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Cellulase and Xylanase Production by *Pleurotus* sp. on Mixed Substrate System

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Abstract

In this study, *Pleurotus flordia* and *Pleurotus djamor* is used for solid state fermentation studies and sugarcane bagasse, wheat bran and sugarcane bagasse with wheat bran (in different ratio) are used as the substrate. The fermentation studies are carried out in 7 days intervals up to 28 days. Sugarcane bagasse and wheat brane has the highest degradation of cellulose and hemicelluloses. The mixed substrate (sugarcane bagasse with wheat bran) has comparatively low degradation of cellulose and hemicellulose. *P.djamor* plays better performance in cellulase and xylanase production. Cellulase production is enhanced in sugarcane bagasse by *P.djamor* mean while xylanase production is enhanced in wheat bran by *P.djamor*. Both *P.djamor* and *P.florida* has obstructed on cellulase and xylanase production on mixed substrate (sugarcane bagasse mixed with wheat bran)

Keywords: *P.florida*; *P.djamor*; Cellulose; Xylanase; Fermentation

Introduction

Pleurotus sp. are wood destroying saprophytic fungi which occur widely in the tropical and temperate zones [1]. Species of *Pleurotus* are commonly known as "Oyster Mushroom". *P.sajor-caju, P.fabellatus*, *P.erungii*, *P.citrinipileatus* are commonly cultivated [2]. Bioconversion of lignocellulosic residues through mushroom cultivation offers the potential of converting them into protein rich, palatable food [3]. As early as straw is found to be a good substrate for growing *Pleurotus* [4] since that time, it's use has been studied in most of the rice producing countries of the world. The ability of *Pleurotus* species to excrete hydrolyzing and oxidizing enzymes has enabled them to flourish over a wide range of natural lignocellulosic waste materials [5,6]. India has great future to cultivate mushrooms. It can be artificially cultivated on different agricultural waste like paddy straw, wheat straw, sugar cane bagasse and etc.,. The artificial cultivation of oyster mushroom has not only economically efficient for farmers and has the ability to produce extracellular lignocelluloytic enzyme like cellulase, xylanase, lignin peroxidase, manganese peroxidase and laccase [7,8].

In recent years, the lignolytic degradation and extra-cellular enzyme production by *Pleurotus* sp. has been extensively studied. The enzyme excretion have varied during colonization and fructification stages of *Pleurotus* growth [9]. To overcome these crises, various methods have been used for the production of extra-cellular enzyme [10]. Enumerated the advantages of extra-cellular enzymes production by *Pleurotus* through Solid State Fermentation (SSF) [11]. Showed about ligninolytic and celluloytic enzyme pattern and activities were influenced by substrate. Thus, the capacity of particular substrate to induce or increase production of lignocellulases is another factor that indirectly confers ability of extra-cellular enzymes production. The present study is focused on the production of cellulase and xylanase enzymes using *Pleurotus florida* and *P.djamor* on sugarcane bagasse, wheat bran and sugarcane bagasse mixed with wheat bran (co substrate) through Solid State Fermentation.

Materials and Methods

Pure cultures and maintenances

Pure culture of *Pleurotus flordia* and *P.djamor* were obtained from Tamilnadu Agriculture University, Coimbatore, Tamilnadu, India. They are maintained in Maltose Extract (ME) Medium, at pH 5.8 and incubated for at 25^{0}C and are sub-cultured regular interval of three weeks.

Substrate preparation and inoculation

Agriculture residues, Sugarcane bagasse and wheat bran were procured locally and allowed to dry. The agricultural residues were milled and powders made which were passes through 1 mm sieve.

Determination of cellulose and hemicellulose

Cellulose is estimated colorimetrically by the method described by [12]. Pure cellulose is used as the standard and it is obtained from Sigma-Aldrich. Hemicellulose is estimated colorimeterically by the method described by [13]. Pure xylose is used as the standard and it is obtained from Sigma-Aldrich.

Solid state fermentation studies

Ten gram of the substrate by dry weight is taken in 250ml flask and 60% of moisture is set for the substrate with distilled water and sterilized at 121^{0}C for 30min. After cooling, each flask is inoculated with five agar discs from the edges of actively growing colonies of *P.florida* and *P.djamor.* After inoculation, the flasks were incubated at 27 ± 1^{0}C. SSF is carried out in once every seven days.

Enzyme extraction

Sodium citrate buffer is used for enzyme extraction. The substrate is squeezed with sodium citrate using cheese cloth to get the culture filtrate. This is used as an enzyme source and is stored in refrigerator at 0^{0}C until use. Enzymatic assays are done in triplicate.

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