UNIVERSITI TEKNOLOGI MARA

THE EFFECT OF DIFFERENT TYPE OF PLASTICIZERS ON GELATIN-SAGO STARCH COMPOSITE EDIBLE FILM FOR FOOD PACKAGING

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ABSTRACT

The objective of this study is to produce gelatin-sago starch composite edible film plasticized with glycerol and polyethylene glycol (PEG) 200, to conduct the physical and mechanical test of the glycerol and PEG 200 plasticized films, and also to determine the suitable types of plasticizers (glycerol and PEG 200) to be used in food packaging. The effectiveness of this edible film was evaluated by conducting the thickness, tensile strength and elongation at break, water vapor permeability, water solubility, FTIR, and also thermogravimetric analyses. Films were prepared by plasticizers concentration of 40%, 50%, 60% and 70% w/w of solution. Films plasticized with glycerol were thicker than films with PEG 200. This was due to the gelatin higher protein content which led to a higher viscosity and greater thickness. Glycerol plasticized films had a higher solubility compared to PEG 200 plasticized films due to the glycerol massive interaction with the gelatin-starch molecule. For the Tensile strength (TS), from the result it can be seen that the TS of GS starch film decreases with increasing plasticizers concentration from 40% to 70% and films with glycerol showed higher TS than films with PEG 200. However, the increase in the plasticizers concentration from 40% to 70% significantly increase the EAB due to the behaviours of the plasticizers that decrease the intermolecular bonds between the amylose, amylopectin and amylose-amylopection of the starch matrix. The WVP analysis showed that the PEG 200 exhibit higher WVP than glycerol thus shows that glycerol was the best plasticizers to be used as food packaging as it had a low WVP. Meanwhile, from FTIR analysis, the absorption bands belong to the OH and CH vibrations. The thermal stability analysis showed that the glycerol TGA curves had a greater degradation rate compared to PEG 200. So the film stability in film plasticized with glycerol was higher than in PEG 200 plasticized film. But generally it indicates that the films were still stable at temperature below 100°C and still can be used for many food packaging applications. Through the conducted analysis, it can be concluded that the glycerol is the better plasticizer to be used in food packaging applications compared to PEG 200.

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CHAPTER ONE
INTRODUCTION

1.1 Research Background

Accelerated pace of the industrial development nowadays had caused the demands and necessity of packaging material to increase. Packaging films are used to keep the food fresh and healthy over a long period of time. It enables the food to be brought safely anytime and anywhere over long distances. So, the packaging material plays an important role in keeping the food fresh. However, they are the major contributor of the waste on a household (Basiak, Galus, & Lenart, 2015). These packaging materials can be divided onto two categories which is synthetic polymer and edible/ biodegradable film.

Most of the synthetic films available for packaging are petrochemical based and are regarded as non-biodegradable in nature. Hence, leads to issues such as the environmental pollution, disposal of solid wastes and serious ecological problem(Vieira, Da Silva, Dos Santos, & Beppu, 2011). Meanwhile, edible films are biodegradable and environmental friendly. Due to the fact that the petroleum resources are depleting over time and along with the disposal issue related to the packaging materials, consumers nowadays realize the necessity of a cleaner, pollution free, environmental friendly product. Consumers demand for product that are non-toxic, economically and environmentally feasible such as edible film. Furthermore, edible film is lower in cost compared to synthetic polymers film besides having the ability to extend the food shelf life.

Edible film can be made from protein, polysaccharides and lipid materials (Bourtoom, 2008). Composite edible film can be prepared by combining these components and researched had concluded that protein based edible films are the most attractive and effective among all. This is due to the good gas barrier properties compared to others. Besides, the oxygen permeability of protein based films is many time lower than others (Gontard, Guilbert, & Cuq, 1992). Protein based edible film also have a higher intermolecular binding potential because it has high potential to form many linkages and it can form bonds at different positions.. This had made protein based film to be strong compared to the other polysaccharides and lipid- based film. Starch is