Thanyarath Sahaya 2008: Effect of Operating Parameters on Protease Production in One and Two Stage Packed-bed Fermentors. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Assistant Professor Jarun Chutmanop, D.Eng. 124 pages.

This research studied the effect of operating parameters on the protease production in the 50 L packed bed fermentors. The experiment was separated into 3 parts. Firstly, the protease production was carried out in one-stage packed-bed fermentor. The substrate was the mixture of wheat and rice bran at the ratio of 1:3 using 10 cm of the substrate thickness, 0.3% *Aspergillus oryzae* inoculums by weight of substrate and 10% (by weight) wheat flour of substrate. The initial moisture content of the substrate was 50% and the air flow velocity in one–stage packed-bed fermentor was varied to 0.05, 0.10 and 0.15 m/s. The protease production in the one–stage packed bed with inlet air flow and non-aerated was compared. The results showed that fungi can grow better with the inlet air flow condition. Therefore, the obtained highest protease activity is 713.57 U/g dry substrate at the air flow of 0.10 m/s and at the 96 hours of fermentation. This maximum protease production is 2.43 times higher than non-aerated condition. The humidifiers which increasing air humidity was using to prevent drying of the substrate, at the air flow in the packed bed fermentor of 0.10 m/s. It was found that the moisture content of substrate increased 39 % at the 60 hour and the maximum protease activity of substrate was 893.93 U/ g dry substrate at the 96 hour of fermentation.

Secondary, the best condition of a one stage packed-bed was applied to a two-stage packed-bed. Due to different design of each tray stage, it was found that the best condition was found if the tray without perforation was located at the 2^{nd} stage (lower tray). For the substrate packing at 10 cm bed of thickess, the protease activity were 680.83 and 620.54 U/g dry substrate at 1^{st} and 2^{nd} stage after 84 hours of fermentation. However, if the thickness of the 1^{st} stage (upper tray) was reduced to 5 cm while the thickness of the 2^{nd} stage was remained at 10 cm, the maximum protease activity were 664.96 and 990.84 U/ g dry substrate at 1^{st} and 2^{nd} stage after 84 hours of fermentation.

Finally, comparison of one-stage and two-stage packed bed fermentor were carried out for protease yield. To set the product of lab scale at 100 % of protease yield, the result indicated the two-stage packed bed fermentor gave high percentage yield as same as a one-stage packed bed fermentor. However, the two-stage packed bed have higher substrate loading and lower operating cost comparing to the one-stage packed bed fermentor.

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