Iranian Journal of Pharmaceutical Sciences
2016: 12 (3): 11-16
www.ijps.ir

Original Article

Essential Oil of the Leaves of *Arum Conophalloides* (Araceae) From Iran

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Abstract

The leaves of *Arum conophalloides* (Araceae) were used in some west areas of Iran as a dessert. The aerial parts of the herb were collected from Sahneh Mountains, Kermanshah Province, west of Iran and was hydrodistilled by Clevenger-type apparatus. Composition of the essential oil was determined by GC and GC/MS. Totally, 18 components (92% of total essential oil) were identified. The oil contains mainly*T*-muurolol (%25.4), Ionone (%12.6), nonanal (%17.7), *T*-cadinol (%8.9), Fitone (%7.9), and Methyl palmitate (%7.0). The chemical composition of essential oils from the herbs is being reported for the first time.

Keywords: Essential oil composition, *Arum conophalloides*, Kermanshah, GC/MS, *T*-muurolol, Ionone, nonanal, *T*-cadinol.

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Cite this article as: Haghighi H, Essential Oil of the Leaves of *Arum conophalloides* (Araceae) From Iran.Iranian Journal of Pharmaceutical Sciences, 2016, 12 (3): 11-16

1. Introduction

Arum conophalloides Kotschy ex Schott (syn. *Arum rupicola* Boiss., *A. virescens* Stapf.)[1, 2] (Araceae) is perennial monoecious erect herb with vertical ovate or almost globular tuber, petiolate leaves 3–4, blades sagittate, spathe large, 25–40 cm long, greenish to greenish–purple outside, green or purple inside. Spadix 20–30 cm long, slightly shorter than spathe; sterile flowers purple. Compound fruit of densely appressed red baccas; seeds 1–6. In Armenia it grows in Zangezur (Kapan) and Meghri (Berdakar, Kaler, Vahravar, Shvanidzor, Nyuvadi) floristic regions. It also grows in Nakhichevan, Anatolia, North Iraq, and North Iran. It grows in lower mountain belt, at the altitudes of 700–1000 meters above sea level, on stony places, often near water. Its Flowering is from April to May, and its fruiting is from May

to June. The leaves grow in April simultaneously with flower blooming [3]. In Iran, it had been used as a traditional dessert in some local areas of Kermanshah Province, etc. In some areas of Turkey (Gecitli, Hakkari [4] and Catak, Van [5]) the aerial parts of the herb (local name: kahri) were cooked as a stew or rice-vegetable dish.

As far as we know, the essential oil composition of the herb has not been described yet. However, there are some reports about chemical composition of *Arum* spp.

Arum maculatum is a common woodland plant species of the Araceae family. It is widespread across most of Europe as well as Turkey and Caucasus [6].The seed oil of *Arum maculatum* has been found to contain 13-phenyltridec-9-enoic (0.4%) and 15-phenyl-pentadec-9-enoic (1%) acids, detected by gas chromatography mass spectrometry of the picolinyl ester and related derivatives [7]).

Non-invasive headspace analyses of the odor produced by inflorescences of *Arum macularurn* L. still attached to plants growing wild in southern England revealed that the major components were 2-heptanone,indole and germacrene B. *p*-Cresol was also a notable odorous component amongst the 56 compounds present [8].

The fatty acid composition of the seed oil of *A. italicum* oil was investigated by analyzing their methyl esters by GC and GC-mass spectrometry. The major fatty acids were 16:0, 16:1 n-7, 18:0, 18:1 n-9, 18:2 n-6, and 13-phenyltridecanoic acid in the seed oil. This is the first report on fatty acid composition and 13-phenyltridecanoic acid content of *Arum italicum* Miller seeds from Turkey [9].

The phytochemical analysis of the ethyl acetate fraction of *Arum palaestinum* Boiss. led to the isolation and identification of a new polyhydroxy alkaloid compound; (S)-3,4,5-trihydroxy-1H-pyrrol-2(5H)-one, and other five known compounds; caffeic acid, isoorientin, luteolin and vicenin II, as well as the rare compound 3,6,8-trimethoxy, 5,7,3′,4′-tetrahydroxy flavone. The structural elucidations of all the compounds were based on spectroscopic data (^{1}H- and ^{13}C-NMR, DEPT, HSQC, HMBC and NOE difference techniques) and comparison with literature data [10].

As a part of our ongoing research programs on essential oils [11-13], the chemical investigation on *Arum conophalloides* oil was undertaken and results are reported in this communication. As we have searched, there is not any report about analysis of its essential oil.

2. Material and Methods

The leaves of *Arum conophalloides* were collected on 21 April 2015 from Hojr Mountains, Sahneh City, Kermanshah Province, west of Iran and were identified by V. Mozaffarian (TARI- 102974). The aerial parts were dried, powdered and subjected to maceration-hydrodistillation for 4 hours using a clevenger type apparatus (by *n*-hexane). The oil

obtained was dried over anhydrous sodium sulfate.

Essential oil sample was analyzed with a Shimadzu Gas chromatograph -mass spectrometer (HP 5973). A 250 m cross-linked methyl silicon (HP-5 MS) capillary column 25m x 0.33-mm was used. Helium was used as carrier gas with a flow rate of 1ml/min. The temperature program consisted of 60-270°C, with rate of 4°C/min. Split ratio was 1:30, and injector temperature was 250°C. The compounds were identified using a computer research library of mass spectra, and comparison of Kovats' indices with standards [14].

3. Result and Discussion

Light yellow volatile oil was obtained by maceration- hydrodistillation of aerial parts of *A. conophalloides*. The oil possessed pungent odor. The analysis of the oil was performed by GC and GC/MS. The relative percentage of the volatile components is presented in Table 1, according to their order of elution on phenyl methyl siloxane column. The oil was found to contain 18 compounds identified by their mass spectra and their linear retention indices (LRI). The oil contains mainly *T*-muurolol (%25.4), Ionone (%12.6), nonanal (%17.7), *T*-cadinol (%8.9), Fitone (%7.9), and Methyl palmitate (%7.0). Terpenoids comprise 67.2% of the volatiles. Sesquiterpenoides are the main components of the oil (34.3%), but Monoterpenoids have low percent (8.7%). One diterpene (Neophytadiene) (1.5%) was identified too. We didn't have any similarity between the oil and other oil of *Arum* species analyzed.

Table 1. The composition of the essential oil of *Arum conophalloides* aerial parts.

No	compounds	%
1	*n*-Heptanal	2.9
2	2-pentyl furan	1.0
3	nonanal	17.7
4	3, 5- dimethyl, 1, 2, 4-trithiolane	1.1
5	safranal	2.2
6	β-cyclocitral	2.9
7	cuminaldehyde	1.2
8	β-damascenone	1.2
9	Geranyl acetone	1.0
10	β-Ionone	12.6
11	Citral	1.3
12	n-hexadecane	1.0
13	*T*-cadinol	8.9
14	*T*-muurolol	25.4
15	Fitone	7.9
16	Neophytadiene	1.5
17	Methyl palmitoleate	2.0
18	Methyl palmitate	7.0

T-muurolol, as a major component in our oil, was reported in some essential oils, such as *Amomum maximum* [15], *A. microcarpum* [15], *Peperomia obtusifolia* [16], and *Kyllinga brevifolia* [17]. Also, β-Ionone was reported in some essential oils, such as *Nephrolepis exaltata* and *N. cordifolia* grown in Egypt [18], *Launaea lanifer*, an Algerian endemic plant [19] and

Adiantum capillus-veneris [20], previously. Nonanal was identified in essential oil of *Allium stipitatum* (Persian shallot) [21], *Nephrolepis exaltata* and *N. cordifolia* [18], as well as Fitone in leaves and roots of *Ardisia brevicaulis* [22].

4. Conclusion

In the research, we analyzed for the first time, an edible herb in Iran for its essential oil. *T*-muurolol was the main component of the oil (%25.4). Apparently, there is not any correlation between the chemical components and local usages.

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