CHAPTER V
CONCLUSIONS AND SUGGESTIONS

The advantages of ethanol production at high temperature are not only reduced contamination of mesophilic microorganisms but also reduction cost for cooling system. Therefore, thermotolerant yeast strains that are capable of producing ethanol at high temperatures are one of the key success factors for the ethanol production at high temperature. Jerusalem artichoke (*Helianthus tuberosus* L.) is one of the most suitable materials for bioethanol production as it contains nearly 20% of carbohydrates, 70-90% of which is inulin. In this study, isolation and selection of thermotolerant yeasts capable of producing ethanol from Jerusalem artichoke (*Helianthus tuberosus* L.) were investigated. As the results, fifty isolates of yeast were obtained from different sources such as sugarcane juice, rotten fruits and soil and plant materials from Jerusalem artichoke plantations collected from different locations in Thailand including Khon Kaen, Udon Thani, Lop Buri, Nong Khai. Among the fifty isolates of yeast, only six isolates, i.e., DBKKU Y-102, DBKKU Y-103, DBKKU Y-104, DBKKU Y-105, DBKKU Y-106 and DBKKU Y-107, were able to use inulin as carbon and energy source for growth and exhibit the ability to grow at high temperature of up to 45ºC. Ethanol fermentation ability of the six isolated yeasts under static and shaking condition was compared using Jerusalem artichoke juice without acid or enzymatic pre-treatment as a raw material. The strain DBKKU Y-102 produced relatively high ethanol concentration at 37 and 40°C, however the highest ethanol concentration (62.38±0.18 g/l) and yield (88.79%) of theoretical value were achieved in shaking condition at 40°C. Identification of the six isolated yeast strains was carried out using morphological and D1/D2 domain of 26S rDNA sequencing analysis and the results revealed that these isolated yeasts were *K. marxianus*.

Effect of incubation temperatures, initial pHs of ethanol production medium, concentrations of sugar, cell numbers, nitrogen sources, and concentrations of magnesium sulfate on ethanol production was studied. The results showed that the highest ethanol productivity (4.37±0.02 g/l.h), ethanol concentration (104.83±0.53

g/l), and theoretical ethanol yield (92.98%) at 37°C were achieved under the following optimal conditions: pH 5.5, 250 g/l initial sugar concentration, 1×10^8 cells/ml initial yeast cell, using 0.5 g/l diammonium phosphate as nitrogen source without additional of magnesium sulfate. The batch ethanol fermentation was conducted in a 2L jar fermenter under the optimal condition with an agitation speed of 100 rpm. *K. marxianus* DBKKU Y-102 yield the final ethanol concentration of 94.31±0.13 g/l, a productivity of 2.62±0.00 g/l.h, and 91.19% of the theoretical ethanol yield. These results suggested that the thermotolerant yeast, *K. marxianus* DBKKU Y-102, has high potential for ethanol production at high temperature from Jerusalem artichoke juice without pre-treatment.