ESSENTIAL OIL CHEMICAL COMPOSITIONS OF THE FRUIT AND SEEDS OF THE ENDEMIC SPECIES *PYCNOCYCLA BASHAGARDIANA* MOZAFF.

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ABSTRACT

The essential oil contents in the fruits and the seeds of the endemic species *Pycnocycla bashagardiana* growing wild in south of Iran was found to be 0.2 % and 0.4% respectively based on the fresh weight. The oils were analyzed by gas chromatography (GC) and GC–mass spectrometry (GC–MS). Twelve and thirty constituents were identified, which approximately constituted 90.5% and 94.0% of the fruits and the seeds oils, respectively. The phenyl propanoid myristicin was found to consist more than 65 % of both oils.

Keywords: *Pycnocycla bashagardiana*, Fruit, Seed, Essential oil, GC/MS

INTRODUCTION

Plants belong to Apiaceae family are rich in secondary metabolites and embodies numerous genera of high economic and medicinal value, yielding flavonoids, coumarins, acetylenes, terpenes and essential oils [1]. It is well known that occurrence of essential oils and oleoresins is a characteristic feature of this family [2].

Pycnocycla is the genus belonging to Apiaceae family, Apioideae subfamily, Echinophoreae tribe and comprising about 20 species of herbaceous perennial, multicaulis and spinous plants widely distributed in tropical and subtropical regions [3]. *Pycnocycla* is represented by eight species in Iran all of which are native or endemic [4]. Some reports on phytochemical analyses of this genus can be found in the literature. The chemical compositions of the essential oils from the aerial parts of *P. nodiflora* Decne. ex Boiss. [3], *P. aucherana* Decne. ex Boiss. [5], *P. spinosa* [6,7], *P. musiformis* [8], *P. bashagardiana* [9] and *P. flabellifolia* (Boiss.)Boiss. [1] have been previously studied. Literature survey revealed just one report on the essential oil composition of the seeds and fruits of *Pycnocycla* genus (*P. nodiflora*) [10] and there was no attempt to study the essential components of *P. bashagardiana* fruits and seeds up to now. Regarding it and significant pleasant odor of the fruits and seeds, we were prompted to investigate the essential oil composition of these parts of *P. bashagardiana* for the first time.

EXPERIMENTAL

Plant material

Fresh fruits and seeds of *P. bashagardiana* were collected in October 2014 from Bashagard village, Jask County, Hormozgan Province, Iran: (25°38'38"N, 57°46'28"E, 900 m). Specimens were identified by R. Asadpour and vouchers were deposited in the Herbarium of Pharmaceutical Sciences Branch, Islamic Azad University (IAUPS), Tehran under code numbers 5067-AUPF and 5068-AUPF respectively. Seeds were removed out of the fruits and both were separately submitted to hydrodistillation in a Clevenger-type apparatus for 3 hours. At the end of distillation the oils were collected, dried with anhydrous Na₂SO₄, measured, and transferred to clean glass vials and kept at a temperature of –18°C for further analyses.

Analysis of the essential oil

Oil sample analyses were performed on a Hp-6890 gas chromatograph (GC) equipped with a FID and a DB-5 capillary column, 30 m × 0.25 mm, 0.25 µm film thickness, temperature programmed as follows: 60°–240°C at 4°C/min. The carrier gas was N₂ at a flow of 2.0 ml/min; injector port and detector temperature were 250°C and 300°C, respectively. Samples were injected by splitting and the split ratio was 1:10.

GC/MS analysis was performed on a Hewlett-packard 6890 /5972 system with a DB-5 capillary column (30 m × 0.25 mm; 0.25 µm film thickness). The operating conditions were the same conditions as described above but the carrier gas was He. Mass spectra were taken at 70 eV. Scan mass range was from 40–400 m/z at a sampling rate of 1.0 scan/s. Quantitative data were obtained from the electronic integration of the FID peak areas. The components of the oils were identified by their retention time, retention indices, relative to

C9–C28 n-alkanes, computer matching with the WILEY275.L library and as well as by comparison of their mass spectra with data already available in the literature [11,12]. The percentage of composition of the identified compounds was computed from the GC peaks areas without any correction factors and was calculated relatively. The analyses of both essential oil are the average of three replicates for each.

RESULTS AND DISCUSSION

The hydrodistillation of the fruit and seeds of *P. bashagardiana* gave pale yellow oils with pleasant odor and yields of 0.2% and 0.4% (v/w) respectively.

Table 1: GC-MS analysis of *P. bashagardiana* fruit and seeds essential oils.

Compound ^a	KI ^b	KI ^c	%(fruits)	%(seeds)
1.α-Pinene	938	939	-	0.7
2.Sabinene	973	975	1.4	-
3.β-Pinene	978	979	1.2	8.1
4.Myrcene	990	991	-	0.5
5.α-Phellandrene	1001	1003	-	0.4
6.Δ-2-Carene	1002	1004	-	2.1
7.p-Cymene	1022	1025	-	0.3
8.β-Phellandrene	1028	1030	-	0.7
9.Z-β-Ocimene	1035	1037	1.1	1.7
10.E-β-Ocimene	1050	1050	4.0	1.4
11.Terpinolene	1087	1089	-	0.1
12.Undecane	1097	1100	-	2.4
13.trans-Pinocarveol	1137	1139	-	0.1
14.Myrtenal	1193	1196	-	0.1
15.α-Copaene	1375	1377	-	0.1
16.β-Cubebene	1392	1391	1.4	0.7
17.Methyl eugenol	1400	1401	1.3	0.4
18.β-Caryophyllene	1418	1419	-	0.1
19.β-Cedrene	1420	1421	-	0.5
20.α-Guaiene	1442	1440	1.4	1.6
21.α-Humulene	1453	1455	-	0.3
22.E-β-Farnesene	1457	1457	-	0.1
23.β-Selinene	1488	1490	-	0.1
24.δ-Guaiene	1506	1508	1.1	-
25.Myristicin	1521	1520	73.5	67.0
26.Elemicin	1542	1540	-	1.1
27.Caryophyllene oxide	1583	1583	0.7	0.2
28.Isomyristicin	1622	1624	1.1	0.9
29.β-Eudesmol	1649	1651	2.3	0.7
30.Geranyl hexanoate	1720	1722	-	1.1
31.Apiol	1678	1678	-	0.4
32.β-Sinensal	1701	1706	-	0.1
Total			90.5	94.0

^aCompounds listed in order of elution.

^bKI (Kovats index) measured relative to n-alkanes (C₉–C₂₈) on the non-polar DB-5 column under condition listed in the experimental section.

^cKI, (Kovats index) from literature.

Table 1 shows the list of compounds whose GC/MS concentration is not less than 0.1% of total peak concentration.

Figure 1. The gas chromatogram of *P. bashagardiana* fruits essential oil.

Figure 2. The gas chromatogram of *P. bashagardiana* seeds essential oil.

Twelve and twenty three components were identified in the fruits and seeds oils respectively which presented about 90.5% and 94.0% of the total compositions. The major constituents of both oils were characterized as myristicin. It was found to consist 73.5% and 67.0% of the fruits and the seeds oils respectively caused both oils to be known as rich natural sources

of myristicin. Myristicin is a phenylpropanoid compound present in small amounts in the essential oil of nutmeg and to a lesser extent in other spices such as parsley and dill. It was reported that myristicin possesses a broad spectrum of biological activities including anti-inflammatory [13], anticarcinogenic [14] and cancer chemopreventive [15] effects. Possible neurotoxic effects on cultivated human neuroblastoma (cancer) cells were shown by Lee et al. [16]. Significant hepatoprotective activity of myristicin has been also shown [17]. Moreover myristicin is known as a naturally occurring insecticide [18]. Regarding highly presence of myristicin in *P. bashagardiana* fruits and seeds oils, observing these actions from the current oils is expectable.

CONCLUSIONS

This paper presents the essential oil chemical compositions of *P. bashagardiana* fruits and seeds for the first time. Due to the presence of myristicin as the major component in both oils, future studies on the biological and pharmacological properties of the oils especially the seeds oil are suggested.

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