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SELECTION OF AUTOCHTHONOUS AND ALLOCHTHONOUS FUNGAL STRAINS FOR THE TREATMENT OF RECALCITRANT WASTEWATERS

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Presentation

The DBIOS of the University of Turin encompasses different multidisciplinary areas (ecology, evolution, conservation and microbiology). The Mycotheca Universitatis Taurinensis (MUT) is its fungal collection, with a great value from the systematic, ecological and applications point of views. The MUT aims are the acquisition, identification, characterization, preservation and distribution of its 5000 fungi. The MUT is certified ISO 9001, and is affiliated to the World Federation Culture Collections and to European Culture Collections' Organisation.

The DICEA of the University of Florence carry out research in industrial and domestic wastewater treatment and reuse, and solid waste treatment, with expertise in biological processes monitoring, modelling and engineering of suspended and attached growth systems, microbial communities characterisation and selection through respirometric, titrimetric techniques. DICEA collaborates with several local public agencies, enterprises, industrial consortia, and external research centres.

The DB of the University of Pisa represents one of the most consistent and active organization within the University. The author team is mainly interested in the characterization of microbial organisms, with particular regard to eukaryotic microbes and their bacterial symbionts. In particular, the team has expertise in studying microbial eukaryotes using a multidisciplinary approach, comprehending a morphological, ultra-structural and molecular characterization.

Abstract

Human activities generate a variety of wastewaters that need appropriate treatment before their discharge in the environment. Some kinds of wastewaters are particularly hard to treat in traditional wastewater treatment plants on account of their toxicity and recalcitrance, which limit the growth and the metabolic activity of heterotrophic bacteria in activated sludge. Among the most impacting wastewaters there are tannery wastewaters and landfill leachates. Both of them are characterised by a dark colour basically due to humic acids and tannins for landfill leachate and tannery effluent, respectively (Primo et al., 2012; Srinivasan et al., 2012).

Bioremediation by means of robust and versatile fungal strains may represent a valid implementation, thanks to fungal extracellular oxidative enzymes with non-selective catalytical activity are the responsible agents of the degradation of recalcitrant compounds with high redox potential, which are instead hard to handle by other organisms, such as bacteria (Wesenberg et al., 2003). Actually, the complementarity of fungi with respect to bacteria was recently demonstrated: fungi are more effective in the removal of colour than in the removal of COD and toxicity, whereas bacteria decreased COD but are ineffective towards colour (Anastasi et al., 2012).

At the base of a successful treatment there is, thus, the selection of interesting strains able to remain metabolically active in the forbidding condition of toxic wastewaters. The selection of fungi can be performed by exploring the biotransformation capability of autochthonous strains, which are already adapted to toxicity and to competition with

autochthonous bacteria. Otherwise, it can be performed by taking into consideration allochthonous fungal strains coming from well-characterised collections of microorganisms and endowed of strong features.

In the present work, 30 autochthonous fungal strains isolated from leachate and tannery effluent were compared to 8 allochthonous strains, kindly provided by the fungal collection of *Mycotheca Universitatis Taurinensis*. They were studied to assess their potential in the decolourisation and detoxification of a landfill leachate and tannery wastewater. An allochthonous fungal strain was selected as the best bioremediation agent towards landfill leachate; on the contrary, towards tannery wastewaters different strains seems to be active towards different parameters of the effluent. Finally, the exploitation of a support for the immobilisation of the biomass and its effect on decolourisation yields were evaluated.

References

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