CHAPTER V

CONCLUSION AND RECOMMENDATION

The main objectives in this study were to optimize the effectiveness strategy of D-(-)-lactic acid production from pineapple crown (PIC) including pretreatment by alkaline, enzymatic hydrolysis using crude cellulase enzyme and the suitable fermentation mode by engineered *K. oxytoca* KIS004-91T. The optimized pretreatment process of PIC was established using 0.75N NaOH at 90°C for 90 min in which 28.35% of lignin and 66.67% of ash was removed compared to the untreated-PIC. Furthermore, cellulose content of PIC was increased to 50.13% after the pretreatment whereas the untreated PIC obtained only 33.12% of cellulose. Fermentable sugar was generated with impressive concentration (13.69±0.36 g/L) from 20 g/L of pretreated PIC by using 60 PCU crude cellulase cocktail /g for hydrolysis for 24 h. Accordingly, D-(-)-lactic acid was produced at the maximum concentration of 45.69±1.16 g/L with a yield of 0.81±0.02 g/g and maximum productivity of 1.92±0.35 g/L/h from 100 g/L pretreated PIC via separate hydrolysis and fermentation (SHF). Under simultaneous saccharification and fermentation (SSF), maximum concentration at 34.23±1.01 g/L of D-(-)-lactic acid was produced, with a conversion yield of 0.70±0.03 g/g and a productivity of 1.07±0.03 g/L/h from 75 g/L of pretreated PIC. The fed-batch separate hydrolysis and fermentation (SHF) process yielded the highest D-(-)-lactic acid concentration of 63.14±0.90 g/L, with a conversion yield of 0.96±0.07 g/g and a productivity of 1.31±0.01 g/L/h. To produce 1 kg of D-(-)-lactic acid, approximately 200.6 kg of fresh PIC was estimated. These findings underscore the potential of PIC as a low-cost, renewable feedstock that supports waste valorization and contributes to the development of a zero-waste biorefinery system. Furthermore, the approach outlined in this study holds promise for broader application in the microbial production of other high-value biochemicals from PIC. Therefore, recycle and reused of alkaline

solution and waste water (water running through pretreated-PIC) shall be optimized, considering of cost saving and water pollution preventative.