CONTENTS

SUBJECT	PAGE
Alaya	Ι
Dedication	II
Acknowledgement	III
Abstract	IV
المستخلص	VI
Contents	VIII
List of Table	XI
List of Appendixes	XII
Abbreviations	XVII
CHAPTER ONE: INTRODUCTION	
1. Introduction	1
1.1. Lipid chemistry	1
1.1.1. Uses for Vegetable Oils	٦
1-1- ^Y .Oils and Nutrition	Α
1.1. [°] . Vegetable oils	٩
1.1. ^w .1. Processing of Fresh Oil	9
1.1. [°] . 2.Vegetable oils (conventional and nonconventional)	١٣
1.1. ^٤ . Frying	١٨
1.1. [£] .1. Physiochemical changes during heating and frying	۲2
1.1. [£] .1.8. A free radical	٤٣

1.1.4.1.9. Rancidity	4^
1.1.5. Antioxidants	٤٩
Objectives	5٣
CHAPTER TWO: MATERIALS & METHODS	
2.1. Materials	54
2.1.1.Chemicals	54
2.1.2.Equipment	54
2.2.Methods	٥5
2.2.1. Sampling	٥5
2.2.2. Extraction of <i>moringaoleifera</i> seed oil	٥5
2.2.3. Frying Procedures	۰6
2.2.4.Statistical analysis	57
2.2.5. Physical Analysis of Oils	۰7
2.2.6. Chemicals Analysis of Oils	09
2.2.7. Instrumental Techniques	61
2.2.7.1. Gas chromatography (GC)	61
2.2.7.2. Fourier transform-infrared (FTIR) analysis	62
2.2.7.3. Ultraviolet –visible spectrophotometry	62
CHAPTER THREE:RESULTS	

Physicochemical properties	63
Determination of fatty acid composition	68
Functional groups from Fourier transform-infrared (FTIR) analysis	70
CHAPTER FOUR : DISCUSSION	
Discussion	72
Conclusion	82
Recommendation	83
References	84
Appendixes	102

List of Table

Table(3.1)Viscosity (m Pas) of different types of vegetable oil	63
during frying at $1/5 \pm 5$ °C for 6 h	

Table(3. 2)Viscosity (m Pas) of different types of vegetable oil during frying at 175± 5°C for 36h	63
Table(3. 3)Refractive index (RI) of different types of vegetable oil during frying at 175 ± 5 °C for 6h	64
Table(3. 4)Refractive index (RI) of different types of vegetable oil during frying at 175± 5°C for 36h	64
Table(3. 5)Color of different types of vegetable oil during frying at 175 ± 5 °C for 6h	65
Table(3. 6) Color of different types of vegetable oil during frying at 175 ± 5 °C for 36h	65
Table(3. 7)Free fatty acid (%) of different types of vegetable oil during frying at 175± 5°C for 6h	66
Table(3. 8)Free fatty acid (%) of different types of vegetable oil during frying at 175± 5°C for 36h	66
Table(3. 9)Peroxide value (meg/Kg) of different types of vegetable oil during frying at $175\pm$ °C for 6h	67
Table(3. 10)Peroxide value (meg/Kg) of different types of vegetable oil during frying at $175\pm$ °C for 36h	67
Table(3. 11)Fatty acid decomposition (%) of different types of vegetable oil during frying at 175± 5°C for 6h	68
Table(3. 12)Fatty acid decomposition (%) of different types of vegetable oil during frying at 175± 5°C for 36h	69
Table(3. 13)FTIR Spectra area (%) of different types of vegetable oil during frying at $175\pm 5^{\circ}$ C for 6h	70
Table(3. 14)FTIR Spectra area (%) of different types of vegetable oil during frying at $175\pm 5^{\circ}$ C for 36h	71

List Appendixes

Appendixes	Page
Appendix 1.Gas chromatographic determination of fatty acid composition of groundnut oil frying for (0h).	102
Appendix 2.Gas chromatographic determination of fatty acid composition of groundnut oil frying for (2h).	103
Appendix 3.Gas chromatographic determination of fatty acid composition of groundnut oil frying for (4h).	104
Appendix 4.Gas chromatographic determination of fatty acid composition of groundnut oil frying for (6h).	105
Appendix 5.Gas chromatographic determination of fatty acid composition of groundnut oil frying for (12h).	106
Appendix 6.Gas chromatographic determination of fatty acid composition of groundnut oil frying for (24h).	107
Appendix 7.Gas chromatographic determination of fatty acid composition of groundnut oil frying for (36h).	108
Appendix 8.Gas chromatographic determination of fatty acid composition of sunflower oil frying for (0h).	109
Appendix 9.Gas chromatographic determination of fatty acid composition of sunflower oil frying for (2h).	110
Appendix 10.Gas chromatographic determination of fatty acid composition of sunflower oil frying for (4h).	111
Appendix 11.Gas chromatographic determination of fatty acid composition of sunflower oil frying for (6h).	112
Appendix 12.Gas chromatographic determination of fatty acid composition of sunflower oil frying for (12h).	113
Appendix 13.Gas chromatographic determination of fatty acid composition of sunflower oil frying for (24h).	114

Appendix 14. Gas chromatographic determination of fatty acid composition of sunflower oil frying for (36h).	115
Appendix 15. Gas chromatographic determination of fatty acid composition of <i>moringa oliefera</i> oil frying for (0h).	116
Appendix 16. Gas chromatographic determination of fatty acid composition of <i>moringa oliefera</i> oil frying for (2h).	117
Appendix 17. Gas chromatographic determination of fatty acid composition of <i>moringa oliefera</i> oil frying for (4h)	118
Appendix 18. Gas chromatographic determination of fatty acid	119
Appendix 19. Gas chromatographic determination of fatty acid composition of <i>moringa oliefera</i> oil frying for (12h).	120
Appendix 20. Gas chromatographic determination of fatty acid composition of <i>moringa oliefera</i> oil frying for (24h).	121
Appendix 21. Gas chromatographic determination of fatty acid composition of <i>moringa oliefera</i> oil frying for (36h).	122
Appendix 22. FTIR Spectrum of groundnut oil frying for (0h).	123
Appendix 23. FTIR Spectrum of groundnut oil frying for (2h).	124
Appendix 24. FTIR Spectrum of groundnut oil frying for (4h).	125
Appendix 25. FTIR Spectrum of groundnut oil frying for (6h).	126
Appendix 26. FTIR Spectrum of groundnut oil frying for (12h).	127
Appendix 27. FTIR Spectrum of groundnut oil frying for (24h).	128
Appendix 28. FTIR Spectrum of groundnut oil frying for (36h).	129
Appendix 29. FTIR Spectrum of sunflower oil frying for (0h).	130
Appendix 30. FTIR Spectrum of sunflower oil frying for (2h).	131
Appendix 31. FTIR Spectrum of sunflower oil frying for (4h).	132

Appendix 32. FTIR Spectrum of sunflower oil frying for (6h).	133
Appendix 33. FTIR Spectrum of sunflower oil frying for (12h).	134

Appendix 34. FTIR Spectrum of sunflower oil frying for (24h).	135
Appendix 35. FTIR Spectrum of sunflower oil frying for (36h).	136
Appendix 36. FTIR Spectrum of moringa oliefera oil frying for	137
(0h).	
Appendix 37. FTIR Spectrum of <i>moringa oliefera</i> oil frying for (2h).	138
Appendix 38. FTIR Spectrum of <i>moringa oliefera</i> oil frying for (4h).	139
Appendix 39. FTIR Spectrum of <i>moringa oliefera</i> oil frying for (6h).	140
Appendix 40. FTIR Spectrum of moringa oliefera oil frying for	141
(12h).	
Appendix 41. FTIR Spectrum of moringa oliefera oil frying for	142
(24h).	
Appendix 42. FTIR Spectrum of moringa oliefera oil frying for	143
(36h).	
Appendix 43. UV Spectrophotometric determination of conjugating dienes And triene of Groundnut Oil Frying for (0h).	144
Appendix44.UV Spectrophotometric determination of conjugating dienes and triene of Groundnut Oil Frying for (2h).	145
Appendix 45. UV Spectrophotometric determination of conjugating dienes and triene of Groundnut Oil Frying for (4h).	146
Appendix 46. UV Spectrophotometric determination of conjugating dienes and trieneof Groundnut Oil Frying for (6h).	147
Appendix 47. UV Spectrophotometric determination of conjugating dienes and trieneof Groundnut Oil Frying for (12h).	148
Appendix 48. UV Spectrophotometric determination of conjugating dienes and trieneof Groundnut Oil Frying for (24h).	149

Appendix 49. UV Spectrophotometric determination of conjugating dienes and trieneof Groundnut Oil Frying for (36h).	150
Appendix50. UV Spectrophotometric determination of conjugating dienes and trieneof sunflower Oil Frying for (0h).	151
Appendix51. UV Spectrophotometric determination of conjugating dienes and trieneof sunflower Oil Frying for (2h).	152
Appendix52. UV Spectrophotometric determination of conjugating dienes and trieneof sunflower Oil Frying for (4h).	153
Appendix53. UV Spectrophotometric determination of conjugating dienes and trieneof sunflower Oil Frying for (6h).	154
Appendix54. UV Spectrophotometric determination of conjugating dienes and trieneof sunflower Oil Frying for (12h).	155
Appendix55. UV Spectrophotometric determination of conjugating dienes and trieneof sunflower Oil Frying for (24h).	156
Appendix56. UV Spectrophotometric determination of conjugating dienes and trieneof sunflower Oil Frying for (36h).	157
Appendix57. UV Spectrophotometric determination of conjugating dienes and trieneof <i>moringaoliefera</i> Oil Frying for (0h).	158
Appendix58. UV Spectrophotometric determination of conjugating dienes and trieneof <i>moringa oliefera</i> Oil Frying for (2h).	159
Appendix59. UV Spectrophotometric determination of conjugating dienes and trieneof <i>moringa oliefera</i> Oil Frying for (4h).	160
Appendix60. UV Spectrophotometric determination of conjugating dienes and trieneof <i>moringa oliefera</i> Oil Frying for (6h).	161
Appendix61. UV Spectrophotometric determination o conjugating dienes and trieneof <i>moringa oliefera</i> Oil Frying for (12h).	162

Appendix62. UV Spectrophotometric determination of conjugating dienes and trieneof <i>moringa oliefera</i> Oil Frying for (24h).	163
Appendix63. UV Spectrophotometric determination of conjugating dienes and trieneof <i>moringa oliefera</i> Oil Frying for (36h).	164

List of Abbreviations

DA	Gs =	Diacylglycerol
ТА	Gs =	Triacylglycerol
PLs	= P	hosphoglycerides
GLs	= g	lycosyl glycerides
DNA	= Deo	xyribo nuclear acid
	FA =	Fatty acid
°C	= (Centigrade degree
h	=	hours
FFA	% =	free fatty acids percent
LDL	=	low density lipoprotein
$^{3}O_{2}$	=	triplet oxygen
$^{1}O_{2}$	= sin	glet oxygen
RH	=	unsaturated lipids
ROO [.]	=	peroxy radicals
ROOH	=	lipid hydro peroxides
ROO-	=	alkylperoxyl radicals
RO [.]	= alk	toxyl radicals
EDTA	= Eti	hylenediaminetetraacetic acid
AOAC	= Ass	ociation of Official Analysis Chemist

PV	= Peroxide value
Ν	= normality
GC	= Gas chromatography
RI	= refractive index
FTIR	= Fourier transform-infrared
mg/Kg	= mill equivalents oxygen per kilo gram of fat/oil
SFA	= Saturated fatty acid
MUFA	= monounsaturated fatty acid
PUFA	= polyunsaturated fatty acids
Fig	= Figure
K_{233} and K_{269}	= specific extinction
R [.]	= lipid free radicals
P/S	= ratio of polyunsaturated to saturated fatty acid
ROO [.]	= peroxy radicals
Н,	= Hydrogen radical
OH	= Hydroxide radical
Pa [·] s	= unit of dynamic viscosity (Pascal- second)