CHAPTER V

CONCLUSIONS

In this study *P. emblica* extract spray dried powder was prepared from fresh fruit juice using Niro Atomizer (Copenhagen Denmark). The suitable method can produce high quality of *P. emblica* extract spray dried powder that easy to dissolve in buffer solution for preparing the product.

Phenolic compounds have been proved to be responsible for the antioxidant activity of emblica fruit (Kumar et al., 2006; Sabu and Kuttan, 2002; Anila and Vijayalakshmi, 2002). Therefore in this study, the total phenolic compound was investigated as active component for studying encapsulation efficiency and chemical stability of *P. emblica* extract and was calculated as gallic acid equivalent (GAE).

P. emblica extract spray dried powder in this investigation contains 308-320 mg/g of total phenolic compound calculated as GAE. The total phenolic compound of *P. emblica* extract in this study are in the same range of the result of Kumaran and Joel Karunakaran(2007) who reported that the total phenols in Phyllanthus species are in the range of 171-380 mg/g plant extract (calculated as GAE).

The encapsulation efficiency show that the highest percent encapsulation from 1mg/ml of *P. emblica* extract in buffer pH 5.5 was 50.84%.The encapsulation efficiency of all preparation of *P. emblica* extract in buffer pH 5.5 resulted in 508 µg/ml of *P. emblica* extract in liposomes that were higher than preparations preparing in buffer pH 7.4 (35.38). The IC_{50} value on DPPH radical scavenging activity of *P. emblica* in aqueous fraction is 142.6 ± 5.3 µg/ml (Xiaoli Liu et al., 2008). This value can confirm that *P. emblica* in liposomes which this concentration has the antioxidant activity due to the amount of *P. emblica* was higher than IC_{50}.

Hydrolysis of the ester linkages will proceed most slowly at pH values close to neutral. However, even at low pH, such as that required for active loading of drugs, hydrolysis can be kept to a minimum if scrupulous attention is paid to the removal of residual solvent from the dried lipids (New, R R C. 1989). *P. emblica* extract has lower pH when it dissolves in water so the method that suitable for this product should be thin film method because it can remove all of solvent then the preparation can be stable than other method.

The stability of *P. emblica* extract in liposomes was stable 8 weeks after that it was significantly decrease. It was more stable than *P. emblica* extract in buffer solution which stable only 4 weeks. This can explain decreade in case of the vesicle can protect the active substance from the environment factor such as light and oxygen.

The stability of liposomes which storage in refrigerator was more stable than in room temperature when studied the particle size distribution and morphology. The morphology by TEM can suggest that the liposomes still be multilamella vesicle with the passing of time.

The highest percent recovery of *P. emblica* extract in liposomes was less than 100 %. In the future work, the process of liposomes preparation during evaporation of thin film should be developed for reducing the hydrolysis of drug and phospholipids. Also more investigation should be further studied.