THE EFFECTS OF TOMATO EXTRACTS ON THE OXIDATIVE STABILITY OF PALM OLEIN

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THE EFFECTS OF TOMATO EXTRACTS ON THE OXIDATIVE STABILITY OF PALM OLEIN

By

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The effects of tomato extracts on the oxidative stability of palm olein

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LIST OF ABBREVIATION AND SYMBOLS

Abbreviation / Symbol	Description
%	percentage
°C	degree Celcius
Δ	Sample Weight Gain
μm	micrometer
AOCS	American Oil Chemists' Society
AV	Acid Value
BHA	Butylated Hydroxyianisole
BHT	Butylated Hydroxytoluene
BS	Butanol Tomato Subfraction
C	Carbon
DS	Dichloromethane Tomato Subfraction
EAS	Ethyl Acetate Subfraction
et al.	and others
FT-IR	Fourier-Transform Infrared
g	gram
HE	Hexane Extract
IR	Infrared
IV	Iodine Value
KI	Potassium Iodide
KOH	Potassium Hydroxide
M	Molality
meq/g	Miliquivalents per gram

mL	Millimeter
N	Normality
$Na_2S_2O_3$	Sodium Tiosulfate
O	Oxygen
ppm	part per million
PO	Palm Olein
POD	Palm Olein in the presence of 1% of Dichloromethane tomato subfraction
PV	Peroxide Value
R•	Hydrocarbon Radical
RBD	Refined, Bleached and Deodorized
ROO•	Peroxy Radical
ROOH	Hydroperoxide
TAN	Total Acid Number
TGA	Thermogravimetric Analysis
T_f	Final Oxidation Temperature
T_i	Initial Oxidation Temperature
TLC	Thin-Layer Chromatography
UV-Vis	Ultraviolet-Visible
WM	Wet Matter
WS	Water Subfraction

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ABSTRACT

In this study, tomato (*Lycopersicon esculentum*) was extracted by methanol and hexane respectively. Methanolic extract was subfractionated by liquid-liquid partition using dichloromethane, ethyl acetate, butanol and water. The structures of all tomato extracts were analyzed by using thin-layer chromatography (TLC), Fourier-transform infrared (FTIR) spectroscopy and ultraviolet-visible (UV-Vis) spectroscopy. The oxidative stability of palm olein in presence of 1% hexane extract, each subfraction of methanolic extract and α-tocopherol were tested respectively by using thermogravimetric analysis (TGA) in oxygen atmosphere. With regard to weight gain percent and initial oxidation temperature, α-tocopherol and all tomato extracts effectively reduced the oxidation rate of the palm olein compared with palm olein without any additive (PO). Palm olein in presence of 1% dichloromethane subfaction of methanol extract (POD) had showed the lowest oxidation rate. To confirm the relative rates of oxidative deterioration, POD and PO were heating at 135°C for 200 hours and analyzed periodically for their peroxide value (PV), iodine value (IV), acid value (AV). In addition, the thermal-oxidative stabilities of PO and POD were analyzed using TGA in nitrogen atmosphere and IR analysis. The results showed that POD effectively reduced the oxidation rate compared PO as detected by higher degradation temperature and onset temperature, less increasing intensity of region C=O, lower PV and TAN, relatively higher IV for all the heating time.

KESAN TOMATO EKSTRAK TOMATO PADA KESTABILAN PENGOKSIDAAN OLEIN KELAPA SAWIT

ABSTRAK

Dalam kajian ini, tomato (*Lycopersicon esculentum*) telah diektrak dengan hexane dan methanol masing-masing. Metanolik ekstrak dibahagikan oleh empat pelarut pembahagian dengan diklorometana, etil acetate dan butanol. Sifat-sifat bagi semua tomato ekstrak telah dikaji dengan kromatografi lapisan nipis, spektroskopi Fourier Transformasi Inframerah dan spektroskopi ultralembayung-nampak. Kestabilan pengoksidaan olein kelapa sawit yang ditambah 1% ekstrak hexane, setiap sub-pengektrakan dan α-tocoferol telah diuji masing-masing dengan analisis termogravimetri dalam oksigen. Berdasarkan peratus berat dan suhu permulaan pengoksidaan, semua ekstrak tomato dan α-tocoferol sebagai antioksidan dapat mengurangkan kadar pengoksidaan olein kelapa sawit dengan berbanding dengan olein kelapa sawit yang tiada penambah (PO). Olein kelapa sawit yang ditambahkan 1% sub-pengekstrakan dichlorometana (POD) telah menunjukkan kadar pengoksidaan paling rendah. Untuk mengkaji kadar kemerosotan, PO dan POD telah dipanaskan pada 135°C selama 200 jam. Nilai-nilai peroksida, iodin dan asid PO dan POD telah ditentukan dari masa ke masa. Tambahan pula, analisis termogravimetri dalam nitrogen dan spektroskopi Fourier Transformasi Inframerah digunakan untuk mengkaji kestabilan pengoksidaan PO dan POD. Keputusan menunjukkan POD dapat mengurangkan kadar pengoksidaan berbanding dengan PO kerana suhu penurunan dan suhu mula yang lebih tinggi, penambahan keluasan C=O yang lebih kurang, nilai-nilai peroksida dan asid yang lebih rendah dan nilai iodine yang lebih tinggi untuk semua masa pemanasan.