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Biodegradation, decolourization and detoxification of natural melanoidins from distillery spent wash using Trametes versicolor

Environmental pollution caused by industrial effluents containing coloured compounds is widespread. One such effluent is distillery spent wash, the unwanted residual liquid waste generated during alcohol production, majorly consisting of large amount of brown pigments known as melanoidins. In this study, Trametes versicolor, a white rot fungus, was exploited for
decolourization and degradation of melanoidins present in distillery spent wash. The parameters effecting the decolourization and degradation of the effluent were optimized using Response Surface Methodology involving Box Bhenken design. Maximum decolourization of 71± 2% and COD reduction of 68 ± 2% was observed at 30℃, under shaking condition in acidic pH range of 5-5.5 at an inoculum size of 10 %(v/v). During decolorization, laccase, manganese independent peroxidase was detected however, these ligninolytic enzymes were not responsible for decolourization instead a membrane bound enzyme which was expressed in low nitrogen condition was found to bring about decolourization. Decolourization of sequential aliquots of molasses spent wash by the pellets of Trametes versicolor further confirmed that the process of decolourization was brought about by microbial metabolism and not by sorption. The toxicity of the untreated and treated distillery spent wash was evaluated by performing phytotoxicity using cow pea, (Vigna unguiculata) seeds and fish toxicity studies using comman guppy, Lesbistes reticulates. Ames mutagenecity test performed using tester strain TA-100 evaluated the mutagenecity of the effluent. Liver enzymes which are the biomarkers of stress such as aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase and catalase were estimated from the fish exposed to the various effluents where the enzyme levels in the microbially treated distillery effluent were same as that of the control. The present research shows that treatment of distillery spent wash by using white rot fungal culture Trametes vericolor is not only
feasible but also the most one of the most effective and economically benefiting treatment ‘technology.
Keywords: Distillery spent wash, Response Surface Methodology, Phytotoxicity, Fish toxicity

Authors: Dr ACHARYA, Bhavik (BRD School of Biosciences, Sardar Patel University); Prof. MADAMWAR, Datta (Department of Biological Sciences, P. D. Patel Institute of Applied Sciences, Charotar University of Science and Technology, Changa); Dr DIVECHA, Jyoti (Department of Statistics, Sardar Patel University.); Dr MOHANA, Sarayu (Department of Microbiology, Mount Carmel College (Autonomous), Bengaluru)

Presenter: Dr MOHANA, Sarayu (Department of Microbiology, Mount Carmel College (Autonomous), Bengaluru)

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