UNIVERSITI TEKNOLOGI MARA

THE EFFECTS OF CMC ON THE MECHANICAL PROPERTIES OF STARCH PROTEIN EDIBLE FILM

NUR ZUFEEQAH BINTI RAZAK

Thesis submitted in fulfilment
of the requirements for the degree of
Bachelor's of Chemical Engineering and Bioprocess

Faculty of Chemical Engineering

July 2017

ABSTRACT

This study was performed to investigate the effects of carboxymethyl cellulose (CMC) on the mechanical properties of starch protein edible film. Characterization such as tensile properties, water vapor permeability (WVP) and solubility in water were the focus of the investigation. It was found that CMC had significant effects on the tensile properties of the starch protein film. The addition of CMC to the starch protein films significantly increased elongation at break from 8.027 to 52.707% and tensile strength from 10.323 to 72.733 MPa. The incorporation of CMC in the films decreased the WVP significantly with 3.1939×10^{-12}, 2.7025×10^{-12} and 2.2930×10^{-12} $g.Pa^{-1}h^{-1}m^{-1}$ for films containing 0, 5, and 10% CMC respectively. However, when the CMC content of the films reached to 15%, the WVP increased significantly to 3.1529×10^{-12} $g.Pa^{-1}h^{-1}m^{-1}$. The results of solubility in water showed that with the increase of CMC content in the starch protein film, the water solubility of films increased. The %TSM calculated were 45.23, 50, 62.96 and 71.01% for 0, 5, 10, 15% CMC, respectively.

ACKNOWLEDGEMENT

First and foremost, I would like to take this opportunity to thank God for giving me the opportunity to complete this long and challenging journey successfully. I wish to express my sincere gratitude to my supervisor Madam Fariza Hamidon, for her support and guidance in assisting me to complete this research. I also would like to express my gratitude to the staff of Universiti Teknologi MARA, especially Mrs. Nor Suhaila Sabli and Mr. Amin Fafizullah Omar for providing the facilities, knowledge and assistance. Last but not least, I would like to express my gratitude to my supportive family and friends for their continuous love and support throughout my studies.

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INTRODUCTION

1.1 RESEARCH BACKGROUND

The starch or protein based films are biodegradable. However, the mechanical properties of these films are still less than commercial petroleum-based plastics. Several research attempts have been done to improve the properties of the films. Due to its cheap, durable and easy to manufacture properties, plastic has become the top choice of food packaging in the industry. More than 40 million tonnes of petroleum-based plastic material was used worldwide in the packaging industry in 2000 (Ban *et al.*, 2005).

According Aytunga Arik Kibar & Us (2012), current global consumption of plastics has an annual grow of approximately 5%, which signifies the largest field of application for crude oil. The current global consumption of plastics highlights how dependent the plastic industry is on oil and consequently the increment of crude oil and natural gas price have an economic impact on the plastic market. Thus, it is becoming critical to utilize alternative raw materials.

Plastic is made of major toxic pollutants that are known to cause illness. It is meant for durability therefore it is not biodegradable. Waste, originate mostly from plastic food packaging is sent to a landfill for disposal. The problem with dumping plastics in the landfill is that when they interact with water, they form hazardous chemicals. When these chemicals seep undergound, they degrade the water quality, which is utilized in our daily lives for internal and external purposes.

In some countries, this waste disposal issue is becoming a huge and worrying problem that requires comprehensive solutions to curb the issue. Therefore, researchers have come up with an innovative use of edible film idea in order to replace these harmful plastic wraps. Most researches focus mainly on using starch and protein from various