

## ESSENTIAL OILS OF *PYCNOCYCLA FLABELLIFOLIA* (BOISS.) BOISS. AND *MALABAILA SECACULE* (MILLER) BOISS. FROM IRAN

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### ABSTRACT

The composition of the essential oils from two Umbelliferae species of Iran were analyzed by GC and GC/MS.  $\alpha$ -Phellandrene (64.0%) and p-cymene (18.5%) were the main components among the nineteen constituents characterized in the oil of *Pycnocycla flabellifolia* representing 94.2% of the total components detected. Sixteen compounds were identified in the oil of *Malabaila secacule* representing 80.4% of the total oil with  $\beta$ -elemene (27.1%) and hexyl 3-methyl butanoate (15.6%) as the major constituents.

**Key words:** *Pycnocycla flabellifolia*, *Malabaila secacule*, *Umbelliferae*, Essential oil composition,  $\alpha$ -Phellandrene, p-Cymene,  $\beta$ -Elemene, Hexyl 3-methyl butanoate.

### INTRODUCTION

The family *Umbelliferae* is rich in secondary metabolites and embodies numerous genera of high economic and medicinal value, yielding flavonoids, coumarins, acetylenes, terpenes and essential oils (1-4).

It is well known that occurrence of essential oils and oleoresins is a characteristic feature of this family (4). The essential oil patterns in the different tribes and subfamilies have been investigated and the chemotaxonomical significance of their constituents were discussed (5).

Two reports on the analyses of essential oil of *Pycnocycla* species has been published (6,7). Phytochemical study on *Malabaila secacule* revealed the presence of cumarine compounds (8). The essential oils of *P. flabellifolia* and *M. secacule* have not been investigated up to now, so we decided to examine the oils.

### MATERIALS AND METHODS

**Plant Materials:** The aerial parts of *Pycnocycla flabellifolia* (Boiss.) Boiss. Syn.: *Chamaescadium flabellifolia* (Boiss.) Hiroe, *Echinophora flabellifolia* Boiss. growing wild in the south west of Iran (Hosseinih - Andimeschk, Province of Khozesstan) was

collected in July 1997, and the aerial parts of *Malabaila secacule* (Miller) Boiss., Syn.: *Pastinaca secacule* (Miller) Banks et Soland., *Tordylium secacule* Miller, was collected from Sabzewar - Espharaene, Province of Khorassan, Iran in July 1997 (9).

Voucher specimens were deposited at the Department of Botany, Shaheed Beheshti University, Tehran, Iran.

**Isolation of the Essential Oils:** Air-dried aerial parts of *P. flabellifolia* and *M. secacule* were ground and the essential oils isolated by hydrodistillation for 3h using a Clevenger type apparatus. After decanting and drying on anhydrous sodium sulfate, the corresponding yellowish colored oils were recovered. (in a yield of 0.37% and 0.25% respectively).

**GC Analysis:** GC analysis of the oils was carried out using a Packard 439 chromatograph equipped with a CP Sil 5 CB column (25m  $\times$  0.25mm i.d., film thickness 0.39  $\mu$ m), oven temperature programme from 60 $^{\circ}$ -220 $^{\circ}$ C at 5 $^{\circ}$ C/min. N<sub>2</sub> was used as carrier gas at a flow rate of 0.8 ml/min; injector and detector temperatures was 270 $^{\circ}$ C.

**GC/MS Analysis:** GC/MS analysis was recorded on a Varian 3700 with a CP Sil 5 CB column (25m  $\times$  0.25mm i.d., film thickness 0.39  $\mu$ m) combined with Varian MAT 44S,

ionization energy 70 eV; carrier gas He and injector temperature was 270° C.

Approximately 0.1 µl of neat oil was injected under split conditions (100:1) and the oven temperature was held at 60° C for 5 min, programmed at 5°C /min to 220° C and then held at this temperature for 20 min.

Component identification were made by comparison of their mass spectra and relative retention indices (RRI) with those of authentic compounds and with data in the literature (10-12).

### RESULTS AND DISCUSSION

The composition of the essential oils of *Pycnocycla flabellifolia* and *Malabaila secacule* are given in Table 1 and 2.

The identified compounds and their percentage are listed according to their elution on the CP Sil 5 CB column.

Table 1. Chemical composition of identified components in the oil of *Pycnocycla flabellifolia* (Boiss.) Boiss.

| Compound         | RRI  | Percentage |
|------------------|------|------------|
| α - Thujene      | 926  | 1.3        |
| α- Pinene        | 936  | 0.7        |
| Camphene         | 950  | 0.5        |
| β - Pinene       | 974  | 0.2        |
| α - Phellandrene | 1000 | 64.0       |
| P - Cymene       | 1016 | 18.5       |
| β - Phellandrene | 1025 | 3.8        |
| γ - Terpinene    | 1059 | 0.6        |
| Terpinolene      | 1083 | 0.7        |
| Linalool         | 1087 | 0.5        |
| Cis -Rose oxide  | 1100 | 0.3        |
| Isoborneol       | 1147 | 0.2        |
| Terpinen - 4-ol  | 1168 | 0.2        |
| α - Terpineol    | 1178 | 0.1        |
| Carvenone        | 1251 | 0.1        |
| Thymol           | 1282 | 2.2        |
| β-Elemene        | 1390 | 0.1        |
| β- Caryophyllene | 1420 | 0.1        |
| Spathulenol      | 1570 | 0.1        |

the major components in the oil of *P. flabellifolia*.

Table 2. Chemical composition of the identified components in the oil of *Malabaila secacule* (Miller) Boiss.

| Compound                   | RRI  | Percentage |
|----------------------------|------|------------|
| Myrcene                    | 983  | 6.3        |
| p-Cymene                   | 1016 | 0.6        |
| 2-Nonanone                 | 1075 | 0.9        |
| Hexyl 2- methyl propanoate | 1132 | 2.1        |
| Hexyl 3-methyl butanoate   | 1227 | 15.6       |
| Bornyl acetate             | 1273 | 0.7        |
| α- Terpinyl acetate        | 1335 | 0.6        |
| Hexyl hexanoate            | 1370 | 4.4        |
| β- Elemene                 | 1390 | 27.1       |
| β - Caryophyllene          | 1420 | 5.6        |
| γ -Murrrolene              | 1473 | 4.0        |
| β- Selinene                | 1477 | 3.1        |
| α- Selinene                | 1484 | 4.1        |
| Calamene                   | 1514 | 0.7        |
| Spathulenol                | 1568 | 2.7        |
| Caryophyllene oxide        | 1573 | 1.9        |

Sixteen components were identified in the oil of *M. secacule*, making up 80.4% of total composition. β-Elemene (27.1%), hexyl 3-methyl butanoate (15.6%), myrcene (6.3%), β- caryophyllene (5.6%), α- selinene (4.1%) and γ - murrrolene (4.0%) were the major components in this oil. Thus, the oil of *P. flabellifolia* consists of 9 monoterpene hydrocarbons (90.3%), 7 oxygenated monoterpene (3.6%) and sesquiterpenes (0.3%). The oil of *M. secacule* consists of 4-monoterpenes (8.2%), 6 sesquiterpene hydrocarbons (44.6%), 2 oxygenated sesquiterpenes (4.6%), 3-aliphatic esters (22.1%) and 1 aliphatic aldehyde (0.9%).

As can be seen from the above informations the oil of *P. flabellifolia* are rich in regard of monoterpene hydrocarbons and the oil of *M. secacule* are characterized by high levels of Sesquiterpene hydrocarbons and aliphatic esters.

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Nineteen components were identified in the oil of *P. flabellifolia*, which represented about 94.2% of the total composition of the oil. α - Phellandrene (64.0%), p- cymene (18.5%), β- phellandrene (3.8%) and thymol (2.2%) were

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