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PRETREATMENT OF PINE NEEDLE WASTE BIOMASS THROUGH ENZYMATIC COCKTAIL FOR BIOETHANOL PRODUCTION

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Pine needles are one of the most important forest biomass material available with serious implications on local understory vegetation besides incidences of forest fires which have both short and long-term effects on environment. The biomass can be put to varied uses by proper exploration of its constituent biopolymers such as cellulose, hemicellulose, lignin etc. Prior treatment of this lignocellulose biomass through various physio-chemical agents like acids, bases, high energy radiations etc help in faster degradation of these polysaccharides to fermentable sugar and finally to bioethanol. However, various inhibitors; like 5-hydroxymethylfurfural (HMF) and 2-furaldehyde (furfural) released in the hydrolysate affect growth of the fermentative agents due to cellular damage during fermentation. In view of this, environment friendly and economically feasible technologies are required to be experimented/invented for inhibitor free fermentation processes. Enzymatic pretreatments offer several added advantages over chemical treatments with higher conversion efficiency, the absence of substrate loss and use of process friendly operating conditions. Use of three different enzymes i.e. cellulase (8.56 U/mg protein), xylanase (95.19 U/mg), and ligninase (75.24 U/mg) from *Bacillus* spp. CPB-21 & XPB-11, *Pseudomonas* sp. LPB-06 respectively resulted into 35 ml of fermentable sugar without any side product or inhibitor with initial 50 g of pine needles in 50 ml (0.1 M sodium citrate buffer pH 7.0) after 24 hr incubation under continuous agitation. The process scale-up when tried with 1000 ml of hydrolysate using *Saccharomyces cerevisiae*, resulted in about 54 % conversion after 48 hr of incubation with 90% purity. The outcome of the

present work seems promising and can help to provide a new environment friendly enzymatic pretreatment process for the production of bioethanol a renewable source of energy from the forest waste after further R&D and scale-up trials.



Biography

Dr. Bhatia working as a Post Doctorate Fellow in the Deptt. of Biotechnology Himachal Pradesh University Summer Hill, Shimla. He is working in the area of biofuel technology from last two year especially on the biotransformation lignocellulosic waste biomass into biofuels. He has eight years research and teaching experience in various areas of biotechnology. During his Doctoral research he developed bioprocess for the production of anticancer compounds and has published more than 20 research papers in various reputed journals, with more than 150 citations. He is also a budding bio- entrepreneur and acting as a team leader in his startup related to bio-transformation of solid waste into biofuel

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