CHAPTER 5
CONCLUSION AND RECOMMENDATION

5.1 Conclusion

This research was focused to study an addition of probiotic bacteria in green soya bean yoghurt ice cream. Parameters that were investigated included finding an optimum formula for the yoghurt ice cream, investigation for the optimum condition to ferment the yoghurt ice cream ingredients and monitoring the quality of the yoghurt ice cream during storage at -18°C for 4 months. Conclusions that could be made based on the research results were:

1. The values of physical, chemical and microbiological parameters of green soya bean milk were lower than those of the green soya bean due to an incorporation of warm distilled water at a ratio of 1:1 for distilled water and green soya bean, respectively. The presence of this water reduced the nutritional compounds and microorganisms in the green soya bean milk.

2. The sensory profile of green soya bean yoghurt ice cream was investigated by an ideal ratio profile technique. Sensory panelists determined 8 sensory characteristics that were important for the sensory profile of green soya bean yoghurt ice cream. These 8 characteristics included green color, smoothness, yoghurt flavor, green soya bean flavor, mouthfeel, sweetness, sourness and overall acceptance. A prototype formula of the yoghurt ice cream was found to be significantly different ($p \leq 0.05$) for most of the sensory characteristics than those of an ideal product.

3. Investigation for the effect of each green soya bean yoghurt ice cream ingredient concluded that 2 main factors that significantly affected the quality of the yoghurt ice cream were skim milk and sugar. The other ingredients were included as fixed factors. Three fixed factors of butter, ABT-5 starter culture and κ-carrageenan were used in their low levels, which were 1.50, 0.15 and 0.08% (w/v), respectively. Whereas carboxymethylcellulose, guar gum and green soya bean milk were used in their high levels, which were 0.30, 0.30 and 60.10% (w/v), respectively. A further study for skim milk and sugar found that these main ingredients should be added at their optimum levels of 9.02 and 13.52% (w/v), respectively.

4. A fermentation condition at 43°C for 8 h was found to be the optimum condition to produce green soya bean yoghurt ice cream. Applying this fermentation condition produced yoghurt ice creams with better values for physical, chemical and microbiological parameters. In addition, sensory panelists gave the highest acceptance score for this yoghurt ice cream.

5. A developed formula for green soya bean yoghurt ice cream composed of 9.02% (w/v) skim milk, 13.52% (w/v) sugar, 1.50% (w/v) butter, 0.15% (w/v) ABT-5 starter culture, 0.08% (w/v) κ- arrageenan, 0.3% (w/v) carboxymethylcellulose, 0.3% (w/v) guar gum, 60.10% (w/v) green soya bean milk and 15.03% (w/v) distilled water. The optimum condition to ferment the yoghurt ice cream ingredients was at 43°C for 8 h. The physical qualities of the yoghurt ice cream in the term of L* value (light), a* value (red - green), b* value (yellow - blue), an overrun value and a melting rate were 76.31 ± 0.58, -5.73 ± 0.24, 28.13 ± 0.75, 33.29 ± 0.33% and 0.26 ± 0.02 g/min, respectively. The nutritional components of carbohydrate, fat, protein, ash, fiber and moisture content of the yoghurt ice cream were 20.90 ± 0.11, 2.96 ± 0.09, 5.79 ± 0.03, 1.10 ± 0.04, 0.02 ± 0.003 and 69.29 ± 0.04%, respectively. The yoghurt ice cream also had a total soluble solid of 27 ± 0.00 °Brix, a titratable acidity of 1.13 ± 0.00 % lactic acid and a pH value of 5.26 ± 0.00. Whereas, the yoghurt ice cream contained high numbers of starter microorganisms, which included 14.33 ± 0.05 log CFU/g of *S. thermophilus*, 11.22 ± 0.03 log CFU/g of

L. acidophilus and 11.25 ± 0.06 log CFU/g of *B. bifidum*. In addition, the yoghurt ice cream was absence from psychrotroph bacteria, had less than 10 CFU/g yeasts and moulds and had less than 3 MPN/g coliform bacteria. For the sensory characteristics of the yoghurt ice cream, the ratio values between the developed and an ideal products were 0.94 ± 0.06 for green color, 0.95 ± 0.04 for smoothness, 0.87 ± 0.07 for yoghurt flavor, 1.00 ± 0.12 for green soya bean flavor, 0.97 ± 0.11 for mouthfeel, 0.94 ± 0.14 for sweetness, 0.92 ± 0.06 for sourness and 0.78 ± 0.08 for an overall acceptance.

6. Green soya bean yoghurt ice cream maintained its physical, chemical and microbiological qualities during storage at -18°C for 4 months. There were only some minor changes for some quality parameters. The number of probiotic bacteria was higher than 10^{11} CFU/g at the end of the storage period. The sensory characteristics of green color, yoghurt flavor, green soya bean flavor, mouthfeel, sweetness, sourness and an overall acceptance were not significantly change throughout the storage period.

5.2 Recommendation

1. A further study to improve an overrun value of green soya bean yoghurt ice cream by studying different propeller speeds of an ice cream machine or different freezing times during the production of yoghurt ice cream would be good to be carried out. The propeller speed of the ice cream machine in this experiment was fixed.

2. A study to apply a fat-replacer substance would be another alternative to decrease the fat content in green soya bean yoghurt ice cream.

3. A development of a good packaging would support the marketing of green soya bean yoghurt ice cream.