Iranian Journal of Pharmaceutical Sciences
Summer 2005: 1(3): 167-170
www.ijps.ir

Original Article

# Essential Oil Constituents of Two African Olibanums Available in Isfahan Commercial Market

Suleiman Afsharypuor*, Marzieh Rahmany

*Faculty of Pharmacy and Pharmaceutical Sciences,*
*Isfahan University of Medical Sciences, Isfahan, Iran*

**Abstract**

The composition of the essential oils of two African ("white" and "yellow") olibanums available in the commercial market of Isfahan (Iran) was analyzed by gas chromatography (GC) and GC-mass spectroscopy methods. The main constituents of the "White" olibanum oil were *alpha*-pinene (34.8%), limonene (15.9%), *alpha*-thujene (9.0%), *para*-cymene (7.0%), myrcene (6.2%) and sabinene (6.0%). Major components of the "yellow" olibanum oil were *alpha*-pinene (48.0%), limonene (21.7%), myrcene (4.9%), *beta*-caryophyllene (4.9%) and *para*-cymene (3.5%).

*Keywords:* African olibanums; *alpha*-Pinene; Limonene; Volatile oil; "White" and "yellow" olibanums.
*Received:* May 17, 2005; *Accepeted:* June 15, 2005

## 1. Introduction

Olibanum, or frankincense, is an oleo-gum-resin that has been collected since ancient times from barks of *Boswellia carterii, B. frereana* and other species of *Boswellia* (Burseraceae), small trees indigenous to north-eastern Africa and Arabia [1, 2]. This drug occurs in more or less ovoid tears, 5-25 mm long, which are sometimes stuck together. The surface is dusty and of a yellowish, bluish-white or greenish-white tint. Olibanum is used in incense and fumigating preparations [2, 3]. Its powdered form is used in toothache [3].

"White" and "yellow" olibanums are two varieties of African olibanums which are available in Isfahan commercial markets. In order to define the volatile terpenoid composition of the above mentioned olibanums and get more pertinent criteria of identification, we decided to isolate their essential oils and analyze them by gas chromatography and GC-mass spectroscopy (MS) methods.

*Corresponding author: Suleiman Afsharypuor, Faculty of Pharmacy and Pharmaceutical Sciences, Isfahan University of Medical Sciences, Isfahan, Iran.

## 2. Marerials and methods

### *2.1. Examined materials*

"White" and "yellow" olibanums were obtained from a commercial market in Isfahan (Iran) in 2003. The samples were identified macroscopically and authenticated to be two African olibanums obtained from *Boswellia* species according to Hairfield et al method [1].

### *2.2. Oil preparation*

Freshly powdered samples of the "white" and "yellow" olibanums were steam distilled

**Table 1.** Percentage composition of oil constituents of the "white" and "yellow" olibanums available in commercial markets of Isfahan.

| Components | Retention indices | "White"olibanum oil (%) | "Yellow" olibanum% |
|---|---|---|---|
| *alpha*-thujene | 933 | **9.0** | 1.5 |
| *alpha*-pinene | 940 | **34.8** | **48.0** |
| camphene | 953 | 0.7 | 0.6 |
| verbenene | 966 | 0.3 | t* |
| sabinene | 978 | **6.0** | 2.6 |
| *beta*-pinene | 981 | 1.3 | 0.8 |
| myrcene | 992 | **6.2** | **4.9** |
| *alpha*-phellandrene | 1007 | 1.4 | 2.6 |
| *alpha*-terpinene | 1019 | 0.2 | t |
| *para*-cymene | 1028 | **7.0** | **3.5** |
| limonene | 1033 | **15.9** | **21.7** |
| 1,8-cineole | 1033 | 0.3 | t |
| *(Z)-beta*-ocimene | 1042 | 0.2 | t |
| *(E)-beta*-ocimene | 1051 | 0.1 | t |
| *gamma*-terpinene | 1063 | 0.3 | 0.2 |
| *beta*-thujone | 1115 | 0.3 | t |
| *alpha*-campholenal | 1126 | 0.3 | t |
| *cis*-sabinol | 1137 | 0.7 | 0.2 |
| pinocarvone | 1164 | 0.2 | t |
| *alpha*-phelladren-8-ol | 1167 | 0.5 | 0.3 |
| terpinen-4-ol | 1177 | 0.6 | 0.4 |
| *para*-cymen-8-ol | 1183 | 0.2 | t |
| *alpha*-terpineol | 1190 | 0.2 | t |
| myrtenal | 1194 | 0.3 | t |
| verbenone | 1205 | 0.4 | t |
| *trans*-carveol | 1219 | 0.2 | t |
| carvone | 1243 | 0.1 | t |
| *alpha*-copaene | 1378 | 0.8 | 0.7 |
| *beta*-bourbonene | 1384 | 0.2 | t |
| *beta*-elemene | 1392 | 0.5 | 1.2 |
| *beta*-caryophyllene | 1418 | 2.5 | **4.9** |
| *alpha*-humulene | 1456 | 0.6 | 0.6 |
| alloaromadendrene | 1462 | 0.2 | t |
| germacrene-D | 1482 | 0.4 | 0.6 |
| *beta*-selinene | 1485 | 0.4 | 0.6 |
| valencene | 1493 | 0.5 | 0.8 |
| *alpha*-muurolene | 1499 | 0.2 | t |
| *gamma*-cadinene | 1514 | 0.4 | 0.5 |
| *delta*-cadinene | 1524 | 0.7 | 1.4 |
| caryophyllene oxide | 1583 | 0.4 | 0.3 |
| **Grouped constituents**: | | | |
| Monoterpene hydrocarbons | | 83.4 | 86.4 |
| Oygen-containing monoterpenes | | 4.3 | 0.9 |
| Sesquiterpene hydrocarbons | | 7.4 | 11.3 |
| Oxygen-containing sesquiterpenes | | 0.4 | 0.3 |
| **Total** | | **95.5** | **98.9** |

*t: trace (less than 0.1%)

for 4 h. Pale yellow oils (4.0 % and 4.06 % v/w) were obtained which exhibited the following physical properties, respectively: $d^{25}$: 0.915; $\eta^{25}$: 1.4720 and $d^{25}$: 0.871; $\eta^{25}$: 1.4770.

*2.3. GC analysis*

Initially to check the separation of the components, samples were examined by capillary GC using a Perkin Elmer 8500 instrument. The column used was a BP1 capillary column (30 m x 0.25 mm; film thickness: 0.25 µm). The carrier gas was nitrogen with a flow rate of 2 ml/min. The oven temperature was programmed from 60 to 275 °C at 4 °C/min. The injector and detector temperatures were 275 °C and 280 °C, respectively.

*2.4. GC/MS analysis*

Analysis of the volatile constituents was performed on a Hewlett Packard 6890 GC/MS instrument under the following conditions: injection of 0.1 µl samples, HP-5 MS capillary column (30 m x 0.25 mm; film thickness 0.25 µm); carrier gas He, flow rate 2 ml/min, the injector temperature 250 °C, temperature program: 60 to 275 °C at 4 °C/min; mass spectra: electronic impact, ionization potential 70 eV, ion source temperature 250 °C, ionization current 1000 µA, resolution 1000, and mass range 30-300.

Identification of the constituents was based on computer matching against the library spectra (Library Database Wiley 275), their retention indices with reference to an *n*-alkane series in a temperature programmed run, interpreting their fragmentation pattern and comparison of the mass spectra with the literature data [4].

## 3. Results and discussion

Forty constituents in the oils of the "white" and "yellow" olibanums were identified which accounted for 95.5% and 98.9% of the total oils, respectively (Table 1). The volatile oils of both olibanums are predominantly monoterpenoid in nature (87.7% and 87.3%), with *alpha*-pinene (34.8% and 48.0%) being the major constituent. However, Verghese et al. [5] reported that the Indian olibanum oil contains higher proportions of *alpha*-thujene. Other major monoterpenoids identified in the examined "white" olibanum oil include limonene (15.9%), *alpha*-thujene (9.0%), *para*-cymene (7.0%), myrcene (6.2%) and sabinene (6.0%); while other major monoterpenoids identified in the oil of "yellow" olibanum were limonene (21.7%), myrcene (4.9%) and *para*-cymene (3.5%).

The predominance of monoterpenoids in the examined samples was in agreement with what was reported by Verghese et al. [5], Maupetit [6], and Kasali et al. [7].

## Acknowledgement

We are grateful to Mrs. Armita Jamshidi for her help in analyzing the oil samples by GC and GC/MS methods.

## References

[1] Hairfield EM, Hairfield HH, Pentz LH. A rapid test for the identification of incense resins. *Perfumer Flavorist* 1984; 9: 33-6.

[2] Evans WC. *Trease and Evans' Pharmacognosy.* 15th ed. Edinburg: WB Saunders, 2002: pp. 407-13.

[3] Zargari A. *Medicinal Plants.* Vol. 1, 4th ed. Tehran: Tehran University Publications, 1986.

[4] Adams RP. *Identification of essential oil components by gas chromatography.* Carol Stream, Illinois: Allured Publishing, 1995.

[5] Verghese J, Joy MT, Retamar JA, Malinskas GG, Catalan CAN. A fresh look at the constituents of Indian olibanum oil. *Flav Frag J* 1987; 2: 99-102.

[6] Maupetit P. New constituents in olibanum resinoid and essential oil. *Perfumer Flavorist* 1985; 9: 19-37.

[7] Kasali AA, Adio AM, Oyedeji AO, Eshilokun AO, Adefenwa M. Volatile constituents of *Boswellia serrata* Roxb. (Burseraceae) bark. *Flav Frag J* 2002; 17: 462-4.