MARA UNIVERSITY OF TECHNOLOGY

WATER VAPOR RESISTANCE (WVR), ANTIMICROBIAL PROPERTIES AND COLOR ANALYSIS OF CASSAVA STARCH-BASED EDIBLE COATING WITH TURMERIC OIL

NUR ASHIKIN BINTI ZAINOL

2012487398

This report is submitted in partial fulfilment of the requirements needed for

Bachelor Degree in Chemical Engineering and Bioprocess (Hons)

FACULTY OF CHEMICAL ENGINEERING

MARA UNIVERSITY OF TECHNOLOGY

SHAH ALAM

JULY 2016

ACKNOWLEDGEMENT

In the name of Creator, Allah S.W.T., may it please Him that I express my appreciation and gratitude to HIM. I am grateful to the God for the good health and wellbeing that were necessary to complete this book.

To begin with, I have to thank my research supervisors, **Mdm Fariza Hamidon** .Without her assistance and dedicated involvement in every step throughout the process, this paper would have never been accomplished. I would like to thank you very much for your support and understanding over these past six months.

I would also like to show gratitude to the laboratory assistants, including **Mdm Nor Suhaila Sabli** of Food Technology laboratory, **Ms Noorbaizura Wahid** of Thermodynamic laboratory and **Mr Rizuan Hamzah** of pharmaceutical laboratory, and also to assistant engineer for Bioprocess Laboratory **Mr. Mohd Ridhuan Salleh** of Faculty of Chemical Engineering, MARA University of Technology Shah Alam for their extraordinary expertise and guide**.**

They kindly assisted me with the analysis in this thesis and was very patient with my knowledge gaps in the area. Getting through my dissertation required more than academic support, and I have many, many people to thank for listening to and, at times, having to tolerate me over the past six months.

Afterwards, I am also grateful to **Dr. Nik Raihan Nik Him** and **Dr. Siti Noor Suzila Maqsood ul Haque**, coordinators for Bioprocess Research Project. I am extremely thankful and indebted to them for sharing their expertise, and sincere and valuable guidance and encouragement extended to me. Following that, I wish to express my sincere thanks to Dean of the Faculty, for providing me with all the necessary facilities for the research.

ABSTRACT

This study set out with the aim of assessing the properties of cassava starch edible coating incorporated with turmeric oil at different %w/v of cassava starch and turmeric oil concentrations. Properties that had been investigated in this report were water vapor resistance (wvr), antimicrobial properties and color analysis of coated apple slices. Cassava starch solutions was gelatinized at temperature of 70 ^{o}C-80 ^{o}C for 40 minutes. Glycerol act as plasticizer and turmeric oil was added to the solution at different concentrations. For WVR, Royal Gala apples (*Malus domestica*) were sliced at equal size and placed in dessicator at relative humidity of 98% followed by 33.5% relative humidity to calculate water vapor loss to the environment. The findings suggest that as high concentration of turmeric oil can highly reduce moisture loss. Increasing %w/v of cassava starch may also reduce moisture loss but the results were less obvious. Antimicrobial properties of the film was evaluated by culturing microorganisms on the surface of the apple slices on Plate Count Agar (PCA) for bacteria and Potato Dextrose Agar (PDA) for yeast and molds. Again, as turmeric oil concentration increase, less colonies were formed. However, increasing turmeric oil concentration may negatively affect the fruits flavor, odor and color. Later, color analysis of the coating was executed on day 1 of coating process. L*, a* and b* value were analyzed. By comparing color of apple slices that were coated and uncoated shows that after coated, apples slices were more toward yellow and green coordinates as the color difference increase as turmeric oil and cassava starch concentration and % w/v increased respectively.

Table of Contents

CHAPTER 1: INTRODUCTION

1.1 Research Background

Generally, bio-polymers are edible films that coat fresh or processed food. Nowadays, demand for natural food had increased. Marketing team had been urge to create new strategies to penetrate the market by offering food products with improvement of freshness, quality, safety and shelf life. Natural bio based edible films in food packaging top the solution as alternative to synthetic packaging and coating due to their advantages and personal use. According to (Pavlath & Orts, 2009), edible film are when a thin layer of material that have certain composition, covered the food surface thus extend the shelf life of the food and can be eaten together with the food.

According to (Pavlath & Orts, 2009) history of edible coating usage was first recorded in southern China during the 12th century. Citrus fruits were preserved by pouring wax all over the fruits and placed in a box before transporting it from southern China to Northern China. In England, larding process was used to increase food's shelf life. Larding process used lard or animal fats as coating. It is said that larding process is effective in preventing moisture loss. However, larding process makes a thick and tight layer of film that interfered with natural gas exchange. Therefore, low quality product was produced. Next, in Japan, "yuba" which is an edible film that is made from the skin of boiled soy milk was used to maintain food quality and preserve appearance. (Han, 2013)

In 19th century, United States used gelatin layer as one of the method to preserved meat. Other preservation method that had been introduced are smoking that is not really