

Composition of Oil from the Seeds of *Cassia Sophera* Linn.

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Abstract

The oil obtained from the seeds of *Cassia sophera* Linn was analyzed by GC-MS and a total of 42 compounds have been identified. The major constituents are palmitic acid (22.82 %), linoleic acid (8.32 %), elaidic acid (19.16 %), stearic acid (9.86 %), 5-isopropyl -6-methyl-3-heptyne-2,5-diol (6.44 %), undecyl lauric acid (6.61 %), oleic acid (2.1 %), arachidic acid (3.57 %) and 3 α , 7 β -dihydroxy -5 β , 6 β -epoxyc-
holestane (5.9 %).

Introduction

C. sophera Linn (Fam. Leguminosae) is locally known as Kulkasunda and grows abundantly in the plain land, hilly areas of Chittagong Hill Tracts, Sylhet and in patches throughout Bangladesh (Yusuf, *et. al.*, 1994). It is also distributed in India and most of the tropical countries (Yusuf, *et. al.*, 1994). *C. sophera* Linn is a shrub or undershrub (2.9-3.0 m) annual or perennial (Kirtikar, *et. al.*, 1980).

C. sophera is an important medicinal plant and considered to have expectorant properties. The bark in the form of infusion and the powdered seeds, mixed with honey, are given in diabetes (Kirtikar, *et. al.*, 1980). The bark, leaves and seeds are used as a cathartic and the juice of the leaves is specific for ring-worm, especially when made into a plaster in combination with sandal-wood. The root is administered internally with black pepper for snake bite (Kirtikar, *et. al.*, 1980). The leaves

are used in asthma, bronchitis and hiccup. Infusion of leaves is also useful in gonorrhea and syphilitic sores (Ghani, 1998). As per literature, the composition of fatty acids of *C. absus* and *C. occidentalis* were reported in a previous study (Sastri, 1950) but till now no study have been done on the composition of oil from *C. sophera*. The purpose of this investigation is therefore to identify the composition and determine the physico-chemical characteristics of the oil of *C. sophera*.

Materials and Methods

Seeds of *C. sophera* were collected from Chittagong, Bangladesh. The seeds were washed with fresh water to remove dirty materials and dried in the sun light for four days. The seeds were finally crushed into powder and dried in an oven at 105^o C for an hour. The oil was then extracted in a soxhlet apparatus with petroleum ether (40-60^o C)

for 24 hours. The solvent was removed by rotary vacuum evaporator and the percent of oil content was calculated. The specific gravity, refractive index, moisture content and volatile matter in the oil was determined by standard methods (Hilditch, 1945). The free fatty acid, saponification value, iodine value, acid value, peroxide value and unsaponifiable matter in the oil were determined by the standard methods (Hilditch, 1945). The fatty acids composition of the oil of *C. sophera* was analyzed as their methyl esters that were prepared by the boron trifluoride-methanol method (Hossain, *et. al.*, 2003). The oil (100 mg) was saponified with methanolic sodium hydroxide (10 ml) by refluxing it for 30 minutes. The saponified materials were evaporated to dryness. The dried material was esterified with BF₃-MeOH complex (5 ml) heating in a boiling water bath for 20 min. The methyl esters of the fatty acid were isolated by partitioning with n-hexane and water. The hexane soluble material was concentrated by rotary vacuum evaporator and analyzed by GC/MS.

GC-MS analysis of methylated fatty acid

The analysis of the oils was carried out by GC-MS electron impact ionization (EI) method (Chowdhury, *et. al.*, 2005) on GC-17A gas chromatograph (Shimadzu) coupled to GC-MS QP5050A mass spectrometer (Shimadzu); fused silica capillary column (30 m X 2.5 mm, 0.25 µm film thickness), coated with DB-5 (J & W), column temperature 100°C (2 min) to 250°C at the rate of 5°C/min; carrier gas, helium at constant pressure of 90 Kpa, acquisition parameters full scan; scan range 40 - 350 amu. The com-

pounds were identified using the NIST 127 and NIST 147 library data.

Results and Discussions

The solvent extraction of the seeds of *C. sophera* Linn yielded 2.02 % of oil (dry basis). The physico-chemical characteristics of the *C. sophera* oil (Table I) are almost similar to *C. occidentalis* oil (Sastri, 1950). The

Table I. Physico-chemical properties of the oil from the seeds of *C. sophera* Linn

Parameters	Results
Colour	Pale yellow
Acid value	10.29
Fatty acids	5.7 (as oleic acid)
Saponification value	180.40
Iodine value	112.80
Density	1.4686
Volatile matter	1.3%
Unsaponifiable matter	6.32%
Oil	2.02%

iodine value of the oil was found to be 112.8 indicating that the oil contained higher amount of unsaturated fatty acids. A higher percentage of free fatty acid (above 1.5 %) is an indication of unsuitability of the oil for edible purpose (Carrol and Nobl, 1957). So, the oil from the seeds of *C. sophera* may not be used for edible purpose as it contained about 10.29 % free fatty acids. Analysis of methyl ester of the oil by GC/MS showed the presence of 42 compounds (Table II) representing 99.79 % of the whole oil. The major constituents are palmitic acid (22.82 %), linoleic acid (8.32 %), elaidic acid (19.16 %), stearic acid (9.86 %), 5-isopropyl

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Table II. Composition of methylated esters of the oil from the seeds of *C. sophora* Linn

SL. No.	Compounds	Mol. Wt.	Mol. Formula	%
1	Octanoic acid methyl ester	158	C ₉ H ₁₈ O ₂	0.03
2	Lauric acid, methyl ester	214	C ₁₃ H ₂₆ O ₂	0.09
3	Nonanedioic acid, methyl ester	216	C ₁₁ H ₂₀ O ₄	0.12
4	Decanedioic acid, dimethyl ester	230	C ₁₂ H ₂₂ O ₄	0.02
5	Myristic acid, methyl ester	242	C ₁₅ H ₃₀ O ₂	0.39
6	Pentadecanoic acid, methyl ester	256	C ₁₆ H ₃₂ O ₂	0.20
7	Palmitoleic acid, methyl ester	268	C ₁₇ H ₃₂ O ₂	0.10
8	Palmitic acid, methyl ester	270	C ₁₇ H ₃₄ O ₂	22.82
9	n-Hexadecanoic acid	256	C ₁₆ H ₃₂ O ₂	0.23
10	Hexadecanoic acid, 14-methyl-, methyl ester	284	C ₁₈ H ₃₆ O ₂	0.36
11	Cyclododecane methanol	198	C ₁₃ H ₂₆ O	0.12
12	Z,E-2, 13-Octadecadien-1-ol	266	C ₁₈ H ₃₄ O	0.86
13	Linoleic acid, methyl ester	294	C ₁₉ H ₃₄ O ₂	8.32
14	Elaidic acid, methyl ester	296	C ₁₉ H ₃₆ O ₂	19.16
15	3-Cyclohexene-1-carboxaldehyde 4-methyl	124	C ₈ H ₁₂ O	0.73
16	Stearic acid, methyl ester	298	C ₁₉ H ₃₈ O ₂	9.86
17	2-Fluorobenzoic acid, dodec-9-ynyl ester	304	C ₁₉ H ₂₅ FO ₂	0.49
18	10-Undecenoic acid, 2-methoxy- methyl ester	228	C ₃₀ H ₂₄ O ₂	0.10
19	2-Furapentanoic acid, tetrahydro-5-nonyl, methyl ester	312	C ₁₉ H ₃₆ O ₃	2.64
20	5-Isopropyl -6-methyl-3-heptyne-2,5-diol	184	C ₁₁ H ₂₀ O ₂	6.44
21	3-Methyl -4,5-diamino- 1,2,4(4H)-triazole	113	C ₃ H ₇ N ₅	0.05
22	4-Methylcyclohexyl methylphosphonfluoride	194	C ₈ H ₁₆ FO ₂ P	0.07
23	Octadecanoic acid, 9, 10,12-trimethoxy, methyl ester	388	C ₂₂ H ₄₄ O ₅	0.82
24	Undecyl laurate	354	C ₂₃ H ₄₆ O ₂	6.61
25	3-Methoxy -2,2,4,4-tetramethyl pentate	158	C ₁₀ H ₂₂ O	0.44
26	1,3- Dioxane	88	C ₁ H ₈ O ₂	0.43
27	4,5-Dimethoxy -2-nitrobenzoic acid	227	C ₉ H ₉ NO ₆	0.30
28	D-Mannoheptadecane 1,2,3,4,5-pentanol	320	C ₁₇ H ₃₆ O ₅	0.65
29	Oleic acid	282	C ₁₈ H ₃₄ O ₂	2.10
30	Arachidic acid, methyl ester	326	C ₂₁ H ₄₂ O ₂	3.57
31	Dilauryl ether	354	C ₂₄ H ₅₀ O	0.06
32	Methyl heneicosanoate	340	C ₂₂ H ₄₄ O ₂	0.37
33	Myristic acid, tetradecyl ester	424	C ₂₈ H ₅₆ O ₂	0.63
34	cis-13-Docosenoyl chloride	356	C ₂₂ H ₄₁ ClO ₂	0.15

Table II. Continue

SL. No.	Compounds	Mol. Wt.	Mol. Formula	%
35	6-b-Hydroxymethandienone	316	C ₂₀ H ₂₈ O ₃	0.14
36	d-Norandrostane (5a, 14a)	246	C ₁₈ H ₃ O	0.41
37	Thunbergol	290	C ₂₀ H ₃₄ O	0.72
38	Methyl isostearate,	288	C ₁₉ H ₃₅ O ₂	3.04
39	3a, 7b-Dihydroxy -5b, 6b-epoxycholestane	418	C ₂₇ H ₄₆ O ₃	5.29
40	5-Cholene, 3,24-dihydroxy	360	C ₂₄ H ₄₀ O ₂	0.24
41	Dimethanedrostanolone	318	C ₂₁ H ₃₄ O ₂	0.24
42	Thujopsene	204	C ₁₅ H ₂₄	0.38

-6-methyl-3-heptyne-2,5-diol (6.44 %), undecyl lauric acid (6.61 %), oleic acid (2.1 %), arachidic acid (3.57 %) and 3 α , 7 β -dihydroxy -5 β , 6 β -epoxycholestane (5.9 %). The fatty oil composition of *C. occidentalis* reported earlier, are saturated fatty acid (19.7 %), linoleic acid (31.4 %), oleic acid (30.7 %) and linolenic acid (6.3 %), and that of *C. absus* oleic acid (16.32 %), linoleic acid (47.32 %), palmitic acid (6.28 %) and stearic acid (8.10 %) (Sastri, 1950). In the present study, we reported the composition of oil from the seeds of *C. sophera* for the first time.

Acknowledgments

The authors are thankful to Mr. Sirajuddin, Junior Experimental Officer of BCSIR Laboratories Chittagong for the active assistance during the present study.

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Received : June 22, 2006;

Accepted : March 01, 2007