characterized BNIs, have been presumed to be associated with the inactivation of ammonia monooxygenase, their actual biochemical mode of action remains unknown, impeding any prediction about their biological spectrum of inhibition against the different groups of AOM and posing an important awback for the improvement of N fertilizer use efficiency. Within the framework of the European Union's Horizon 2021-2027 research and innovation programme ACTIONr, we aim (a) to define the mode of action of selected synthetic and biological NIs against soil representative strains of ammonia-oxidizing bacteria (AOB) (Nitrosospira multiformis and Nitrosomonas communis) and ammonia-oxidizing archaea (AOA) (Nitrososphaera viennensis, Ca. Nitrosotalea sinensis, Ca. Nitrosocosmicus franklandus) using proteomic and transcriptomic approaches, and (b) to develop, optimize and use synthetic microbial communities of nitrifiers as an ecologically relevant tool for NI activity screening by co-culturing two or more selected strains with distinct functions in nitrification (e.g., AOB/NOB, AOA/NOB and AOB/AOA/NOB). Overall, our work is expected (i) to contribute to the development of novel NI N-fertilisers, with improved performance, combining NIs with a complementary spectrum of activity against the main groups of nitrifying microorganis, and (ii) to provide innovative methodological tools for the in vitro study of the impact of NIs and other established agrochemicals on soil ecosystem functioning.

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