CHAPTER V

CONCLUSIONS

The present study was aimed to develop the extraction method of xyloglucan from tamarind seed. The appropriate extraction method was evaluated by the defatting and sedimentation technique, and investigation of xyloglucan, total protein and fat contents. The spray drying technique was optimized to obtain the optimal condition for preparing xyloglucan powder. After that, film formulation were prepared from xyloglucan and loaded with *Centella asiatica* extract. The result of the investigation can be concluded as follows:

1. Among the four methods of xyloglucan extraction, method I with direct by soaked tamarind seed powder with hexane and sediment the slurry of tamarind seed powder in water immediately by centrifugation was selected.

2. Xyloglucan contents, which were analyzed by the HPLC method, were not significantly different among four methods. The xyloglucan content obtained ranged from 42.85-44.62%. The extraction method could reduced contaminated total protein and fat content.

3. The optimization techniques were operated for spray drying condition of xyloglucan solution, estimated by response surface methodogy. The optimum region of the spray-drying technique by overlay plot was carried out. The optimal condition was inlet temperature 178°C and aspiartor 100%. The observed means of the responses obtained, %yield and %moisture content, were in range of the prediction intervals at 95% confidence level. The results clearly showed that the model fitted the experimental data well and described the region studied well.

4. The xyloglucan tamarind seed powder which was obtained from the optimal spray drying condition had small shape average particle size 10.87 ± 0.06µm with spherical shape, and finely rough surface.

5. The physicochemical properties of xyloglucan tamarind seed powder were as follows:

The pH value of 1% xyloglican solution was 7.83±0.19.

The solubility in water was 6.28±0.08 mg/ml.

The viscosity of 1%, 1.5% and 2% w/w of xyloglucan tamarind seed powder were ranged from 39.46 ± 0.85 to 168.06 ± 1.83 mPas. At all concentrations of xyloglucan powder from tamarind seed exhibited a typical pseudoplastic flow.

The 1%w/v solution of xyloglucan tamarind seed powder was not compatible to ethanol added 1-5%.

6. The appropriate film formulations prepared from xyloglucan powder was obtained. The formulation containted 2%w/w xyloglucan powder, 2%w/w glycerin and 4%w/w sorbitol containing *Centella asiatica* extract. The selected formulation exhibited the highest adhesive force at 21.16±15.49 N/cm^2.

7. The film formulation containing *Centella asiatica* extract was pale brown color, transparent, smooth and flexible. It was hard and tough. The adhesive force of film formulation was reduced to 3.703±1.11 N/cm^2. The tensile strength, elongation, work of failure and Young's modulus of the films formulation were 15.11±2.32 MPa, 232.73±17.50%, 12.24±2.19 mJ and 5.81±1.18 MPa, respectively.

8. The film formulation containing *Centella asiatica* extract exhibited, from the DSC thermograms and powder X-ray diffactograms, that the *Centella* extract was uniformly dispersed in an amorphous state.

9. The release profile of asiaticoside from film formulation containing *Centella asiatica* extract were fitted with Higuchi model (R^2 = 0.9862). The release rate constant was demonstrated to be 6.9233 %h$^{-1/2}$.

10. The permeation study using porcine skin as a model membrane showed the absence of asiaticoside detected in the receptor fluid. The asiaticoside remained in the porcine skin could be detected at 1.30±1.28%.

11. From stability study, the film formulation containing *Centella asiatica* extract during 3 month periods showed the percentage loss of asiaticoside was 16.41% of the initial value. The loss might be due to the degradation by hydrolysis of asiaticoside to asiatic acid in the presence of moisture adsorbed in the film.