Elum, Ejiro Anslem (2019): Partial Lignin Degradation and Phenolic Monomers Formation in Enzymatically Pre-Treated Sawdust. Supervisor: Fischer (Masterthesis).

ABSTRACT

Increasing cost and environmental impact of production of aromatic compounds from petrochemical and fossil sources makes it imperative to explore cleaner and less expensive sources. The polymer nature of lignin is used to derive useful monomer compounds from renewable feedstock like sawdust, without prior isolation of lignin.

Laccase extract from a 12^{th} day growth medium containing *Trametes versicolor* treated with and without Cu^{2+} (30µM), was brought in contact with sawdust for 24, 48 and 72 hours, before oxidative depolymerisation using microwave assisted extraction (MAE) was performed.

Laccase activity, kinetics and pH were determined, and HPLC, UV-spectroscopy and percentage mass loss were applied to pre and post MAE extracts.

Peak laccase activity was on the 12^{th} day: 362 U/L in extract treated with Cu^{2+} and 24 U/L in enzyme extract without Cu^{2+}, while V_{max} and K_m were found to be 9.4 U/ml and 16µM as well as 114 U/ml and 15 µM for enzyme extract without and with copper respectively. Residual laccase activity was found to decrease slightly in Cu^{2+}-treated extracts, while increasing slightly in extracts without Cu^{2+}. More monomer compounds were produced in the post- as compared to pre-MAE extracts, however 4-Hydroxybenzahldehyde (4-HBA), vanillic acid (VS), vanillin (V), p-Coumaric Acid (p-CS) and Syringaldehyde (SA) were produced in both steps. Reduced or no detectable amounts of monomer compounds were observed in pre-MAE extracts containing Cu^{2+}, however benzoic acid and 4-HBA seemed to be higher in these extracts. V, VS, syringic acid and acetosyringon were increased in post-MAE-extracts treated with Cu^{2+}.

UV-Scan shows highest absorption by treatments containing enzyme with Cu^{2+} followed by enzyme without Cu^{2+}; water and untreated, in that order, while percent mass loss is slightly higher in copper containing enzymatically treated sawdust.

This study shows that useful aromatic compounds can be produced using enzymatically pretreated cheap and waste materials like sawdust in a simpler and cleaner way despite by-passing initial lignin isolation steps.