

Together or alone? How endohyphal bacteria impact their fungal host?

Fungal-bacterial interactions are quite common in nature. Due to the development of microscopic and molecular techniques, in the beginning of the 21st century, a special type of such interactions have been discovered - bacteria living within fungal hyphae. The relationships between Mucoromycota fungi and their endohyphal bacteria are of particular interest. Mucoromycota representatives, contrary to ascomycetous and basidiomycetous fungi, harbour only a narrow group of symbionts which makes it easier to extract and dissect the impact of one particular bacterial species on the host. Secondly, if the relationship between the fungus and bacteria is facultative, it is possible to manipulate the partners and, thus, to unravel the molecular mechanism underlying forming the symbiosis. Moreover, the ancestors of Mucoromycota were probably among the first eukaryotic colonizers of the land, and possibly helped plant with terrestrialization. Studying the interactions between Mucoromycota fungi and their symbionts can thus help understand the dynamics of the terrestrialization processes.

The main aim of this study is **to understand the impact of endohyphal bacteria on biology and fitness of their fungal host under optimal and stress conditions. The study will be conducted on a recently described relationship between *Umbelopsis* and *Paraburkholderia*.** In this project, I also plan to analyze the molecular mechanism responsible for establishing the symbiosis.

In order to achieve these goals, an experiment in which growth rate and differential gene expression profiles will be compared between fungus with and without endohyphal bacteria in optimal conditions, as well as osmotic, thermal, and cell membrane stress. The results of the experiment will help answer the question how the bacteria impact the fungal growth and gene expression depending on the environmental conditions.

Ecological and molecular characterization of the previously unknown relationship between fungus and endohyphal bacteria can also bring us closer to answering the question about the wider evolutionary context of bacterial-fungal interactions, including their role in plant terrestrialization.