MINOR CHEMICAL CONSTITUENTS FROM PALM FRUIT AND PALM-PRESSED FIBRE

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TABLE OF CONTENTS

CHAPTER TWO: BIOCHEMICAL CHANGES IN THE DEVELOPING OIL PALM MESOCARP

CHAPTER THREE: RECOVERY OF PHOSPHOLIPIDS FROM PALM-PRESSED FIBRE

LIST OF TABLES

LIST OF FIGURES

LIST OF SCHEMES

LIST OF ABBREVIATIONS

cm	centimetre
cpo	crude palm oil
° C	degree Celsius
DG	diacylglycerols
DPG	diphosphatidylglycerol
FFA	free fatty acids
FFB	fresh fruit bunches
FRAP	ferric reducing antioxidant power assay
g	gram
GC	gas chromatography
HPLC	high performance liquid chromatography
LPC	lysophosphatidylcholine
LPE	lysophosphatidylethanolamine
max	maximum
mg	milligram
MG	monoacylglycerols
min	minute
ml	mililitre
mm	milimetre
MPOB	Malaysian Palm Oil Board
nm	nanometre
PA	phosphatidic acids

PC	phosphatidylcholine
PE	phosphaditylethanolamine
PG	phosphatidylglycerol
PI	phosphatidylinositol
PL	phospholipids
PM	phosphatidylmethanol
ppm	part per million
PS	phosphatidylserine
SD	sterilised and dried palm mesocarp oil
SW	sterilised and wet palm mesocarp oil
TEAC	trolox equivalent antioxidant capacity
TG	triacylglycerols
TLC	thin layer chromatography
T	trace
UD	unsterilised and dried palm mesocarp oil
UV-Vis	ultraviolet-visible
UW	unsterilised and wet palm mesocarp oil
WAA	weeks after anthesis
wt	weight
µl	microlitre
λ	wavelength

ABSTRACT

The analyses of selected minor components in the developing palm fruits exhibited interesting distribution patterns, which may reveal their possible roles during maturation process and their fates resulting from different treatments prior to extraction.

The increase in phospholipids and sterols content due to the cellular proliferation at earlier stages had been observed. The major phospholipids found in the immature fruits are phosphatidylcholine, phosphatidylinositol and lysophosphatidylcholine. There was a transformation of phosphatidylcholine to other phospholipids in the presence of phospholipase D at 16 weeks after anthesis (WAA). The phosphatases and lipases present in the immature fruits may be the inducible agents for fruit ripening and trigger the oil accumulation starting at 16 WAA.

The biosynthesis of tocopherols and tocotrienols might follow different pathways with the former activated in the earlier stages of ripening, whereas the latter was activated after 16 WAA. At the same time, there was a massive biosynthesis of carotenes followed by degradation of chlorophyll mainly due to the biosynthesis of α- and β-carotenes.

The sterols were found in significant amount at 4 and 16 WAA. This observation suggests the active cellular proliferation at 4 WAA and the sterols accumulation precede the oil accumulation and reached the maximum at 16 WAA. Squalene showed similar distribution pattern as sterols in the developing palm mesocarp.

The maturation and ripening of palm fruits is a very complicated process, which involve numerous biochemical and chemical changes. 16 WAA seems to be the most important growth stage where many significant changes occur.

Attempts have been done to recover the phospholipids from palm-pressed fibre which amounted up to *ca.* 37,000 ppm. The total lipids in palm-pressed fibre were fractionated by the stepwise solvents extraction at room temperature, which yield the FOES with 13 wt. % of phospholipids. The major components were phosphatidylcholine, phosphatidylethanolamine and phosphatidylinositol.

Purification of crude lecithin extract, *viz.* FOES (fibre oil extracted using 95% ethanol by stepwise solvent extraction) through octadecyl (C_{18}) open column chromatography seems to be equivalent to that of phosphatidylcholine enrichment. High purity phospholipids fractions with more than 90% phosphatidylcholine were obtained. The preferable solvent system to be used is depicted in Experiment (F): i. ethanol: water (85:15 v/v); ii. ethanol: water (95:5 v/v); iii. hexane.

Phospholipids extracted from palm-pressed fibre showed superb synergistic effect with vitamin E where there were ten folds activities increase in Ferric Reducing Antioxidant Power (FRAP) assay expressed in μM of Trolox activity per weight (1mg/ml) of sample.