

THE EFFECT OF LIGHT AND HEAT ON THE STABILITY OF BILIRUBIN

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THE EFFECT OF LIGHT AND HEAT ON THE OXIDATIVE STABILITY OF  
PALM OLEIN

By

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**JABATAN SAINS KEJURUTERAAN  
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**PENGAKUAN DAN PENGESAHAN LAPORAN  
PROJEK PENYELIDIKAN I DAN II**

Adalah ini diakui dan disahkan bahawa laporan bertajuk:

The Effect of Light and Heat on the Oxidative Stability of Palm Olein oleh Muhajir bin Herman. No. Matrik UK 7818 telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Kejuruteraan sebagai mematuhi sebahagian daripada keperluan memperolehi Ijazah Sarjana Muda Teknologi (Alam Sekitar), Fakulti Sains dan Teknologi, Universiti Malaysia Terengganu.

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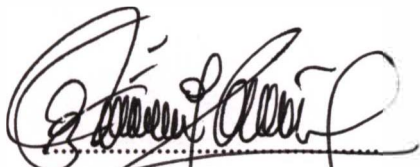
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### **List of Abbreviation**

AOCS	American Oil Chemist's Society
AV	Acid Value
PV	Peroxide Value
IV	Iodine Value
FTIR	Fourier Transform Infrared
FA	Fatty Acid
KOH	Potassium Hydroxide
KI	Potassium Iodide
M	Molarity
N	Normality
TAG	Triacylglycerol
$\text{Na}_2\text{S}_2\text{O}_3$	Sodium Tiosulfate
TAN	Total Acid Number
p-AV	p-Anisidine Value
TGA	Thermogravimetric Analysis

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## ABSTRACT

The focus of this research is to determine the effect of heat and light to oxidative stability of palm olein. Besides, the effectiveness of additive Irgalube F10 to reduce oxidation under different condition was determined. Palm olein samples were prepared under three different conditions which were stored in the dark at room temperature, under visible light of *pendafloor* and heated for 135°C in oil bath for 600 hours. The oil samples were analyzed at selected hours with Acid Value Test (AV) and Iodine Value Test (IV) to measure the oxidation rate. Fourier Transform Infrared (FTIR) Spectroscopy was used to confirm micro structural changes of palm olein while Thermogravimetric Analysis (TGA) was used to determine the thermal stability. The result from this study showed that the oxidation of palm olein was influence by the heating process and the presence of light where those conditions stimulate the oxidation process. This proved through high acid value and low Iodine value. This research also proved that additive Irgalube F10 can reduce the oxidation process under high temperature but act as photosensitizer that increase with the presence of light, as indicated by the increase in acid value. Overall high temperatures accelerate the oxidation process. Additive Irgalube F10 successfully reduces the oxidation process at high temperature.

## ABSTRAK

Fokus kajian ini dijalankan adalah untuk mengkaji kesan cahaya dan pemanasan ke atas kestabilan pengoksidaan minyak sawit olein. Selain itu keberkesanan aditif Irgaluge F10 dalam mengurangkan proses oksidasi turut dikaji. Sampel minyak sawit olein telah diletakkan dalam tiga keadaan yang berlainan iaitu disimpan di tempat gelap pada suhu bilik, dipancarkan dengan cahaya lampu *pendafloor* dan dipanaskan pada suhu 135<sup>0</sup>C selama 600 jam di dalam *oil bath*. Sampel minyak pada masa tertentu dianalisa menggunakan kaedah nilai asid (AV) dan nilai iodin (IV) yang dapat menentukan kadar oksidasi yang terjadi. Kaedah analisis Spektroskopi Inframerah (IR) digunakan untuk menentukan perubahan struktur mikro yang berlaku pada minyak manakala analisis Termogravimetrik digunakan untuk menentukan kestabilan terma minyak. Kajian ini menunjukkan bahawa pengoksidaan minyak sawit olein dipengaruhi oleh pemanasan dan juga pancaran cahaya yang menyebabkan peningkatan kadar pengoksidaan. Ini dibuktikan dengan nilai ujian asid yang tinggi dan nilai ujian Iodin yang rendah. Kajian turut membuktikan aditif Irgalube F10 dapat mengurangkan kadar pengoksidaan pada suhu yang tinggi tetapi bertindak sebagai fotosensitizer yang mempercepatkan kadar pengoksidaan di bawah pancaran cahaya. Ini ditunjukkan dalam peningkatan nilai ujian keasidan. Secara keseluruhannya, pemanasan dapat mempercepatkan pengoksidaan manakala aditif Irgalube F10 boleh mengurangkan kadar pengoksidaan pada suhu tinggi.