TREATMENT OF RAW LEACHATE AND SYNTHETIC RECALCITRANT COMPOUNDS USING A SELECTED WHITE ROT FUNGUS

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Recalcitrant compounds represent a serious concern in wastewater treatment since conventional processes are not suitable for their removal. In recent years, white rot fungi (WRF) with their potential of removing hazardous and recalcitrant pollutants, have been regarded with increasing interest (Kalčikova, 2014). Due to the high organic content, the decontamination of landfill leachate requires innovative and sustainable technologies, among which fungal-based one show interesting potential (Kamaruddin, 2014).

This study focused on fungal treatment of few effluents samples through batch tests. A total of 12 fungal strains were screened for their ability to treat raw leachate. Among them, 9 strains were collected and isolated from S. Colombano wastewater treatment plant (Italy) mixed liquor and 3 strains were obtained from the *Mycotheca Universitatis Taurinensis Collection* (MUT, University of Turin). Color removal, pH, two enzymatic activities (laccases and manganese-dependent peroxidases) were measured. Several fungal strains, including 3 autochthonous strains and an allochthonous one, resulted effective in the decolourisation of leachate up to 40% within 4 days of treatment. Enzymatic activity was detected in 2 allochthonous strains: one strain was able to produce laccases and the other one manganese-dependent peroxidases. Since previous studies showed that peroxidases are the major enzymes involved in the decolourisation of landfill leachate (Tigini et al., 2013), *Bjerkandera adusta* MUT 2295 was selected as the optimum strain due to its capability of decolorizing leachate up to 40%, combined with manganese-dependent peroxidases activity (Figure 1).

The efficiency of the treatment, in terms of organic and color removal, *was* tested on landfill leachate (Winnipeg, Canada) and two synthetic recalcitrant compounds mixtures prepared with 1) tannic acid and 2) humic acid. *B. adusta* was immobilized on polyurethane foam cubes. Each trial was triplicated including the same number of abiotic controls. The fungus could decolorize raw leachate, humic acid and tannic acid up to 49%, 42% and 25%, respectively (Figure 2). The results showed also a reduction of the chemical oxygen demand (COD) of 48%, 61% and 48% in raw leachate, tannic acid and humic acid, respectively (Figure 3). The percentage of COD removal detected in the treatment regard to the one observed in the respective control was far higher in 2 out for 3 effluents tested. Only in raw leachate the percentage of COD removal was the same in the treatment and control. This result could be presumably due to the presence of autochthonous microorganisms in the leachate capable of removing a certain amount of recalcitrant compounds from leachate itself, as already reported in literature (Anastasi et al., 2010).

In conclusion, the results encourage the use of the selected fungus as potentially effective in the treatment of the tested recalcitrant compounds. Further investigations could allow optimizing the treatment efficiency, enabling its application on wider scale, using bioreactors.

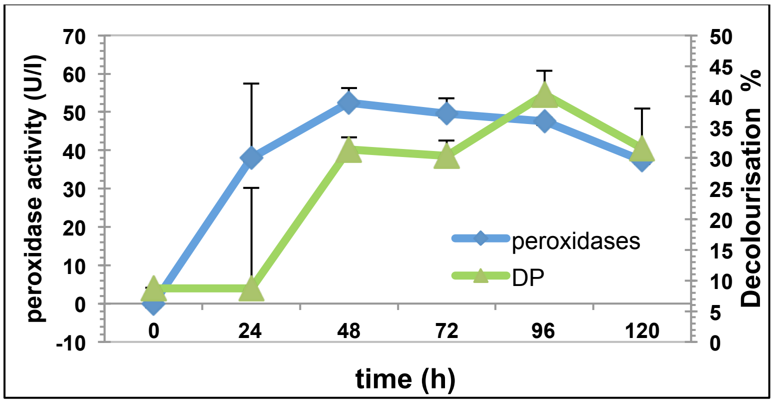
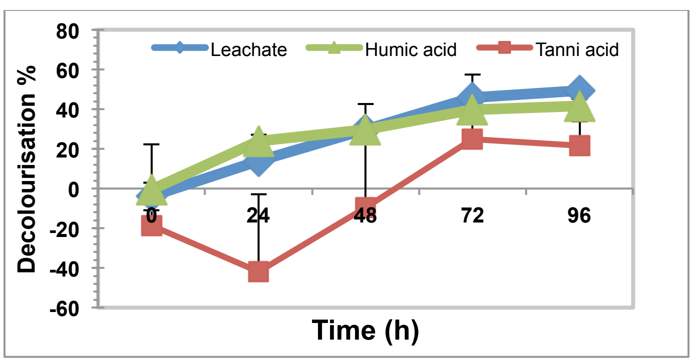


Figure 1. Peroxidases activity (U/l) and decolourisation percentage by *B. adusta* (MUT2295)



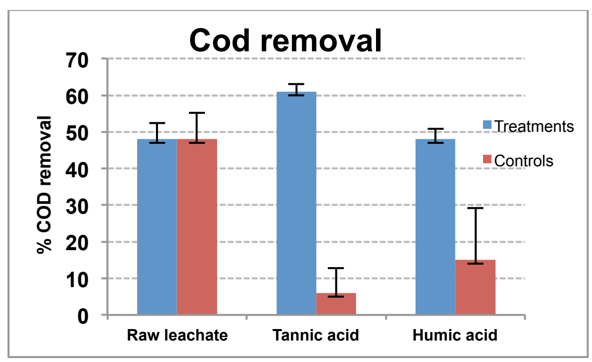


Figure 2. Decolourisation percentage in raw leachate, humic acid and tannic acid by *B. adusta*

Figure 3. Percentage of COD removal in the different effluents after 10 days of treatment with *B. adusta*

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