PRODUCTION OF XYLANASE BY *ASPERGILLUS NIGER* ATCC 16404 USING OIL PALM LEAF AS SUBSTRATE

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Thesis submitted in fulfillment of the requirements for the degree of Doctor of Philosophy

Faculty of Chemical Engineering

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CONFIRMATION BY PANEL OF EXAMINERS

I certify that a panel of examiners has met on 25th June 2015 to conduct the final examination of Norazlina Binti Idris on her Doctor of Philosophy thesis entitled “Production of Xylanase by Aspergillus Niger ATCC 16404 using Oil Palm Leaf as Substrate” in accordance with Universiti Teknologi MARA Act 1976 (Akta 173). The Panel of Examiners recommends that the student be awarded the relevant degree. The panel of Examiners was as follows:

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ABSTRACT

Malaysia generates agricultural wastes (agro-wastes) with the volume nearly 5 million tonnes yearly. At present, oil palm fronds are the major composition of agricultural waste materials that are exported to European countries for the industrial needs. Automatically, there is also a lot of oil palm leaf that was thrown away without being utilized. Oil palm leaf (OPL) was exploited as substrates for the cultivation of *Aspergillus niger* ATCC 16404 for the production of xylanase via solid state fermentation (SSF). SSF is generally defined as the growth of the microorganisms on solid material in the absence or near absence of free water. Five fermentation parameters were investigated in determining the most influential factors in maximizing the xylanase activity and via the five-factor two-level factorial design (statistical experiment design), only ratio of carbon and nitrogen, fermentation temperature and fermentation time were significant. These three significant parameters were optimized in Response Surface Methodology (RSM) using Central Composite Design (CCD) and it shows the optimized values for ratio of carbon and nitrogen is 0.3443, fermentation temperature is 31.2°C and fermentation time is at 6.7645 days (162.35 hours) with 53 U/ml of xylanase activity. By using the optimized OPL crude xylanase for the enzyme kinetic determination, it shows Lineweaver Burk plot with $R^2$ equal to 0.9374, $V_{\text{max}}$ was 156.25 U/ml and $K_m$ was 2.078 is the most suitable model in which these results were comparable with the commercial xylanase where $R^2$ 0.967, $V_{\text{max}}$ 270.27 and $K_m$ was 1.757 respectively. Furthermore, the optimized crude xylanase also utilized in the sugarcane bagasse delignification and juice clarification. In comparison with commercial xylanase, OPL crude xylanase showed positive capability results as it was successfully remove the lignin and clarified the juice.
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