UNIVERSITI TEKNOLOGI MARA

ANTIBACTERIAL ACTIVITY OF FERMENTED AND NON-FERMENTED VIRGIN COCONUT OIL AGAINST PORPHYROMONAS GINGIVALIS AND AGGREGATIBACTER ACTINOMYCETEMCOMITANS: AN IN VITRO STUDY

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PhD

September 2021

AUTHOR'S DECLARATION

I declare that the work in this dissertation was carried out in accordance with the 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 dissertation has not been submitted to any other academic institution or non-academic institution for any 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

Periodontal disease is associated with the presence of periodontopathogenic microorganisms such as *Porphyromonas gingivalis* and *Aggregatibacter actinomycetemcomitans.* The elimination of these bacteria requires mechanical instrumentation by scaling and root debridement (SRD). However, residual dental biofilm requires adjunctive treatment to SRD to achieve complete removal of biofilm, hence improving periodontal health. Several delivery agents have been used to inhibit these bacteria's growth, but natural remedy is offered as an alternative to synthetic material with minimal or no side effects and better patient acceptance. Virgin Coconut Oil (VCO) is growing interest and applied in food, industrial, skincare and medicinal fields. This study aims to determine the antibacterial effect of fermented and non-fermented VCO against *P. gingivalis* (ATCC 33277) and *A. actinomycetemcomitans* (ATCC 43718) by measuring antimicrobial susceptibility testing (AST), minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC), VCO cytotoxicity effect and SEM morphological changes. The selected concentrations of fermented and non-fermented VCO were 12.5%, 25% and 50%. The negative control was 10% dimethyl sulfoxide (DMSO), and the positive control was 0.12% chlorhexidine digluconate (CHX). After that, the MIC values obtained from the fermented (3.13%) and non-fermented VCO (1.56%) were used to investigate their safety on normal human gingival fibroblast cells (hGF) via cytotoxicity test using MTT assay for the duration of 12, 24 and 48 hr. Samples that exhibit MIC were observed under scanning electron microscope (SEM). Results showed that 50% of non-fermented VCO exhibit the highest AST with the inhibition zone diameter of 14.78±2.59 mm and 14.56±0.88 mm for *P. gingivalis* and *A. actinomycetemcomitans*, respectively. AST was observed at all concentrations for non-fermented VCO and only at a concentration of 50% for fermented VCO. The highest bacteriostatic and bactericidal effects recorded non-fermented VCO with MIC of 1.56% on *P. gingivalis* and *A. actinomycetemcomitans*, MBC of 3.13% on *A. actinomycetemcomitans* while fermented VCO showed MBC 3.13% for *P. gingivalis*. The MICs of fermented VCO were 3.13% and 6.25% for *P. gingivalis* and *A. actinomycetemcomitans*, respectively. The cytotoxicity test showed the percentage of viable cells in hGF exposed with fermented VCO, this demonstrated more than 85% at the 3.13% concentration for the duration of 12, 24 and 48 hr. Morphologic configurations of bacterial cells that were observed under SEM showed alteration in the bacterial cell's configuration and cell shrinkage. VCO was proven to exhibit antibacterial activity against *A. actinomycetemcomitans* and *P. gingivalis* and would be an added benefit adjunct to SRD.

ACKNOWLEDGEMENT

First and foremost, all praise to the Almighty Allah for His countless favours and blessings throughout my study, for granting me to complete this long and challenging journey successfully. Next, I would like to express my deepest gratitude to my respected supervisors, Prof Dr Fouad Hussain Al-Bayaty and Dr Mohd Faizal Hafez Bin Hidayat for their undying support, motivation and immense knowledge.

My sincere thanks and appreciation to everyone involved in helping me to complete this thesis, especially my friends at the laboratory and staff of the Faculty of Dentistry UiTM Sungai Buloh and National University of Malaysia, KL. Special thanks to my dearest husband, Mr Mohammed Rasheedan Bin Ellin, my son, Yusuf Zaim and Yunus Zain, for the time that has been sacrificed, and thank you for being supportive and understanding in this challenging period.

My utmost appreciation goes to the National University of Malaysia, University Technology Mara and Umaty Industries for providing the facilities and assistance when I was working on this research.

Finally, this thesis is dedicated to my dearest father, Mr Ayob Bin Kasah and beloved mother, Madam Faziah Binti Ibrahim for the vision and determination while raising me; thank you for giving me decent education, for always being there for me with prayers and support along the journey. Not only that, I would like to thank my mother-in-law, Hajah Seah Binti Bujang, my siblings, Yusmaliza, Jain Nazley, Yusailalinda, Jaffaruddin as well as my in-laws. They have provided me with endless support and prayers.

Thank you to everyone who had contributed and helped in finishing this study. Alhamdullilah.

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