



Sudan University of Science and Technology

Collage of Graduate Studies



**Physiochemical Properties and Effects of Addition of Some
Natural Antioxidants on Shelf Life of Sunflower and
Soybean Oils**

الخواص الفيزيوكيميائية وتأثيرات إضافة بعض مضادات التأكسد الطبيعية في
فترة صلاحية زيت زهرة الشمس وزيت فول الصويا

*A thesis Submitted for the Fulfillment of the Requirements of
Degree of Doctor of Philosophy in Chemistry*

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Dedication

To whom I love

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Abstract

The aim of this work was to investigate the effect of addition of natural antioxidants, Sesame oil and dichloromethane (DCM) extract of ginger roots, at different concentrations (0, 200, 300, 400, 500 and 600 ppm each separately), to the shelf life (150 days) of edible oils (refined sunflower oil and crude soybean oil), at room temperature (28° C).

It is found that ginger roots were found to consist from 12.5% moisture, 5.98% ash, 3.24% protein, 21.5% carbohydrate, 1.5% oil content and 56.86% fiber. Their main elements determined by atomic absorption spectrophotometry were found to be calcium 111.23 ppm, iron 15.24 ppm, zinc 10.96 ppm, and sodium 10.92 ppm as well as small amount of copper 0.65 ppm, manganese 11.03 ppm, lead 0.27 ppm and chromium 0.02 ppm; however aluminum was not detected. Fatty acids of oils under study (sesame, sunflower, soybean, ginger oil and dichloromethane extract) were determined by GC-MS.

The effective use of antioxidants in edible oils was investigated by determining the changes in the physiochemical properties of edible oil such as peroxide value, iodine value, acidity, viscosity, refractive index and colour intensity through the period of storage. Among these physiochemical properties, only peroxide and iodine values were found to be useful in determining the extent of deterioration

of the quality and nutritional value between treated and untreated edible oils with natural antioxidants during different times of the storage period.

The activity of antioxidant was determined by 2, 2-diphenylpicrylhydrazyl (DPPH) free radical scavenging assay. In comparison with 94.7% for the standard propyl gallate, it gave up to 80% for DCM extract from ginger roots and down to 4.0% for crude sesame oil.

الخلاصة

عنيت هذه الاطروحة بدراسة تأثير اضافة مضادات الاكسدة الطبيعية (زيت السمسم ومستخلص ثنائى كلورو الميثان من جذور الجنزبيل) على زيوت الطعام (زيت عباد الشمس وزيت الصويا) بغرض اطالة عمر الزيت .تمت اضافة مضادات التاكسد الي زيوت الطعام بعدة تراكيز (0 ، 200 ، 300 ، 400 ، 500 ، 600 جزء من المليون) عند درجة حرارة الغرفة (28°م) خلال 150 يوم (فترة التخزين) .

وُجد أن جذور الجنزبيل تتكون من 12.5% رطوبة ، 5.98% رماد ، 3.2% بروتين ، 21.51% كاربوهيدريت 1.5% محتوى لزيت ، 56.86%الياف . العناصر الاساسية تم تحديدها بجهاز مطياف الامتصاص الذري ووُجدت 111.23 جزء في المليون كالسيوم ، 15.24 جزء في المليون حديد ، 10.90 جزء في المليون زنك ، 10.92 جزء في المليون صوديوم ، كما وُجدت كميات ضئيلة من النحاس 0.65 جزء في المليون والرصاص 0.27 جزء في المليون رصاص والمنجنيز 1.03 جزء في المليون والكروم 0.02 جزء في المليون . لم يتم تحديد الامونيوم . كذلك تم استخدام جهاز كروماتوغرافيا الغاز- مطياف الكتله لتحديد الاحماض الدهنيه لزيوت السمسم عباد الشمس، الصويا ، الجنزبيل ومستخلص ثنائى كلورو الميثان . تم تحديد فاعلية مضادات التاكسد على زيوت الطعام المستهدفة بدراسة التغير في الخواص الفيزيوكيميائية للزيوت خلال فترة التخزين (قيم البيروكسيد ، قيم الايودين ، الحمضية ، الكثافة ، معامل الانكسار والكثافة اللونية) . وجدت الدراسة ان قيم البيروكسيد والايودين لزيت عباد الشمس وزيت الصويا اعطت قيم واضحة الدلالة في العينات المعالجة بمضادات التأكسد مقارنة مع الكنترول. تمت دراسة فاعلية مضادات التأكسد في إزالة الجذور الحرة باستخدام 2-2 ثنائى فينيل بكريل هيدراذيل الذي اعطى قيم 94.7% ازالة الجذور الحرة للمركب القياسي بروبييل جاليت و80% لمستخلص ثنائى كلورو الميثان من جذور الجنزبيل و 4% لزيت السمسم .

Table of Contents

content		Page no.
Opening page		I
Dedication		II
Acknowledgement		III
Abstract (English)		IV
Abstract (Arabic)		V
Contents		VII
List of tables		X
List of Figures		XII
Chapter one		
1.0	Introduction	1
1.1	Lipids	1
1.1.1	Classification of lipids	1
1.2	Fatty acids	2
1.2.1	Saturated fatty acids	2
1.2.2	Unsaturated fatty acids	3
1.3	Nonglyceride components of fats and oils	5
1.4	Refining process	5
1.5	Rancidity	7
1.5.1	Hydrolytic rancidity	7
1.5.2	Oxidative rancidity	7
1.5.3	Autoxidative rancidity	8
1.6	Measurement of oxidative rancidity	9
1.7	Antioxidants	10
1.7.1	Synthetic antioxidants	11
1.7.2	Natural antioxidants	12
1.7.2.1	Tocopherols	12
1.7.2.2	Phenolic acids	15
1.7.2.3	Flavonoids	16
1.7.2.3.1	Flavonoids mechanism of action	18
1.8	Classification of ginger	21
1.9	Sesame	23
1.9.1	Classification of sesame	23
1.9.2	Lipid composition of sesame oil	23
1.10	Sunflower	26
1.10.1	Classification of sunflower	26
1.10.2	Composition of sunflower oil	27

1.11.0	Soybean	28
1.11.1	Classification of soybean	28
1.11.2	Oil composition of soybean	29
1.12	Objectives	31
1.12.1	General objectives	31
1.12.2	Special objectives	31
Chapter Two		
2.0	Materials and methods	32
2.1	Materials	32
2.1.1	Plant materials	32
2.1.2	Chemicals	32
2.1.2.1	Reagents	32
2.1.2.2	Solvents	33
2.1.2.3	Instrumentation	33
2.2	Methods	34
2.2.1	Extraction of ginger oil	34
2.2.2	Extraction by dichloromethane	34
2.2.3	Addition of natural antioxidants on sunflower and soybean oils	34
2.2.4	Approximate analysis of ginger roots	34
2.2.4.1	Moisture content	35
2.2.4.2	Ash content	35
2.2.4.3	Protein content	35
2.2.4.4	Fiber content	36
2.2.4.5	Carbohydrate content	36
2.2.4.6	Determination of essential elements	36
2.2.5	Physiochemical properties of sunflower and soybean oils	37
2.2.5.1	Peroxide value (PV)	37
2.2.5.2	Iodine value (IV)	37
2.2.5.3	Acidity (AV & FFA)	38
2.2.5.4	Viscosity (V)	38
2.2.5.5	Refractive index (RI)	39
2.2.5.6	Colour intensity (CI)	39

2.2.6	Gas chromatography-mass spectroscopy (GC-MS)	39
2.2.6.1	Sample preparation (methylation)	39
2.2.7	Diphenylpicrylhydrazyl	40
Chapter Three		
3.0	Results and discussion	41
3.1	Approximate analysis of ginger	41
3.2	Fatty acids of edible oils	47
3.3	Effects of addition of antioxidants on shelf life of the refined sunflower oil and crude soybean oil	53
3.3.1	Peroxide value (PV)	53
3.3.2	Iodine value (IV)	59
3.3.3	Acidity (AV and FFA)	65
3.3.4	Viscosity (V)	75
3.3.5	Refractive index (RI)	81
3.3.6	Colour intensity (CI)	87
3.3.7	Diphenylpicrylhydrazyl (DPPH)	90
Chapter four		
4.0	Conclusions and Recommendations	91
4.1	Conclusions	91
4.2	Recommendations	92
	References	93

List of tables

No.	Title of table	Page no.
1.1	Most common saturated fatty acids	2
1.2	Fatty acids with one double bond	3
1.3	Fatty acids with more than double bond	4
1.4	Some exceptional of fatty acids	4
1.5	The mechanism of antioxidant activity	10
1.6	Occurrence of flavonoids in food	18
1.7	Diseases treated with flavonoids	19
1.8	Some antioxidants isolated from herbs and spices	20
1.9	Codex parameters of sesame oil	25
1.10	Fatty acids of sunflower oil	27
1.11	Approximate composition of seeds of sunflower oil	29
1.12	Oil composition of crude and refined soybean oil	30
1.13	Fatty acids composition of soybean oil	30
3.1.1	Approximate analysis of ginger	41
3.1.2	Chemical compositions in percent for ginger oil	42
3.1.3	The main chemical constituents of ginger DCM extract	45
3.2.1	Fatty acids composition of crude sesame oil	48
3.2.2	Fatty acids composition of refined sunflower oil	49
3.2.3	Fatty acids composition of crude soybean oil	50
3.3.1.1	Effect of the addition sesame oil on(PV) of sunflower oil	54
3.3.1.2	Effect of the addition DCM extract on (PV) of sunflower oil	56
3.3.1.3	Effect of the addition sesame oil on(PV) of soybean oil	57
3.3.1.4	Effect of the addition DCM extract on (PV) of soybean oil	58
3.3.2.1	Effect of the addition sesame oil on (IV) of sunflower oil	61
3.3.2.2	Effect of the addition DCM extract on (IV) of sunflower oil	62
3.3.2.3	Effect of the addition sesame oil on (IV) of soybean oil	63
3.3.2.4	Effect of the addition DCM extract on (IV) of soybean oil	64
3.3.3.1	Effect of the addition sesame oil on (AV) of sunflower oil	67
3.3.3.2	Effect of the addition sesame oil on (FFA)of sunflower oil	68
3.3.3.3	Effect of the addition DCM extract on(AV)of sunflower oil	69
3.3.3.4	Effect of the addition(DCM)extract on(FFA) of sunflower oil	70
3.3.3.5	Effect of the addition sesame oil on (AV) of soybean oil	71
3.3.3.6	Effect of the addition sesame oil on(FFA) of soybean oil	72
3.3.3.7	Effect of the addition DCM extract on (AV) of soybean oil	73
3.3.3.8	Effect of the addition DCM extract on (FFA) of soybean oil	74

3.3.4.1	Effect of the addition sesame oil on the (V) of the sunflower oil	77
3.3.4.2	Effect of the addition DCM extract on the (V) of the sunflower oil	78
3.3.4.3	Effect of addition sesame oil on the (V) of the soybean oil	79
3.3.4.4	Effect of the addition DCM extract on the (V) of the soybean oil	80
3.3.5.1	Effect of the addition sesame oil on the (RI) of the sunflower oil	83
3.3.5.2	Effect of the addition DCM extract on the (RI) of the sesame oil	84
3.3.5.3	Effect of the addition sesame oil on the (RI) of soybean oil	85
3.3.5.4	Effect of the addition DCM extract on the (RI) of soybean oil	86
3.3.6.1	Effect of the addition sesame oil on the (CI) of the sunflower oil	88
3.3.6.2	Effect of the addition DCM extract on the (CI) of the sunflower oil	88
3.3.6.3	Effect of the addition sesame oil on the (CI) of the soybean oil	89
3.3.6.4	Effect of the addition DCM extract on the (CI) of the soybean oil	89
3.4	The scavenging ability of DPPH ,sesame oil and DCM extract	90

List of figures

Figure	Text	Page No
1.1	The refining steps in edible oils	6
1.2	The development of oxidative rancidity in food	8
1.3	Most common synthetic antioxidants	12
1.4	Most common tocopherols	13
1.5	The mechanism of α - tocopherols	14
1.6	Most common phenolic acids	15
1.7	Basic molecular structure of flavonoids	16
1.8	Different molecular structure of flavonoids	17
1.9	Main compounds of ginger	22
1.10	Structures of main reactive constituents in sesame oil	24
3.3.1.1	Curves of (PV) of sunflower oil storage with sesame oil	54
3.3.1.2	Curves of (PV) of sunflower oil storage with DCM extract	56
3.3.1.3	Curves of (PV) of soybean oil storage with sesame oil	57
3.3.1.4	Curves of (PV) of soybean oil storage with DCM extract	58
3.3.2.1	Curves of (IV) of sunflower oil storage with sesame oil	61
3.3.2.2	Curves of (IV) of sunflower oil storage with DCM extract	62
3.3.2.3	Curves of (IV) of soybean oil storage with sesame oil	63
3.3.2.4	Curves of (IV) of soybean oil storage with DCM extract	64
3.3.3.1	Curves of (AV) of sunflower oil storage with sesame oil	67
3.3.3.2	Curves of (FFA) of sunflower oil storage with sesame oil	68
3.3.3.3	Curves of (AV) of sunflower oil storage with DCM extract	69
3.3.3.4	Curves of (FFA) of sunflower oil storage with DCM extract	70
3.3.3.5	Curves of (AV) of soybean oil storage with sesame oil	71
3.3.3.6	Curves of (FFA) of soybean oil storage with sesame oil	72
3.3.3.7	Curves of (AV) of soybean oil storage with DCM extract	73
3.3.3.8	Curves of (FFA) of soybean oil storage with DCM extract	74
3.3.4.1	Curves of (V) of sunflower oil storage with sesame oil	77
3.3.4.2	Curves of (V) of sunflower oil storage with DCM extract	78
3.3.4.3	Curves of (V) of soybean oil storage with sesame oil	79
3.3.4.4	Curves of (V) of soybean oil storage with DCM extract	80
3.3.5.1	Curves of (RI) of sunflower oil storage with sesame oil	83
3.3.5.2	Curves of (RI) of sunflower oil storage with DCM extract	84
3.3.5.3	Curves of (RI) of soybean oil storage with sesame oil	85
3.3.5.4	Curves of (RI) of soybean oil storage with DCM extract	86