

Plant roots host a wide spectrum of endophytic fungi ranging from parasites through neutralistic fungi to mutualistic mycorrhizal fungi. In most of terrestrial ecosystems, these groups of symbiotic fungi are well documented. However, much less is known about fungal endophytes of aquatic plants, especially the only group of submerged marine plants, seagrasses.

We focused on roots of the seagrass species *Posidonia oceanica* which is a Mediterranean endemite. Its roots hosted an abundant presence of endophytic fungi. We examined the roots using optical and electron microscopy in order to study its morphology. We isolated the mycobionts and determined their taxonomic classification.

A specific symbiosis of *P. oceanica* roots and dark coloured septate fungus has been recorded all over a vast area of the Mediterranean spreading from southern Spain to south Turkey. The fungus forms distinctive and typical structures: superficial hyphae occasionally forming hyphal sheaths or dense hyphal nets, intraradical hyphae colonizing extracellular space and, occasionally, primary cortex cells, and finally intracellular microsclerotia. The colonization pattern of the fungi resembles dark septate endophytes (DSE), group of fungi commonly found in roots of both terrestrial and freshwater plants.

In our following studies, we isolated the fungal endophytes of *P. oceanica*, cultivated axenic cultures and determined the mycobionts. In our first study, samples from a large area of the northwestern Mediterranean including Spain, south France, northwestern Italy and southern Croatia was examined. Subsequently, we focused on studies performed in smaller regions such as central Croatia, Sicily, southern Croatia, western, southwestern and southern Turkey. Globally, the fungal communities were dominated by ascomycetes, majority of them being represented by a dark septate fungus determined as “Pleosporales sp. MV-2012”. Second most abundant isolate was an ochre fungus determined as “Lulworthiales sp. MV-2012”. Other taxons were represented by merely single or very few isolates. Samples from central Croatia were further analyzed using pyrosequencing. Similar results were recorded as the community was dominated by Pleosporales sp. MV-2012 with Lulworthiales sp. MV-2012 also being recorded.

In terrestrial plants, colonization of roots by specific mycorrhizal association often influences root hair formation. Mycorrhizal fungi take over the role of root hairs in plant nutrition. In our final study, we tried to discover a potential relationship between presence and abundance of root hairs and fungal colonization of *P. oceanica* roots. Young seedlings possessed a dense root hair cover whereas they were completely lacking fungal colonization. On the other hand, established

seedlings and adult plants were frequently colonized by endophytic fungi but their root hair abundance diminished. The root hairs were frequently forming morphologically distinctive apical structures and spirally formed cell walls. These adaptations provided increased attachment to the substrate.

Obviously, *P. oceanica* and endophytic fungus known as *Pleosporales* sp. MV-2012 form a specific and morphologically distinctive symbiosis. This association influences the occurrence and density of root hairs and has a potential role in life and nutrition of the host seagrass.