CHAPTER IV

CONCLUSION

Polysaccharide (PG) isolated from fruit-hulls of durian (*Durio zibethenus* L.) is a natural polymer that is composed of sugars including arabinose, rhamnose, fructose, glucose and galacturonic acid (Gerddit, 2002). The PG powder was light-brown color, had characteristic smell and taste and was soluble in water forming a viscous layer, acid pH. Rheological properties of an aqueous solution of PG indicated a Non-Newtonian, pseudoplastic behavior. The viscosity value of PG solution at acidic pH was higher than that at basic pH. Divalent cations such as $MgCl_2$, $CaCl_2$ and monovalent cation such as KCl increased the viscosity of PG solutions; however, the other monovalent cation, i.e., NaCl had very little effect on viscosity. High concentrations of ethyl alcohol and isopropyl alcohol increased the viscosity of PG solution.Whereas butyl alcohol at high concentration did not change the viscosity of PG solution. Humectants studied, propylene glycol and glycerin, increased PG viscosity; propylene glycol had greater effect than glycerin. PG solution could endure paraben concentrate at various concentration more than benzoic acid and sorbic acid. PG solution could endure temperatures of 50 and 70°C with very few changes of viscosity. However, when the PG solution was heated to 100°C, it became fluid and the change was irreversible.

After studying the compatibility of ingredients in the primary stage, PG vitamin E gel was formulated by adding vitamin E as an active ingredient, Propylene glycol as a humectant, paraben concentrate as a preservative and cremophor RH 40 as a solubilizer. This gel contain is 3 % PG and 0.05M $CaCl_2$ with pH 5.5. It was clear with natural brown. Besides, the Gel product could pass 6 Temperature cycling (4 °C, 24 hr; 45 °C, 24 hr). After the gel product was stored at ambient temperature for 30 days, it was still stable with the same appearance as the original product. Many volunteers were quite satisfied with the product.

Film-forming property of PG was investigated to evaluate its application as a mouth refreshing film in confectionery industry. The PG films were produced by casting/solvent evaporation technique. Plasticizers such as propylene glycol, glycerin and sorbitol is very useful for applications. When it was added to the film forming

solutions, the plasticizers could drastically reduce the intermolecular forces, increase the mobility of the polymer chains and improve the mechanical properties of the films. However, the addition of plasticizers adversely affected the barrier properties and increased mass transfer through the films. Moreover, the addition of menthol and peppermint oil into the mouth refreshing film gave a very satisfied result.

Films of PG polymer containing sorbitol at all concentrations were slightly soft and tough indicated by high values of % strain at break and low values of Young's modulus. Films of PG polymer with hydroxypropyl methylcellulose (HPMC) at all concentrations were slightly soft and tough indicated by high values of % strain at break and low values of Young's modulus and tensile strength; their dissolution times were also less than PG films without HPMC. The films containing PG could include oil and water soluble ingredients to produce the better film than the HPMC film alone. Therefore, PG might have some properties of surfactant. The PG films absorbed more moisture than the PG films alone. They also swelled more than the PG films.

Volunteers were quite satisfied with the smoothness, softness and instant dissolution of the mouth refreshing film. However, many volunteers were not satisfied with sweetless taste. After the interview, they were very interested in this new product. This investigation discovered a novel polysaccharide gelling and film forming agent from fruit-hulls of durian. It is possible to use this natural polymer in cosmetic and pharmaceutical products.