UNIVERSITI TEKNOLOGI MARA

EFFECTS OF PALM-BASED EDIBLE COATING ON THE POSTHARVEST LIFE OF GUAVA *(Psidium guajava* L.*)* AND PALM-BASED CHITOSAN FILM ON CHERRY TOMATO *(Solanum lycopersicum* C.*)*

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Thesis submitted in fulfillment
of the requirements for the degree of
Doctor of Philosophy

Faculty of Applied Sciences

January 2015

CONFIRMATION BY PANEL OF EXAMINERS

I certify that a panel of examiners has met on 17th September 2014 to conduct the final examination of Ruzaina binti Ishak on her Doctor of Philosophy thesis entitled "Effects of Palm-based Edible Coating on the Postharvest Life of Guava *(Psidium guajava* L.*)* and Palm-based Chitosan Film on Cherry Tomato *(Solanum lycopersicum* C.*)"* in accordance with Universiti Teknologi MARA Act 1976 (Akta 173). The Panel of Examiners recommends that the student be awarded the relevant degree. The panel of Examiners was as follows:

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AUTHORS'S DECLARATION

I declare that the work in this thesis was carried out in accordance with regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any other degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research..

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ABSTRACT

This study was conducted to determine the potential of palm stearin (PS) as edible coating materials for fruits. The palm stearin was blended with 20-80% palm kernel olein (PKOo) and the properties of the blends were evaluated in terms of the slip melting point (SMP), solid fat content (SFC), fatty acid and triacylglycerol compositions (TAG), and polymorphism. Blending of PS with PKOo reduced the SMP, SFC, altered the FAC and TAG composition and changed the crystal polymorphism from β to mixture of β and β'. The changes in the physicochemical properties of PS were due to the replacement of the high melting TAG in PS with medium chain TAG in PKOo. From the analysis, 1:1 and 3:2 were the better PSPKOo blend formulations in slowing down the weight loss, respiration gases and gave better appearance when compared to other PSPKOo blends formulations. These two different coating formulations, 1:1 and 3:2 PSPKOo blends were applied onto guava by hand-wiping techniques, stored at 10°C and 20°C and were compared to beeswax (commercial coating) in terms of respiration gases, cohesiveness, weight loss, glossiness, colour and appearance. Guavas coated with 1:1 PSPKOo blend showed the lowest weight loss, while coating with 3:2 PSPKO showed the best guava appearance at 20°C. Both the PSPKOo coating blends significantly reduced ($p<0.05$) the weight loss, loss of O_2 and CO_2, glossiness, lightness, greenness and yellowness of guava stored at 20°C for 21 days when compared to beeswax. No significant difference ($p>0.05$) was observed between the two coating formulations in terms of weight loss, ethylene gas concentrations, lightness, greenness and yellowness of guava for both storage temperatures. However, both coating resulted in better guava appearance than beeswax at both storage temperatures. The PSPKOo blend (at 31%) was incorporated into chitosan of different degree of deacetylation (DD) (85% and 95%) and molecular weight (MW) (100.000 and 300.000 Da) to form films and the films were evaluated in terms of particle size, diameter and stability of emulsion and also thickness and tensile strength. The chitosan with 85% DD (MW 300.000 Da) + 31% PSPKOo blend resulted in the strongest film and thus this chitosan was added with 15.5% and 31% PSPKOo blends for comparison of physical properties of film. Emulsion blend containing 85% DD (MW 300.000 Da) and 31% PSPKOo blend of chitosan gave the biggest particle size, highest viscosity and the most stable emulsion, resulting in the thickest film with the highest TS and EM. The film was applied on cherry tomato and stored at 20°C for 9 days. The chitosan film with 85% DD (MW 300.000 Da) + 31% PSPKOo blend was the most effective in reducing weight loss, maintaining firmness and redness of cherry tomato compared to the other two films. Hence, PS showed potential to be used as a moisture barrier in fruit coating.

ACKNOWLEDGEMENTS

I am indebted to my supervisor Associate Professor Dr. Hjh. Norizzah bt. Abd. Rashid for her guidance, advice, valuable discussions, encouragement, assistance and support throughout the period of my study at Universiti Teknologi MARA, Shah Alam. I am also indebted to my co-supervisor Associate Professor Dr. Halimahton Zahrah bt. Mohamed Som, grant members, Associate Professor Dr. Cheow Chong Seng and Mr. Adi b. Md. Sikin. A million thanks also go to Professor Dr. Fang Zhong and Associate Professor Dr Li Yue from Jiangnan University, China, Professor Dr. Charles F. Shoemaker from University California, Davis for their valuable comments and advice.

I am appreciative of the valuable assistance and moral support of the Postgraduate Research Lab members En. Mat, Mery, Kema, Dilla, Didi, Yo, Suzi, Fish, Ami, Amy, Fareez, Angah, Zima, Ika, She, Ida, Echa, Zahid and others.

I wish to thank members of the Food Technology Lab K. Nora, K. Hariyah, K. Siti, Syu, Mek Dah, Sab, Ami, Laily, Cik Su and Wani. Last but not least, all friends in Jiangnan University, Patriot, Mohammad, Druce, Lu Yang, Zhou, Yi Gang, Fu, Ting, Wu Jia, Xiao Jing, Chang and the rest for their co-operation. To all my colleagues in MARDI (Khalisanni & Nadia) and Management and Science University (Rafeah & Hidayat) thanks for your moral support.

I am grateful to the Ministry of Science, Technology and Innovation, Government of Malaysia, for the E-Science grant, MOSTI-UiTM Postgraduate Scholarship and UNESCO/China the Great Wall Co-sponsored Fellowship Award 2009/2010 that financed this study.

To my parents and in-laws En. Ishak, Pn. Sofiah, En Awang, Pn. Raimah, siblings/in-laws and my beloved husband Amirudin, I am indebted for their love, forbearance and support throughout the period of this study.