

**UNIVERSITI TEKNOLOGI MARA**

**THE EFFECTS OF NAA AND  
PRECURSORS ON GROWTH AND  
THE PHYTOCHEMICAL  
CONSTITUENTS OF *Elaeis guineensis*  
Jacq. EMBRYOID CULTURES**

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Thesis submitted in fulfillment  
of the requirements for the degree of  
**Master of Science**

**Faculty of Applied Sciences**

February 2017

## ABSTRACT

*Elaeis guineensis* Jacq. (oil palm) is a very important commercial crop in Malaysia. This plant is a valuable source of oil and phytochemical compounds used in food, cosmetics, pharmaceuticals and biofuels. Conventional propagation of oil palm cannot be done vegetatively since it has a single growing apex. Hence, propagation *in vitro* has great advantages in the case of oil palm where vegetative propagation is possible only via tissue culture. Somatic embryogenesis is an important pathway for the oil palm *in vitro* propagation in order to increase the number of new regenerated plantlets. The evolving commercial importance of the phytochemicals has a great interest particularly in the production of secondary metabolites by means of cell culture technology. The presence and accumulation of phytochemical compounds can be an added value to the oil palm tissue culture. This study aimed to determine the effects of Naphthaleneacetic acid (NAA) and precursors (glutamine and phenylalanine) on fresh weight, number of shoots and the phytochemical constituents of oil palm embryoid culture. Oil palm embryoids from clone PL 213, PL 209 and PL 220 were cultured on Murashige & Skoog (MS) media supplemented with 0.0, 0.5, 1.0 and 2.0 mg/L NAA. Then, the best clone was selected to be cultured on MS media supplemented with precursors which were glutamine (0, 250, 500 mg/L) and phenylalanine (0, 75, 100 mg/L). The phytochemical screening of embryoids and shoots methanolic extract was done using Gas Chromatography-Mass Spectrometry (GC-MS). The histological study was carried out for the precursor treatment to observe the structure and the development of embryoids. Results from NAA experiment showed that clone PL 213 produced the highest mean of fresh weight ( $55.30 \pm 3.40$  g) and number of shoots ( $123.00 \pm 4.00$ ) in MS0 (control) after 16 weeks of culture. Clone PL 213 also showed the highest number of phytochemical constituents in embryoids and was selected as the best clone to be used in the precursor experiment. Findings from precursor experiment using clone PL 213 indicated that the highest mean of fresh weight ( $6.39 \pm 2.14$  g) was found in MS+500 mg/L glutamine while the highest mean of number of shoots ( $20.00 \pm 7.87$ ) was produced in MS+250 mg/L glutamine after 28 days of culture. However, MS0 gave the highest mean of fresh weight ( $6.33 \pm 1.30$  g) and MS+100 mg/L phenylalanine produced the highest mean of number of shoots ( $31.00 \pm 7.00$ ) after 28 days of culture. The number of phytochemical constituents was higher in embryoids and shoots treated with glutamine and phenylalanine compared to MS0. These precursors influenced growth and secondary metabolism of oil palm embryoid culture as it could serve as an alternative nitrogen source and constituents of proteins. Generally, histological study of oil palm embryoid showed that adjacent numerous centers of meristematic cells with dense cytoplasm. Also, differentiated cells containing high storage lipid content were obtained within the cytoplasm. As a conclusion, NAA did not enhance the growth meanwhile glutamine and phenylalanine gave a positive effect on the growth of oil palm embryoid cultures. However, NAA and these precursors can promote the accumulation of phytochemical constituents. Therefore, it was suggested that oil palm embryoid culture can be further exploited and manipulated with different concentration of precursor to obtain more valuable phytochemical compounds.

## ACKNOWLEDGEMENT

First of all, I wish to thank God for giving me the opportunity and health so that I can complete my research and this thesis successfully.

My gratitude and thanks go to my beloved supervisor, Associate Professor Dr. Norrizah Jaafar Sidik for the guidance, support and patience during conducting me for few years of my study. I also would like to thanks my co-supervisors Dr. Ahmad Tarmizi Hashim and Associate Professor Dr. Norizan Ahmat for their support.

My appreciation also goes to the staff of Malaysian Palm Oil Board and Faculty of Applied Sciences, Universiti Teknologi MARA for providing the facilities, knowledge and assistance. Thanks also to RMI, Universiti Teknologi MARA and The Ministry of Higher Education for the grant FRGS/2/2010/SG/UiTM/03/22.

Thanks to my father, Hj. Termizi Yahya who always support me during my study and also giving the financial support in order to help me to complete my study. Thanks also to my mother, [REDACTED] and my siblings for their patience, motivation and encouragements that always give me the excitement to further study.

Finally, special thanks to my husband, Mr. Mohd Harris Md Alimuddin and also to my friends who always helped me in this research and gave the moral support until I completed my study successfully. Alhamdulillah.

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