

4/2000  
EXTRACTION AND ANALYSIS OF OILS FROM AVOCADO  
FRUITS GROWN IN THIKA.

TRADE PROJECT

PRESENTED BY : PAUL NGUGI MUTHONDU.

INDEX NO. : 401001/\_\_\_\_

COURSE NAME : DIPLOMA IN ANALYTICAL CHEMISTRY

INSTITUTE : KENYA POLYTECHNIC

PRESENTED TO: KENYA NATIONAL EXAMINATION COUNCIL

DATE OF PRESENTATION: NOVEMBER 2000.

CHEM S

## ABSTRACT

Despite the fact that a number of oil crops are grown in Kenya, few of <sup>these</sup> ~~thee~~ crops have been exploited. For a long time the use of oil has been in practice but their significance has not been fully studied.

In this project, extraction and subsequent analysis of oils from avocado fruit, botanically known as *Persea americana* was the major objective. Solvent extraction method was used to extract the oils from mashed avocado pulp. Different types of solvent were tried in an attempt to see which one was the best solvent for avocado oil extraction. Petroleum ether was found to be the best both in yield and the ability to separate the solvent and the oil. Therefore oils extracted by petroleum ether were used for the analysis.

Different parameters both chemical and physical were used so as to determine the quality of extracted oil. Trace metal analysis was also carried out and in this respect only three metals were analysed, that is, iron, copper and zinc which were all present but in low quantity. Attempt to determine the calorific value using adiabatic bomb calorimeter showed a great difference from those of pure oil.

Avocado oil showed that it is of superior quality and can be used as a substitute in the manufacture of salad and it can find its application in preparation of cosmetics.

## ABSTRACT

Despite the fact that a number of oil crops are grown in Kenya, few of <sup>these</sup> ~~thee~~ crops have been exploited. For a long time the use of oil has been in practice but their significance has not been fully studied.

In this project, extraction and subsequent analysis of oils from avocado fruit, botanically known as *Persea americana* was the major objective. Solvent extraction method was used to extract the oils from mashed avocado pulp. Different types of solvent were tried in an attempt to see which one was the best solvent for avocado oil extraction. Petroleum ether was found to be the best both in yield and the ability to separate the solvent and the oil. Therefore oils extracted by petroleum ether were used for the analysis.

Different parameters both chemical and physical were used so as to determine the quality of extracted oil. Trace metal analysis was also carried out and in this respect only three metals were analysed, that is, iron, copper and zinc which were all present but in low quantity. Attempt to determine the calorific value using adiabatic bomb calorimeter showed a great difference from those of pure oil.

Avocado oil showed that it is of superior quality and can be used as a substitute in the manufacture of salad and it can find its application in preparation of cosmetics.

## TABLE OF CONTENTS

Declaration.....	i
Dedication.....	ii
Acknowledgements.....	iii
Abstract.....	iv
Table of contents.....	v
<b>CHAPTER 1</b>	
1.0 Introduction and literature review.....	1
1.1 Introduction.....	1
1.1.1 Cross-section diagram of avocado fruit.....	3
1.2 Literature review.....	4
1.2.2 Oils and fats in plants.....	5
1.2.3 Uses of fats and oils.....	7
1.2.4 Biological functions of fats and oils.....	8
1.3.0 Methodology.....	9
1.3.1 Oil extraction.....	9
1.3.1.1 Solvent extraction.....	9
1.3.1.2 Other methods of oil extraction.....	10
1.3.2.0 Chemical and physical parameters.....	10
1.3.2.1 Saponification value.....	10
1.3.2.2 Unsaturation (iodine value).....	11
1.3.2.3 Free fatty acid and acid value.....	12
1.3.2.4 Calorific Value.....	12
1.3.2.5 Trace metal analysis.....	14
1.3.2.5.1 Iron.....	14
1.3.2.5.2 Copper.....	14
1.3.2.5.3 Zinc.....	14
1.3.2.5.4 Atomic Absorption Spectroscopy.....	15
1.3.2.5.5 Reason for choice of A. A. S.....	16
Block diagram of A. A. S. (Double beam).....	17
1.3.2.6 Peroxide value.....	17
1.3.3.0 Physical test.....	18
1.3.3.1 Refractive Index.....	18
1.3.3.2 Specific gravity.....	18
1.3.3.3 Boiling point.....	19
1.4 Objectives.....	20
<b>CHAPTER 2</b>	
2.1 Sampling and experimental procedure.....	20
2.1.1 Sampling.....	20
2.1.2 Sample storage.....	20
2.1.3 Sampling area.....	20
2.1.4 Sample preparation.....	22
2.2 Reagents and apparatus.....	22
2.2.1 Apparatus.....	22
2.2.2 Reagent.....	23
2.2.3 Preparation of reagents.....	24

2.2.3.1 Starch indicator .....	24
2.2.3.3 Sodium thiosulphate .....	24
2.2.3.4 Standardization of sodium thiosulphate solution .....	24
2.2.3.5 Preparation of potassium dichromate solution .....	25
2.3 Determination of the best solvent for avocado oil extraction .....	25
2.4.0 Analysis oil .....	26
2.4.1 Chemical methods .....	26
2.4.1.1 Saponification value .....	26
2.4.1.2 Iodine value .....	27
2.4.1.3 Acid value .....	28
2.4.1.4 Determination of calorific value .....	28
2.4.2 Physical test .....	30
2.4.2.1 Refractive index .....	30
2.4.2.2 Specific gravity .....	30
2.4.2.3 Determination of boiling point .....	31
2.4.3 Trace metal analysis .....	31
2.4.3.1 Preparation of standard .....	31
2.4.3.1.1 Iron standard .....	32
2.4.3.1.2 Copper standard .....	32
2.4.3.1.3 Zinc standard .....	32
2.4.3.2 Sample preparation for metal analysis .....	32
2.4.3.3 Instrumental parameters and working conditions for A. A. S. ....	33
<b>CHAPTER 3</b>	
3.1 Extraction of oil .....	34
3.2.1 Saponification value .....	35
3.2.2 Iodine value .....	36
3.3.3 Peroxide value .....	36
3.2.4 Acid value and free fatty acid .....	37
3.2.5 Determination of calorific value .....	37
3.3 Physical test .....	38
3.3.1 Specific gravity .....	38
3.3.2 Boiling point .....	38
3.3.3 Refractive index .....	38
3.4.0 Trace metal analysis .....	39
3.4.1 a Determination of iron .....	39
3.4.2 b Determination of copper .....	39
3.4.3 c Determination of zinc .....	40
3.4.1.b Calibration curve for the iron concentration in standard and in the sample .....	41
3.4.2.b Calibration curve for copper concentration in standard and sample .....	42
3.4.3 b Calibration curve for zinc concentration both in standard and sample .....	43
<b>CHAPTER 4</b>	
Discussion of the results .....	44
Conclusion .....	46
Recommendation .....	47
References .....	49