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DIVERSITY, ECOLOGICAL ROLE AND POTENTIAL BIOTECHNOLOGICAL APPLICATIONS OF MARINE FUNGI ASSOCIATED TO MEDITERRANEAN SEAGRASSES AND ALGAE

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Abstract

The marine ecosystem is an extreme environment characterized by high salinity, low water activity and scarcity of nutriment. Marine fungi play important ecological roles and represent a large source of novel metabolites and enzymes. Despite their great biotechnological and pharmaceutical potential, they remain one of the most under-explored group of organisms in the marine environment. Moreover, research on the chemistry of marine fungi demonstrated the great versatility in biotechnology and pharmacology.

The aim of this study was to isolate and identify fungi associated with the seagrass *Posidonia oceanica* and the green alga *Flabellia petiolata* to compare from a quali/quantitative point of view the two mycofloras and to understand the ecological role of fungi on these substrates. The sampling was conducted in March 2010 in four meadows of *P. oceanica*, localized in 2 sites (Margidore and Ghiaie) at upper sub littoral (3-5 m deep) and intermediate sub littoral (15-16 m deep) bathometry, on the cost of the Elba Island (Livorno, Italy).

Hundreds of marine fungi were isolated and identified; most of them represent saprotrophic species, but some could be symbionts of algae or seagrasses (*i.e. Verrucocladosporium dirinae* and *Arthropyrenia salicis*) or parasite of plants and marine animals (*Botryosphaeria stevensii, Acremonium alternatum, Gibberella pulicaris, Sirococcus clavigigneti*).

Hundreds of strains were grown at different salt concentrations and tested by means of a quali-quantitative microtitre plate method for the rapid screening of oxidoreductase (laccases, peroxidases) and tannase activity.

In addition, to select strains able to produce secondary metabolites of pharmaceutical interest, 101 strains were screened for the presence of polyketide synthase (PKS) genes (it is well known that strains possessing these genes produce a significantly higher number of metabolites with pharmaceutical potential) and for their antimicrobial activity toward one pathogenic bacterium, four pathogenic yeasts and two algae involved in zoogenic disease.

The obtained results suggest that marine Ascomycetes are good producers of oxidative enzymes and tannases and hence can play an important ecological role in the decomposition of lignocellulosic matrixes in the marine environment can also be exploited for the production of these enzymes for different biotechnological purposes.

Moreover the molecular screening showed that 48% of the fungal strains resulted positive for the presence of PKS genes and many of them showed a strong antibacterial (26%), antifungal (17%) and/or antialgal (5%) activity.