

Chemical Composition and Characteristics of *Commiphora wightii* (Arnott) Bhandari Seed Oil

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Abstract The seeds of *Commiphora wightii* (Arnott) Bhandari contain $9.8 \pm 0.7\%$ oil. The fatty acid composition and chemical properties of the extracted oil were determined. Gas liquid chromatography of the methyl esters of the fatty acids shows the presence of 46.62% saturated fatty acids and 51.40% unsaturated fatty acids. The fatty acid composition is as follows: capric acid 3.50%, myristic acid 14.51%, palmitic acid 6.68%, stearic acid 4.70%, arachidic acid 3.18%, behenic acid 14.05%, myristoleic acid 1.34%, palmitoleic acid 12.07%, oleic acid 14.15%, eicosenoic acid 0.11%, linoleic acid 22.34% and alpha linoleic acid 1.37%.

Keywords Oilseeds · Fats and oils · Chromatography · Lipid chemistry · Lipid analysis

Introduction

The *Commiphora wightii* L. (Syn. *Commiphora mukul* Engl., *Balsamodendron wightii* Arn., *B. mukul* Hook. ex stocks) belongs to the family Burseraceae which is a large pantropical family, forming an important element of the flora of both rain forests and arid areas [1]. The plant is dimorphic, one having bisexual and male flowers and the other having female flowers with staminodes [1]. A third

category of plants with only male flowers has also been reported [2]. Each fruit of *C. wightii* contains one seed. Two types of seeds, viz. black and white has been recorded—of these, the black seeds are found to be viable and contain 5.7% oil with four different types of fatty acids [3]. There was little documentation on the oil content, chemical properties and fatty acid composition of *Commiphora wightii* seed oil (CWSO). The purpose of the present work was to study the chemical properties and fatty acid composition of the CWSO and compare with that of an earlier report.

Experimental Methods

Sampling

The fresh matured fruits of *C. wightii* (Arnott) Bhandari were collected from Dwarka, Jamnagar district, Western Gujarat, India during the favorable season between February and March. The black seeds were sorted out from the fruit and air dried. The specimens collected were identified with the help of the “Flora of the Indian Desert” [1]. Further, the species was confirmed by comparison with the specimen lying in the herbaria of Blatter, Mumbai, India (Blatter 5811, Blatter 5817, Voucher specimen no. PSN 113, PSN 115, PSN 121).

Extraction and Analysis of Oil

The *C. wightii* seeds were powdered without removing the testa and then extracted completely with petroleum ether (40–60 °C) in a Soxhlet apparatus. The resulting extract was filtered and evaporated “in vacuo” leaving behind a yellowish oil. It was evaluated for its various chemical

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Table 1 Fatty acid composition of *Commiphora wightii* seed oil

Fatty acid	Isomers	% Composition (present study) ^a	% Composition [3]
Saturated fats			
Capric	10:0	3.35 ± 0.075	–
Myristic	14:0	14.50 ± 0.005	–
Palmitic	16:0	6.68 ± 0.02	10.2
Stearic	18:0	4.535 ± 0.165	12.8
Arachidic	20:0	3.19 ± 0.001	–
Behenic	22:0	14.1 ± 0.05	–
Monounsaturated fats			
Myristoleic	14:1	1.36 ± 0.02	–
Palmitoleic	16:1	12.07 ± 0.085	–
Oleic	18:1 cis	14.735 ± 1.63	18.3
Eicosenoic acid	20:1	0.11 ± 0.015	–
Polyunsaturated fats			
Linoleic	18:2cis	22.315 ± 0.025	58.6
Alpha-linolenic acid	18:3n3	1.37 ± 0.035	–
Saturated		46.31 ± 0.31	23
Unsaturated		51.85 ± 0.465	77

^a Mean standard deviation

Table 2 Chemical properties of *Commiphora wightii* seed oil

Determination	Present study ^a	Kakrani [3]
Acid value	69.87 ± 2.08	–
Saponification value	161.39 ± 3.82	182
Iodine value	46.90 ± 0.9	102

^a Mean standard deviation

properties by AOCS standard methods [4]. Three replicates were taken for the analyses of the chemical properties.

GLC Analysis

Two samples were taken for the analysis of the fatty acid composition. The methyl esters of extracted oil were prepared in accordance with the Bureau of Indian Standards (BIS). (548, part III). A NUCON-GLC chromatograph with a flame ionization detector (FID) was employed for the analysis using nitrogen as the carrier gas. The column

used was 30 M × 0.53 mm I.D. 5.0 μm DB-1 Type MXT-1 capillary column. The injection port temperature was 250 °C and the detector temperature was 280 °C. Sample injection was done at 60 °C and the temperature programming was set for 2 °C rise per minute to a maximum of 280 °C. The total run time was 40 min. Identification of each component was made by comparing its retention time with that of a Sigma-Aldrich standard fatty acids mixture.

Results and Discussion

The oil content in *C. wightii* varied between 9.8 ± 0.7% as compare to 5.7% reported earlier [3]. The chemical properties of the oil were estimated and compared with the earlier study wherein the seeds of *Commiphora mukul* Hook ex stocks was used (Table 2). The saponification values were more or less similar, however, the iodine values differed. Similarly the oil composition stated earlier showed mainly four fatty acids viz. palmitic acid, stearic acid, oleic acid and linoleic acid. However, the present study showed that the oil is composed of 12 fatty acids with 46.62% saturated fatty acids and 51.40% unsaturated fatty acids. The dominant unsaturated fatty acid being linoleic acid while the predominant saturated fatty acids were myristic acid and behenic acid (Table 1).

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