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## Constituents and Antioxidant Activity *Sesamum indicum* Oil Marketed in Khartoum-Sudan

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**Abstract** *Sesamum indicum* is cultivated worldwide for its edible seed oil. *Sesamum indicum* which grows up to 100 cm in height is native to Africa and India. *Sesamum indicum* is used traditionally against habitual constipation, insufficient lactation, intestinal worms and white hair. The oil of this plant is claimed to be useful for liver, kidney and spleen. In this study, *Sesamum indicum* oil marketed in Khartoum (Sudan) was analyzed by GC-MS. The analysis revealed thirteen constituents dominated by: 9- heptadecenoic acid methyl ester (Z)-(33.70%), 9-octadecenoic acid (Z)-, methyl ester (33.05%), hexadecanoic acid, methyl ester (15.52%) and methyl stearate (12.75%). The oil was evaluated for its antioxidant activity. In the DPPH assay the oil showed weak antioxidant activity.

**Keywords** Antioxidant Activity, *Sesamum indicum*

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### Introduction

*Sesamum indicum* is an annual herbaceous plant in the family Pedaliaceae [1]. The plant is cultivated worldwide for its edible seed oil [2]. *Sesamum indicum* which grows up to 100 cm in height is native to Africa and India [3]. *Sesamum indicum* is used traditionally against habitual constipation, insufficient lactation, intestinal worms and white hair [4]. The oil of this plant is claimed to be useful for liver, kidney and spleen [5]. The seeds contain protein consisting of lysine, methionine and tryptophan. Seed oil is a rich source of oleic and linoleic acid. It is also rich in fat-soluble lignans [6,7]. *Sesamum indicum* oil contains important constituents including vitamins and minerals [8]. Seeds are antioxidant and contain phytosterols, phenolics and phylates beside short chain peptides [9]. Due to the presence of antioxidants, the oil has a long shelf life [10]. The antioxidant property of seed oil has been reported [11]. Seed aqueous extract demonstrated significant free radical scavenging activity in experimental models [12].

### Materials and Methods

#### *Sesamum indicum* oil

*Sesamum indicum* oil was purchased from the local market, Khartoum (Sudan).

### Instruments

A Shimadzo GC-MS-QP2010 Ultra instrument with a RTX-5MS column (30m, length; 0.25mm diameter; 0.25  $\mu$ m, thickness) was used for GC-MS analysis.



### Test Organisms

*Sesamum indicum* seed oil was screened for antimicrobial activity using the standard microorganisms: *Bacillus subtilis* (G+ve), *Staphylococcus aureus* (G+ve), *Pseudomonas aeruginosa* (G-ve), *Escherichia coli* (G-ve) and the fungal species *Candida albicans*.

### Methods

#### GC-MS Analysis

*Sesamum indicum* oil was analyzed by GC-MS using a Shimadzo GC-MS-QP2010 Ultra instrument. Chromatographic conditions are displayed below.

**Table 1:** Oven temperature program

Rate	Temperature (°C)	Temperature (°C)
-	150.0	1.00
4.00	300.0	0.00

**Table 2:** Chromatographic conditions

Column oven temperature	150.0 °C
Injection temperature	300.0 °C
Injection mode	Split
Flow control mode	Linear velocity
Pressure	139.3 KPa
Total flow	50.0 ml/ min
Column flow	1.54 ml/sec
Linear velocity	47.2 cm/sec
Purge flow	3.0 ml/min
Spilt ratio	- 1.0

### Antioxidant Activity

Evaluation of the antioxidant activity was carried out by measuring the capacity of the oil against stable DPPH radical. The change in colour was measured spectrophotometrically at 516nm.

### Results and Discussion

The constituents of *Sesamum indicum* oil marketed in Khartoum state (Sudan) have been investigated by GC-MS analysis. The oil has also been assessed for antioxidant activity by the DPPH bioassay.

#### GC-MS analysis of *Sesamum indicum* oil

The GC-MS analysis of the target oil showed 13 components dominated by 9- heptadecenoic acid methyl ester (Z)- (33.70%), 9- octadecenoic acid (Z)-, methyl ester (33.05%), hexadecanoic acid, methyl ester (15.52%) and methyl stearate (12.75%). The constituents of the oil are shown in Table 3.

**Table 3:** Constituents of *Sesamum indicum* oil

No.	Name	RT.	Area%
1	Methyl tetradecanoate	13.537	0.04
2	7-Hexadecenoic acid methyl ester	15.387	0.05
3	9-Hexadecenoic acid methyl ester	15.432	0.31
4	Hexadecanoic acid methyl ester	15.647	15.52
5	Cis-10-Heptadecenoic acid methyl ester	16.604	0.08
6	Heptadecanoic acid methyl ester	16.604	0.13
7	9-Heptadecenoic acid methyl ester	17.355	33.70
8	9-Octadecenoic acid methyl ester	17.405	33.05



9	Methyl stearate	17.562	12.75
10	Cis-11-Eicosenoic acid methyl ester	19.095	0.63
11	Eicosanoic acid methyl ester	19.293	3.51
12	Docosanoic acid methyl ester	20.915	0.85
13	Tetracosanoic acid methyl ester	22.421	0.38

Major components of the oil are: i) 9-heptadecenoic acid, methyl ester (Z) (33.70%) ii) 9-octadecenoic acid (Z)-, methyl ester (33.05%) iii) hexadecanoic acid, methyl ester (15.52%) and iv) methyl stearate (12.75%). The mass spectrum of 9-heptadecenoic acid, methyl ester is shown in Fig. 2. The peak at  $m/z$  282 corresponds to  $M^+ [C_{18}H_{34}O_2]^+$ . Fig. 3 shows the mass spectrum of 9-octadecenoic acid (Z)-, methyl ester. The peak at  $m/z$  296 accounts for the molecular ion:  $M^+ [C_{19}H_{36}O_2]^+$ , while the signal at  $m/z$  266 corresponds loss of a methoxyl. The mass spectrum of hexadecanoic acid methyl ester is displayed in Fig. 4. The peak at  $m/z$  270 is due to  $M^+ [C_{17}H_{34}O_2]^+$ . The signal at  $m/z$  239 is attributed to loss of a methoxyl function. Fig. 5 illustrates the mass spectrum of methyl stearate. The signal which appeared at  $m/z$  298 corresponds the molecular ion:  $M^+ [C_{19}H_{38}O_2]^+$ , while the peak at  $m/z$  267 accounts for loss of a methoxyl group.

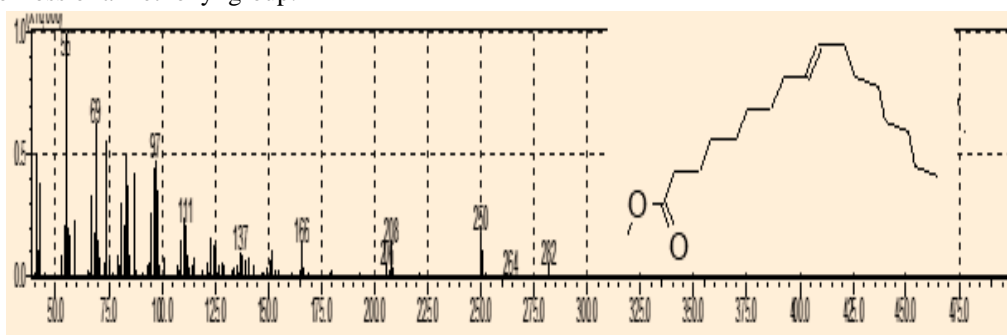


Figure 2: Mass spectrum of 9-heptadecenoic acid methyl ester

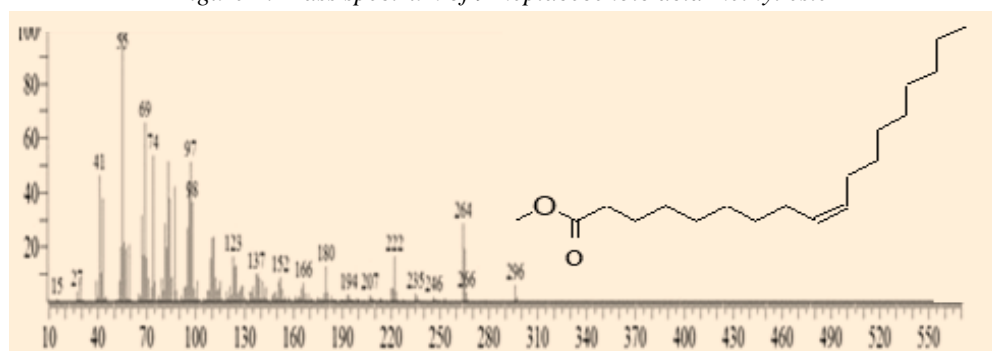


Figure 3: Mass spectrum of 9-octadecenoic acid (Z)-, methyl ester

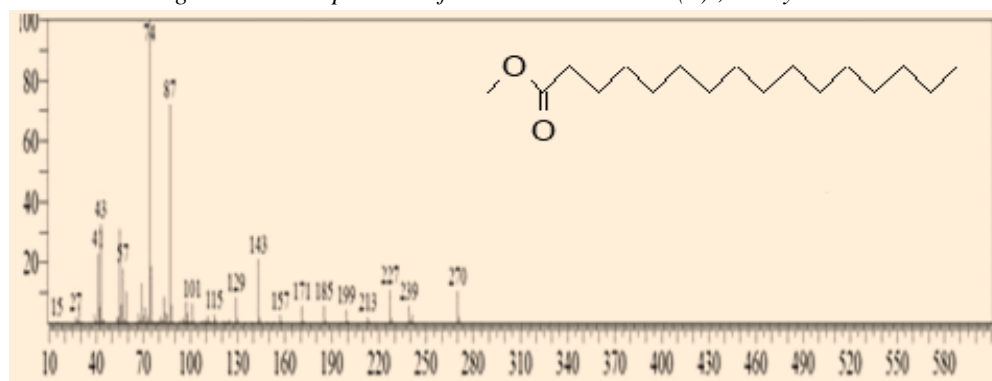


Figure 4: Mass spectrum of hexadecanoic acid, methyl ester



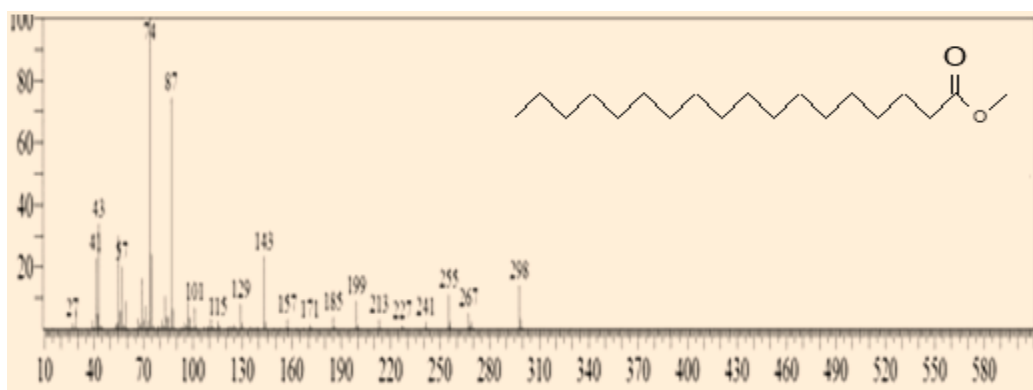


Figure 5: Mass spectrum of methyl stearate

### Antioxidant Activity

*Sesamum indicum* oil was screened for its free radical scavenging properties. Contrary to literature reports [10], which indicated significant antioxidant activity of *Sesamum indicum* oil, the oil marketed in Khartoum (Sudan) exhibited weak antioxidant activity. The weak antioxidant activity of the studied oil could be attributed to a prolonged storage of the raw material, prolonged shelf life of the oil or may result from the industrial process involved in the production of this oil.

**Table 4:** Radical scavenging activity of *Sesamum indicum* oil

Sample	Antioxidant activity (%)
<i>Sesamum indicum</i> oil	27.3
Propyl gallate(standard)	90.6

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