

EFFECT OF ROSELLE (*Hibiscus sabdariffa* L.) EXTRACT ON PHYSICAL
PROPERTIES AND LIPID OXIDATION STABILITY OF MODEL EXTRA VIRGIN
OLIVE OIL EMULSIONS

By

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Research Report submitted in partial fulfilment of
the requirements for the degree of
Bachelor of Food Science (Food Technology)

DEPARTMENT OF FOOD SCIENCE
FACULTY OF AGROTECHNOLOGY AND FOOD SCIENCE
UNIVERSITI MALAYSIA TERENGGANU

2012

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ENDORSEMENT

The project report entitled **Effect Of Roselle (*Hibiscus Sabdariffa L.*) Extract On Physical Properties And Lipid Oxidation Stability Of Model Extra Virgin Olive Oil Emulsions** by **Tan Sok Lee**, Matric No. **UK 16618** has been reviewed and corrections have been made according to the recommendations by examiners. This report is submitted to the Department of Food Science in partial fulfilment of the requirement of the degree of Food Science (Food Technology), Faculty of Agrotechnology and Food Science, Universiti Malaysia Terengganu.

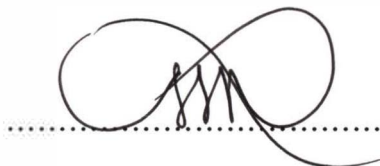


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DECLARATION

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ACKNOWLEDGEMENT

First of all, I would like to thank my family for giving me the reason and strength to complete this thesis. I would like to dedicate my appreciation to all especially my parents who keeps on supporting me along the journey of completing this thesis. Without them, there are no way I can make this far.

I would also like to record a special thanks to my beloved supervisor, DR NOR HAYATI BT IBRAHIM for her encouragement, suggestion, advise as well as guidance along along the time of study and the whole journey of completing this thesis. I would also like to thank her for all the patience she gave me when she was guiding me through.

Other than that, I would like to thank my co-supervisor, DR. MOHD ZUL HELMI ROZAINI for his teaching and guidance along the journey of completing my thesis. His teaching was very useful for me in the completion of thesis especially on the part of handling sensitive and delicate equipment.

Besides, I would also like to thank the Department of Food Science for giving me this opportunity and provide me with the laboratory facilities needed to complete the lab work for my thesis. Not to forget all lecturers, laboratory officer and staff who help me finishing my thesis either directly or indirectly.

Last but not least, I would like to say thank you to all my friends who are very helpful and supportive in assisting me to finish my thesis. Your help will not be forgotten and I will remember it for the rest of my life. Thank you so much.

Finally, I would like to apologize to everyone for my bad attitude and rude manners whether it is intentionally or not.

ABSTRACT

This research studied the effect of Roselle (*Hibiscus sabdariffa. L*) extract on the physical properties and lipid oxidation stability of extra virgin olive oil (EVOO) emulsions. The methods used to test the physical properties were droplet size distribution, microstructure observation, flow behavior analysis, viscosity, pH, color and centrifugation assay. While, peroxide value (PV) and p-Anisidine value (AV) were used to investigate lipid oxidation stability under accelerated oxidation at 60° C for 10 days and the total oxidation was calculated as Totox value. 0.02 % Roselle extract emulsion showed lower polydispersity (Span = 1.76) and more uniform droplet size compared with BHT and NAE through droplet size distribution and microstructure observation. There are flocculation and coalescence happen for all freshly prepared emulsions. Viscosity of 0.02% Roselle extract (0.02 RE) emulsions at 10 s⁻¹ showed the lowest viscosity (0.089 mPa s) measured using a controlled stress rheometer while the viscosity of 0.02 RE was the highest (~4 Pa s) when it was tested at 200 s⁻¹ using viscometer. pH of the emulsions were in the increasing order for 0.02 RE < 0.01 RE < NAE < BHT. 0.02 RE emulsion showed the lowest lightness and yellowness which represented by L* and b* values with 86.38 and 13.91, respectively. Centrifugation assay showed that the emulsion aqueous phase increased after 15 days of storage at 5°C with BHT showed the highest separation with increasing of aqueous phase by 14% after storage. RE emulsion showed protective effect of Roselle extract at day 0, 2, 8 and 10 in delaying lipid oxidation with Totox value in a narrower range (5.4 to 13). All emulsions showed insignificant deterioration with PV < 20 meq/kg after accelerated oxidation. Level RE used in this study however did not significantly change the properties and stability of the prepared emulsions when compared to control and BHT emulsions except for pH value.

ABSTRAK

Kajian ini mengkaji kesan penambahan ekstrak Roselle (*Hibiscus sabdariffa. L*) terhadap sifat fizikal dan kestabilan pengoksidaan emulsi minyak zaitun sangat tulen. Kaedah-kaedah yang digunakan untuk mengkaji sifat fizikal adalah ujian taburan saiz titisan, pemerhatian mikrostruktur, analisis kelakuan aliran, kelikatan, pH, warna dan analisis pengemparan. Sementara itu, nilai peroksida (PV) dan nilai p-Anisidine (AV) telah digunakan untuk menyiasat kestabilan pengoksidaan lipid di bawah pengoksidaan yang dipercepatkan pada 60°C selama 10 hari dan jumlah pengoksidaan adalah dikira sebagai nilai Totox. 0.02 % Emulsi ekstrak Roselle menunjukkan polydispersity yang lebih rendah (SPAN = 1.76) dan saiz titisan yang lebih seragam berbanding dengan emulsi Butylated hydroxytoluene dan emulsi tanpa antioksidan melalui taburan saiz titisan dan pemerhatian mikrostruktur. Terdapat 'flocculation dan 'coalescence' berlaku untuk semua emulsi yang baru disediakan. Emulsi 0.02% ekstrak Roselle (0.02 RE) pada pada 10 s⁻¹ menunjukkan kelikatan terendah (0.089 mPa s) yang diukur menggunakan rheometer tekanan terkawal manakala kelikatan 0.02 RE tertinggi (~ 4 Pa s) apabila ia diuji pada 200 s⁻¹ menggunakan meter kelikatan. pH emulsi semakin meningkat untuk 0.02 RE < 0.01 RE < Nae < BHTe. Emulsi 0.02 RE menunjukkan kecerahan dan kekuningan yang paling rendah yang diwakili oleh nilai L* dan b* masing-masing dengan 86.38 dan 13.91. Analisis pengemparan menunjukkan bahawa fasa akueus emulsi meningkat selepas 15 hari penyimpanan pada 5 °C dengan emulsi BHT menunjukkan pemisahan tertinggi dengan peningkatan fasa akueus sebanyak 14% selepas penyimpanan. Emulsi RE menunjukkan kesan perlindungan ekstrak Roselle pada hari 0, 2, 8 dan 10 di mana pengoksidaan lipid dilambatkan dengan nilai Totox dalam julat yang lebih sempit (5.4 hingga 13). Semua emulsi menunjukkan kemerosotan yang tidak ketara dengan PV < 20 milisetara / kg selepas pengoksidaan yang dipercepatkan. Walau bagaimanapun, paras ekstrak Roselle yang digunakan dalam kajian ini tidak memberikan perubahan signifikan ke atas sifat-sifat fizikal dan kestabilan emulsi yang disediakan berbanding emulsi kawalan dan emulsi BHT kecuali untuk nilai pH.