CHAPTER V

CONCLUSIONS

In this study monoglyceride-based drug delivery systems containing *Garcinia mangostana* extract were prepared. The effects of type and ratio of triglycerides on the ternary phase diagram, physicochemical properties and antimicrobial activity of the formulations were investigated. The results of this study can be concluded as follows:

1. *Garcinia mangostana* extract was obtained by maceration method with ethyl acetate. The melting point of the extract was conformed to the melting point of mangostin. In addition, TLC and HPLC chromatogram of the extract were similar to standard mangostin. Based on these data, the extract was corresponded to mangostin.

2. From the ternary phase diagram, glyceryl monooleate-sesame oil-water system showed more area of one-phase liquid crystals than systems containing soybean oil and olive oil; however, the differences were slight. The structures of liquid crystalline phases under polarized light microscope were not influenced from using different oils while the ratio of oils affected these liquid crystals.

3. Monoglyceride-based drug delivery systems could be prepared from the ratio of triglyceride: monoglyceride: water as 8:62:30 and 12:58:30 with good physical appearances. After incorporating *Garcinia mangostana* extract, the physicochemical properties were not changed.

4. Monoglyceride-based drug delivery systems have the potential of acting as *in situ* liquid crystalline forming drug delivery systems due to their viscosity which was initially low enough to be administered through the syringe with 23-gauge tip

needle. The systems could be transformed to the high-viscous liquid crystalline phase upon contact with excess water.

5. From the release profiles, all of these systems could sustain the release of mangostin over a period of 48 hr. The release kinetics followed Higuchi's equation indicating that the release of mangostin from these systems was diffusion controlled.

6. Various oils showed similar release profiles but different in the percentages of drug release. The highest percentage of release was obtained from the system containing sesame oil, followed by soybean oil and olive oil, respectively. Increasing triglycerides content into the formulations did not affect the release of the delivery systems.

7. The DSC thermograms demonstrated that *Garcinia mangostana* extract can be incorporated into the liquid crystalline phase of monoglyceride-based drug delivery systems without causing phase transition.

8. Although, *Garcinia mangostana* extract exhibited antimicrobial activity against *Streptococcus mutans* $KPSK_2$, monoglyceride-based drug delivery systems containing the extract did not showed the clear inhibition zone in the agar diffusion method. The probable reason is that mangostin is a lipophilic compound and does not diffuse into the medium.

9. Monoglyceride-based drug delivery systems in the presence of *Garcinia mangostana* extract both low-viscous state and high-viscous liquid crystalline phase were stable under the heating-cooling cycle.

From this investigation, the stable formulation of monoglyceride-based drug delivery systems containing *Garcinia mangostana* extract could be developed. The *in situ* liquid crystalline phase could be formed from the injectable low viscosity formulation upon contact with water. Since this study used agar diffusion method for

determination of antimicrobial activity, the solid agar medium could not simulate the condition of fluid in the oral cavity. Therefore, the further *in vivo* study should be performed to investigate the efficacy of monoglyceride-based drug delivery systems containing *Garcinia mangostana* extract.