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**ENZYME PROFILES OF *Pycnoporus sanguineus* GROWING IN
SOLID SUBSTRATE FERMENTATION
ON SELECTED AGRO-RESIDUES**

By

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TO MY BELOVED PARENTS

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ABSTRACT

A comparative study was done for solid substrate fermentation (SSF) of sago 'hampas', oil palm frond parenchyma tissue (OPFPt) and rubberwood sawdust with a white-rot fungus, *Pycnoporus sanguineus* for enzyme production. Xylanase, laccase and cellulase productivity was assayed during degradation. Excellent growth of *Pycnoporus sanguineus* was observed for all the substrates studied over a 21 day time-course fermentation. Laccase productivity was highest during degradation of sago 'hampas' and OPFPt ranging from 7.4-7.6 U/g substrate on 11th day of fermentation compared to rubberwood sawdust with a maximum laccase of 5.7 U/g substrate on day 11 of SSF. Xylanase productivity recorded highest at 9.14 U/g OPFPt on 15th day of SSF compared to 7.64 U/g 'hampas' on day 11 and 8.56 U/g sawdust on 17th day. Maximum cellulase productivity was also for OPFPt about 6.59 U/g substrate at 9th day. Based on the production of enzyme cocktail for all the substrates, OPFPt produced highest amount of enzyme cocktail at 11th day of fermentation compared to rubberwood sawdust and sago 'hampas'. Thus, OPFPt was chosen as substrate for further studies to optimize bulk enzyme production.

Further investigation was done to optimize the extraction of the enzymes. Recovery of laccase was four times higher at 30.6 U/g substrate on day 10 of SSF using tap water as extraction medium at pH 5.0 at 25 ± 2°C compared to the initial extraction technique using sodium acetate buffer at pH 4.8 at 4° C (7.46 U/g substrate). Further optimization showed that laccase recovery increased 50% (46.5 U/g substrate) on day 10 of SSF while using extraction with tap water at pH 5.0 at 25 ± 2°C compared to the extraction technique using tap water (pH 8.0) without pH adjustment (30.6 U/g substrate). However, xylanase activity did not show significant difference with the various extraction temperature, medium and pH used.

This study showed that laccase and xylanase productivity was also influenced by the inoculum age, inoculum density and the nitrogen supplementation of the substrate. Solid substrate fermentation of OPFPt by *Pyc. sanguineus* produced maximum activity of laccase (46.5 U/g substrate) and maximum xylanase activity (9.12 U/g substrate) on day 6 of fermentation using 30% of 4 week old inoculum and 0.92% (2.0 X urea) of nitrogen content of substrate.

ABBREVIATIONS

Oil palm frond parenchyma tissue	OPFPt
Solid substrate fermentation	SSF
Lignin modifying enzymes	LME
Hydrogen peroxide	H ₂ O ₂
3,3,3',4',- tetrachlorobiphenyl	TCB
Polyaromatic hydrocarbon	PAH
Polychlorinated biphenyls	PCBs
Bleached, kraft-mill effluent	BKME
Mixed-function oxygenase	MFO

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