CHAPTER V
CONCLUSION AND RECOMMENDATION

Feasibility of biohydrogen and biomethane production from food waste by a two-stage fermentation process and the important factors (initial pH, temperature and C/N ratio) affected on biohydrogen and biomethane production were investigated in this research. The results could be concluded as follows:

5.1 Conclusion

5.1.1 Biohydrogen and biomethane production from food waste by a two-stage fermentation process presented the maximum total biogas production of 3,161.50 mL and COD removal of 79.41%. Hydrogen yield of 32.43 mL H_2/g COD was obtained from stage I of biohydrogen production from food waste and the pretreated seed sludge. Methane yield of 178.49 mL CH_4/g COD was obtained from stage II of biomethane production from the byproducts of stage I and the raw seed sludge.

5.1.2 Biohydrogen production from food waste under the initial pH of 7.0 and thermophilic temperature (55 $\pm$ 2^{o}C) presented the maximum hydrogen yield of 176.10 mL H_2/g COD and COD removal of 91.11%. Butyric acid of 3,654.87 mg/L and acetic acid of 1,600.23 mg/L were found when the maximum hydrogen production occurred.

5.1.3 At the initial pH of 7.0 and thermophilic temperature (55 $\pm$ 2^{o}C), the maximum hydrogen yield of 214.88 mL H_2/g COD and COD removal of 90.34% were obtained from biohydrogen production from food waste at C/N ratio 30. Acetic acid of 4,982.03 mg/L and butyric acid of 465.05 mg/L were found when the maximum hydrogen production occurred.

5.1.4 The effluent from biohydrogen production under the optimal environmental conditions with the high concentration of VFAs (acetic acid of

14,378.53 mg/L, butyric acid of 4,978.02 mg/L and propionic acid of 530.11 mg/L) and COD (7,786.67 mg/L) could be used as a substrate in biomethane production. Biomethane production from hydrogen fermentation effluent under the initial pH of 7.0 and thermophilic temperature (55 $\pm$ 2^{o}C) presented the maximum methane yield of 310.77 mL CH_4/g COD and COD removal of 70.37%. VFAs of hydrogen fermentation effluent decreased in the final product.

5.2 Recommendation

The following aspects are recommended for the further studies.

5.2.1 Application of organic nitrogen source (animal manure, compost, sludge, etc.) to supplement of C/N ratio should studied further for the decrease in economical cost and pollution from using an inorganic nitrogen source.

5.2.2 The optimal environmental conditions obtained from this study should be applied on biohydrogen and biomethane production by a two-stage fermentation process in continuous reactor and large scale for practically application of renewable energy in the future.