A Review on Bioremediation of Waste Effluent Associated with Pulp and Paper Industry

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Abstract : Pulp and paper industry is one of the fastest growing industries due to an increased demand in paper products. For it to satisfy this ever increasing demand, it adopts new technological innovations some of which are proved to affect our environment negatively. Global consumption of paper has increased by 400% in the last four decades and this suggests that more research is required to assess the impact of industrial effluents to our environment and public health. Paper products are generally biodegradable, however, the processes involved in its production which involve the use of mainly bleaching agents and other non-biodegradable substances pose serious problem to the environment. There are more than 250 chemicals released in paper mill waste and some are xenobiotics. Different methods such as physical and chemical methods can be adopted for the remediation of the effluents but are proved to be costly and not safe to the environment. On the other hand, biological method is shown to be less costly and environmentally friendly. Microorganisms and their enzymes have shown a promising future for bioremediation of effluents related to paper mill. Many studies prove that one of the major pollutants in the paper mill effluent is phenol especially its chlorinated derivatives. Pentachlorophenol is extremely hazardous to living cells and therefore need to be removed from the environment. Microorganisms including bacteria and fungi have the potential to degrade phenolic compounds e.g. Bacillus stearothermiphilus, Pseudomonas putida, Coricus versicolor, Sphingomonas chlorophenolica, Fusarium sp, Bacillus subtilis and P. aeroginosa. Enzymes used for the degradation include phenol hydrooxylase, polyphenoloxylase, laccase, peroxidase among others. Lignin is another important pollutant and is resistant to microbial degradation but it has been proved that certain bacteria and fungi like can degrade it. Among the fungi white-rot fungi like Fomes lividus and Trametes vesicolor are the most important bioremediators. This review focused on use of microorganism to reduce or eradicate pollutants released from the paper industry. It can serve as a review for further research to be conducted especially in the field of Biotechnology.

Keywords : bioremediation, pulp and paper, pentachlorophenol, environment

Conference Title : ICBAE 2015 : International Conference on Biological and Agricultural Engineering

Conference Location : Jeddah, Saudi Arabia

Conference Dates : January 26-27, 2015

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