

**A STUDY ON THE STABILITY AND FRYING PERFORMANCE OF  
USED PALM OLEIN – EFFECT OF TOPPING UP**

By

**Nik Nurain Bt Nik Hanafi**

**Final Project Paper Submitted in Partial Fulfillment for the Degree of Bachelor  
of Science (Hons.) in Food Quality Management, Faculty of Applied Sciences  
Universiti Teknologi MARA**

**April 2003**

## ACKNOWLEDGEMENTS

In the name of Allah, The Most Gracious and The Most Merciful. Thanks to Allah S.W.T. for giving me the strength and patience to complete this thesis.

During the completion of this study, there were many people who were involved in giving me support and supervision. First of all, I wish to express my sincere gratitude and appreciation to my thesis supervisor, Assoc. Prof. Dr. Halimahton Zahrah bt Mohamed Som for her invaluable guidance, keen interest, advice, unreserved assistance and encouragement during the laboratory experiments, the preparation of the text and her evaluation throughout the study. I also would like to thank my co-supervisors, Dr. Razali Ismail and Dr. Muhammad Nor Omar from Malaysian Palm Oil Board, Bangi, for their guidance and supervision during the course of this study. Appreciation also goes to Dr. Nor Aini Idris for her contribution in the sensory evaluation of the palm olein and nuggets, and all the relevant staff of Malaysian Palm Oil Board (MPOB) for their assistance and technical support throughout this study.

I also want to record my sincere gratitude and appreciation to all my lecturers of Food Technology Department, whose encouragement and optimism throughout my studies in the BSc. (Hons.) in Food Quality Management had given me the strength to complete this course. My sincere thanks are also extended to En. Azli Munjat, Cik Hariyah, En. Osman and En. Omar for their guidance and assistance in

## TABLE OF CONTENTS

		Page
<b>ACKNOWLEDGEMENTS</b> .....		iii
<b>LIST OF TABLES</b> .....		vii
<b>LIST OF FIGURES</b> .....		viii
<b>LIST OF ABBREVIATIONS</b> .....		ix
<b>ABSTRACT</b> .....		x
<b>ABSTRAK</b> .....		xi
<b>CHAPTER</b>		
<b>1</b>	<b>INTRODUCTION</b> .....	1
<b>2</b>	<b>LITERATURE REVIEW</b> .....	5
2.1	Palm Olein.....	5
2.1.1	Palm Oil Composition and Physical Properties.....	5
2.2	Frying Medium.....	8
2.3	Frying Equipment.....	10
2.3.1	Avoid Metal Contamination.....	11
2.3.2	Avoid Overheating.....	11
2.3.3	Avoid Overloading of Food.....	12
2.3.4	Problems with Electric Kettles.....	12
2.4	Deep-Fat Frying.....	13
2.4.1	General Mechanism of Deep-Fat Frying.....	14
2.5	Oil Changes and Reactions During Frying.....	16
2.5.1	Oxidation.....	18
2.5.2	Polymerization.....	19
2.5.3	Hydrolysis.....	20
2.5.4	Color Formation.....	21
2.5.5	Physical Effect of Chemical Degradation.....	23
2.6	Discarding Frying Oil.....	26
2.7	Filtration of Used Oils.....	26
2.8	Measurement of Heat Abuse of Oils.....	27
2.9	Prevention of Oil Degradation.....	28
2.10	Breaded Chicken Nuggets.....	29
2.10.1	Polysaccharides.....	30
2.10.2	Protein.....	30
2.10.3	Fats and Hydrogenated Oils.....	30
2.10.4	Water.....	31
2.10.5	Seasoning.....	31
2.11	Stability of Frying Oils.....	32
2.12	Health Issues of Frying Fats and Oils.....	33

## **ABSTRACT**

### **A STUDY ON THE STABILITY, QUALITY AND FRYING PERFORMANCE OF USED PALM OLEIN – EFFECT OF TOPPING UP**

By

**NIK NURAIN BT NIK HANAFI**

April 2003

This study investigated the stability, quality and frying performance of used palm olein and the effect of topping up during frying. The peroxide value (PV), free fatty acid (FFA), color, polar and polymer compounds of the used palm oleins were measured on the first, third and fifth days of frying to be correlated to the oxidative stability as determined by the Rancimat, overall oil quality and frying performance. Sensory evaluation of chicken nuggets and odor of oil were also conducted at the same time to determine consumer acceptability of both used palm oleins. The study indicated that the topped up used palm olein had higher oxidative stability and quality than the non-topped up used palm olein as shown by its lower PV, FFA, color, polar and polymer compounds and its higher induction period on the first, third and fifth days of frying. For the sensory evaluation of chicken nuggets fried in topped up and non-topped up used palm oleins, and the sensory evaluation of odor of oil, the results showed no significant differences ( $p>0.05$ ) in terms of color, aroma, taste, texture, odor and overall acceptability on the first, third and fifth days of frying. Overall, the topped up used palm olein was better than the non-topped up used palm olein in terms of stability, quality and frying performance.

## CHAPTER 1

### INTRODUCTION

The use of fats and oils prior to the beginning of the nineteenth century was based on practical knowledge that had been accumulated slowly over many centuries. Today, fats and oils are developed and subsequent productions are controlled with knowledge of their composition, structural and functional properties, and the expected reactions obtained through the application of scientific approach. The intent was to help the processors and users to understand the functionalities and limitations of fats and oils product (O'Brien, 1998).

Palm oil is one of the most important fruit oils in world trade and its use grows at a rapid rate for a period of time. Palm oil is derived from the fruit of the oil palm tree, *Elaeis guineensis*. It was first introduced to Malaysia as an ornamental plant in 1870 and has now become the cornerstone of the country's agricultural sector. The palm oil processing industry in Malaysia offers regular palm oil processed to different points, as well as the olein and stearin fractions of palm oil. Palm olein is the liquid fraction obtained by fractionation of palm oil after crystallization at controlled temperatures. The physical characteristics of palm olein differ significantly from those of palm oil. It is fully liquid in warm climates, has a narrower range of glycerides and blends perfectly with any seed oil. Palm olein used as cooking oil originates from crude palm oil and it is widely used for frying a variety of food products (Pantzaris, 2000).