Marine-derived fungi as potential indicators of sediment quality and bioremediation tool: preliminary study

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Introduction: Fungi from marine environments, referred as "marine-derived fungi", contribute to the energy flow and productivity of marine ecosystem [1]. Fungi play a central and active role in the biogeochemical cycles of marine sediments and may be influenced by many environmental factors (e.g.: salinity, temperature, pH, high hydrostatic pressure, etc). However, marine environment represents a largely unexplored niche for unidentified fungi, which may possibly be used in biotechnological processes. In fact, some studies show that the reintroduction of indigenous microorganisms, isolated from contaminated areas after culturing, provide an effective bioremediation strategy [2; 3]. This study is aimed at giving a multidisciplinary characterisation of marine bottom sediments of the eastern Gulf of Tigullio (northwestern Italy; Fig. 1) contaminated by ecotoxic metals derived from the Acid Mine Drainage (AMD) of the abandoned Libiola Fe-Cu sulfide mine (Sestri Levante). A further goal is to evaluate how the chemical and physical factors may affect the fungal community, and to explore the biotechnological potential of the marine isolates in the ecotoxic metal bioremediation.

Methods: Bottom sediments were sampled from a ecotoxic metal contaminated costal area of Tigullio at 24 stations. The sediments were analysed under different points of views: physical, chemical, mineralogical, and mycological. In particular, fungal characterisation was achieved by inoculating sediments in Petri dishes with different culture media. The fungal strains were identified with a polybasic approach which includes morphological and physiological identification, extraction of genomic DNA, PCR amplification, and DNA sequencing. A Principal Components Analysis was used to understand spatial variation of marine-derived mycobiota in relation to the environmental parameters, which characterise the bottom sediments (dimensional classes, mineralogy, and metal concentration) and water column (temperature, salinity, dissolved oxygen, irradiance, turbidity, and pH).

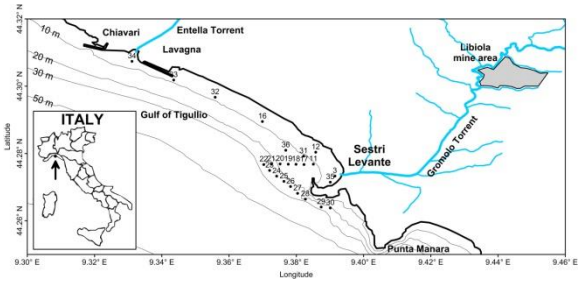

Fig. 1: Area of investigations.

Results: 244 microfungal strains were isolated. The quantitative analysis showed a mean value of 7.55 strains per gram of sediment. The most frequent genera are: *Aspergillus*, *Cladosporium*, *Penicillium*, and *Thricoderma*.

The PCA analysis showed that the higher microfungal amount and diversity can be found at the deeper sampling station in front of Sestri Levante headland. Conversely, the low microfungal abundance were observed at the stations along Lavagna beaches, where metal concentration is higher and wave action is more pronounced.

Discussion: The results highlight a significant presence of microfungal communities with a high level of adaptability to the effects of environmental ecotoxic pollution, temperature, salinity, and dissolved oxygen marine changes. Moreover, the achieved data suggest that the high metal concentration produces a considerable reduction of mycobiota. This reduction is likely due to high water temperature and salinity values, and to the change of the grain size of sediment particles.

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References: [1] Kohlmeyer et al. (1979) *Academic Press NewYork* pp.690; [2] Raghukumar et al. (2012) *Biology of Marine fungi* pp.334; [3] Zotti et al. (2014) *Chemosphere* **117(1)**:471-476.