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Original Article

Seed oil chemical composition of *Platychaete aucheri* (Boiss.) Boiss

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ABSTRACT

Background: *Platychaete aucheri* is an endemic plant to the south of Iran and no phyochemical investigations is reported on the seeds oil. **Materials and Methods:** The chemical composition of *Platychaete aucheri* seeds oil was extracted by suxhelet apparatus, methyl esterificated and analyzed by GC and GC/MS spectroscopy method. **Results:** 16 compounds were determined in total and taraxasterol (19.0%), γ-sitosterol (14.1%) and lupeol (11.8%) were characterized as the most abundant components. **Conclusion:** Regarding the presence of high amounts of triterpenoids and sterols in the seed oil, related biological activities are expected from the studied oil.

Key words: *Platychaete aucheri*, *Asteraceae*, Seed oil, Taraxasterol, gamma-Sitosterol.

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INTRODUCTION

The genus *Platychaete* belongs to *Asteraceae* family and is represented by five herbaceous perennial species most of which are endemic and grow wild in deserts, wadis and sandy and alluvial habitats of Iran. They are low perennial herbaceous shrub, often cushion shaped and usually up to 60 cm high and are also found in Afghanistan and Pakistan.[1] *P. aucheri* is commonly distributed in South of Iran and is locally called "Kalajook". Fumes from burning are used to treat measles and repel insects. Aerial parts contain essential oil that has a characteristic aroma and is used in traditional medicine as a carminative, antibacterial, antifungal and sedative agent, and as a perfume in handmade soap.

Literature survey revealed that there were just two studies refer to phytochemical investigation of this genus both of which has been done on the clerodanditerpenoids and the essential oil composition of *P. aucheri* aerial parts.[2-3] Since there was no previous study of *P. aucheri* seed oil, we were prompted to investigate the oil chemical composition of the seeds for the first time.

MATERIAL AND METHODS

Plant material

P. aucheri seeds were collected in August 2014 from Najvan Village, Hadji Abad County, Hormozgan Province, Iran: (28°c18′33″N 55°c54′06″E, 1800 m). Specimen was identified by R. Asadpour and voucher was deposited in the Herbarium of Pharmaceutical Sciences Branch, Islamic Azad University (IAU), Tehran under code number 5043-AUPF.

Oil extraction

Oil extraction was performed with a Soxhlet apparatus using n-hexane as the solvent. 100 g of powdered seeds was extracted for 6 h and then the solvent was evaporated by using a rotary evaporator at 30°C. The pure oil was transferred into a small glass vial, flushed with nitrogen and maintained at -18°C until analyzed for fatty acid composition.

Fatty acid methyl esterification

Fatty acid methyl esters of the extracted oil were prepared according to the method previously reported by Metcalfe *et al.*[4] 1 g of the oil was weighed into a volumetric flask. Then, 25 ml of 0.5 N methanolic potassium hydroxide was added and placed in the boiling water for 20 min. Then 12 ml boron trifluoride (BF_3) was added and boiled again for 3 min. After that, the flask was cooled and 5 ml n-hexane and adequate saturated NaCl solution were added. The flask was shaken vigorously and left to stand for 5 min. the fatty acid methyl esters were prepared and dissolved in n-hexane (the upper layer). 2 ml of upper layer was transferred to a small vial and stored at 0°C until analyzed by GC/MS.

Analysis of the oil

Oil sample analysis was 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°c–240°C at 4°C/min. The carrier gas was N_2 at a flow of 2.0 ml/min; injector port and detector temperature were 250°C and 300°C, respectively. Sample was 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 oil was 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 those of authentic samples or with data already available in the literature.[5-6] The percentage of composition of the identified compounds was computed from the GC peaks areas without any correction factors and was calculated relatively. The analysis of the oil is the average of three replicates for each.

RESULTS AND DISCUSSION

Table 1 shows the list of compounds whose GC/MS concentration is not less than 0.4% of total peak concentration. Sixteen components were identified in the oil which presented about 86.6% of its total composi-

Table 1:GC-MS analysis of *P. aucheri* seed oil

Compound[a]	KI[b]	KI[c]	Percentage
n-Decane	996	1000	1.1
n-Dodecane	1997	1200	1.0
Hexadecane	1603	1600	0.6
Palmitic acid methyl ester	1980	1984	0.9
Linoleic acid methyl ester	2168	2173	1.1
Octadecane	1792	1800	5.7
Nonadecane	1905	1900	8.2
Eicosane	1994	2000	1.2
Tetracosane	2306	2300	8.2
Octacosane	2807	2800	5.4
Campesterol	3299	3305	3.7
Stigmasterol	3330	3332	1.0
γ-Sitosterol	3412	3408	14.1
β-Amyrin	3420	3424	3.6
Taraxasterol	3443	3438	19.0
Lupeol	3492	3486	11.8
Total			86.6

[a]Compounds listed in order of elution.

[b]KI (Kovats index) measured relative to *n*-alkanes (C_9-C_{28}) on the non-polar DB-5 column under condition listed in the Materials and Methods section.

[c]KI, (Kovats index) from literature.

tion. The oil major constituents were found to be taraxasterol (19.0%), γ-sitosterol (14.1%) and lupeol (11.8%). *P. aucheri* seed oil comprised four sterols (37.8%), two triterpenoids (15.4%), eight hydrocarbons (31.4%) and two fatty acids (2.0%).

The major constitutions of the studied oil were sterols. Sterols are a group of naturally occurring substances derived from hydroxylated polycyclic isopentenoids. Plant sterols (phytosterols), in particular, are important agricultural products for health and nutrition industries.[7] They are common components of plant foods especially plant oils, seeds and nuts.[8] The most common phytosterols are campesterol, sitosterol and stigmasterol. As the results all these three sterols were found in the studied oil. Although they are structurally similar to cholesterol, they have been shown to exert significant unique biochemical effects in both in animals and humans.[9] The main constitution of the studied oil was taraxasterol with a high amount of 19.0%. It is usually found in the plants belong to the *Asteraceae* family. The distribution of taraxasterol is not extensive in plants but its biological activity is very interesting. Significant chemo preventive, antioxidant and anti-inflammatory properties of this compound have been shown[10] so the studied oil could deserve greater attention in the evaluation of these kinds of activities.

According to the Table 1, lupeol was characterized as the other major component of *P. aucheri* seed oil. Lupeol is a pharmacologically active triterpenoid. It has several potential medicinal properties. Anti-protozoal, anti-microbial, anti-inflammatory, anti-tumor and chemo preventive properties[11] have been reported from this compound. Animal models suggest lupeol may act as an anti-inflammatory agent. Lupeol found to decrease paw swelling in rats by 39%, compared to 35% for the standardized control compound indomethacin.[12] It is also an effective inhibitor of prostate and skin cancers.[13-14]

Due to the presence of bioactive sterols and the triterpenoid lupeol as the seed oil major components, future studies on the biological and pharmacological properties of *P. aucheri* seed oil are suggested.

ACKNOWLEDGMENTS

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ABBREVIATION USED

GC-MS: Gas Chromatography-Mass Spectrometry.

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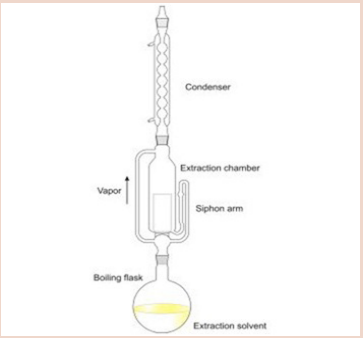
PICTORIAL ABSTRACT



SUMMARY

- The chemical composition of *Platychaete aucheri* seeds oil was analyzed.
- 16 compounds were determined in total.
- GC and GC/MS analysis showed taraxasterol (19.0%), γ-sitosterol (14.1%) and lupeol (11.8%) as the most abundant components.