Chollada Sirisatesuwon 2008: The Production of Lactic Acid with Immobilized *Lactobacillus rhamnosus* ATCC 10863. Master of Science (Biotechnology), Major Field: Biotechnology, Department of Biotechnology. Thesis Advisor: Associate Professor Sarote Sirisansaneeyakul, Dr.rer.nat. 171 pages.

Lactic acid is an essential organic acid, due to its widely used in food and food-related industries, and its role for the production of biodegradable plastic. This study improved lactic acid fermentation process by selecting culture medium for *Lactobacillus rhamnosus* ATCC 10863. The result showed that the optimal media consisted of (l^{-1}): glucose 10 g, yeast extract 15 g, $MgSO_4$ 0.2 g, $MnSO_4$ 0.03 g, sodium citrate 0.5 g, $FeSO_4$ 0.03 g, KH_2PO_4 2.5 g, NH_4Cl 5 g and H_2SO_4 0.015 ml. This optimal media gave the highest volumetric lactic acid productivity of 0.53 g l^{-1} h^{-1}.

Taguchi experimental design was used to optimize the production of lactic acid with immobilized *Lb. rhamnosus* ATCC 10863 and the 4 factors of L_9 (2^1x 3^3) orthogonal array were selected. The following conditions were obtained: 46.825 ml volume of beads, 93.75 volume of medium, 5.7 pH of medium and 500 ml size of flask. All these factors were found to be significant on lactic acid concentration and volumetric lactic acid productivity. At this optimal condition, lactic acid concentration and volumetric lactic acid productivity were 5.56 g l^{-1} and 0.93 g l^{-1} h^{-1}, respectively.

Batch, fed batch and batch with lactic acid recovery system in packed bed reactor with broth recycle were used to produce lactic acid. The beads/broth ratio of immobilized *Lb. rhamnosus* ATCC 10863 was 250/750. The batch with lactic acid recovery system gave the highest lactic acid and volumetric lactic acid productivity of 36.50 g and 1.14 g h^{-1}, respectively, which is higher than batch and fed batch production of lactic acid. Also, fed batch production of lactic acid showed the higher glucose consumption than batch production at the same initial glucose concentration.

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