Bio-bleaching Of Wood Pulp: A Promising Approach To Protect The Environment From Chlorinated Pollutants

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Chemical bleaching is a key process to any mill in order to get the paper white. This process uses chlorine and other chemicals to whiten the pulp. Unfortunately, chemical bleaching produces a lot of toxic chlorinated hydrocarbons, which get released into the environment with the wastewater from the mills. These chemicals grab onto other chemicals besides hydrogen, thus creating highly toxic chemicals called "organochlorines", which are basically poisons, such as dioxin. Biotechnology can play a major role in establishing the new, technologically advanced and effective processes in this industry. Present study exploits the capability of laccase secreting bacterium, Pseudomonas Stutzeri, isolated from a forest site (Roorkee, India) to bleach the wood pulp biologically. A plate assay method was developed to screen the isolated bacteria for laccase secretion. The isolated bacterium Pseudomonas Stutzeri produced laccase as the predominant extra cellular phenoloxidase. Syringaldazine (0.20µM) was found as the best inducer for laccase induction. Laccase activity in the crude extra cellular medium and purified sample was assayed by monitoring the oxidation of 2,2'-azinobis-(3-ethylbenzthiazoline-6-sulphonate) at 420 nm.

In a trial to bleach the wood pulp biologically, extra cellular medium of the culture of Pseudomonas Stutzeri was concentrated 20 times and unbleached wood pulp (8% consistency) was incubated in it for 2 hours at 37°C following by 2 hours incubation at 70°C for alkali extraction. Use of laccase secreted by Pseudomonas stutzeri has been found effective to bleach the wood pulp to an extent of 14% brightness as measured spectrophotometrically. Bleaching of wood pulp could be observed when unbleached pulp was incubated at 37°C for two hours in the concentrated extra cellular medium containing enzyme and mediator. Bio-bleaching eliminates the use of chlorine in bleaching process of pulp mills and thus stops the generation of chlorinated toxic pollutants.

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