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ORIGINAL ARTICLE

Chemical composition of *Ziziphoratenuiar* of Kahnooj in Iran

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ABSTRACT
The increasing demands of consumers for using less chemical preservatives has led to increasing number of researches to produce natural compounds with antimicrobial properties.Fresh aerial parts of wild *Ziziphoratenuiar* were collected in Eastern Iran*Z.tenuior* samples were collected after initial preparation isolated from the aboveground plant parts and plant samples preparation by water distillation using Clevenger apparatus after determining the optimal conditions for making essential oil was obtained. Essential oil with an efficiency of 1/1 percent (g/g) was obtained and by GC-MS to determine the composition of the essential oils was analyzed and indicates 21 compounds. Key combinations were as: pulegone (82.6 %) and limonene (6.8%) which was extracted. the studied essential oil would exhibit good antimicrobial properties, but this was not evaluated and further investigation should be carried out for use of this essential oil in various industries.
Keywords: *Ziziphoratenuiar*, Essential oil, GC-MS

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INTRODUCTION

The increasing demands of consumers for using less chemical preservatives has led to increasing number of researches to produce natural compounds with antimicrobial properties[1]. Using essential oils of plants, known as natural compounds, is expanding since these compounds have significant antimicrobial effects on a wide range of microorganisms [2]. Lamiaceae family of plants has been used as spice in foods and as medicine for digestion and combatting viral diseases [3]. This tribe includes 46 genera and 410 species and sub species in Iran. *Ziziphoratenuira* belongs to *lamiaceae* tribe, *lamiales* order and *asteridae* subclass [4]. This plant is an herbaceous, annual, 5 to 15 cm high with a short stem. Its leaves are narrow and pointed with short internodes. Its flowers are small, pale purple or violet. Geographical distribution is in Iran, Turkey, Russia, Turkmenistan, Afghanistan, Pakistan, Caucasus and Siberia [5]. A substance, which is mainly seen in the essential oils from *lamiaceae* family including Z.tenuira, is pulgone. Pulgone owns antibacterial and antifungal properties [6]. The substance can also prevent the growth of *candida albicans* and *salmonellatyphimurium*. Meanwhile, their effect on *candida albicans* is twice Nastatine[7].

Due to the existence of compounds such as pulgone, the essential oil compounds of *Ziziphora* species have been repeatedly studied in varying vegetative and weather conditions around the world. The results of the analysis of gas chromatography in a research revealed the existence of 22 different compounds in the essential oil of this herb. 5 of these compounds formed more than 73% of the essential oil and pulgone was the most [8]. Gozed et al examined the antibacterial activity of *Z.tenuior*subsp, native to Turkey. The study by Gozed was conducted in laboratory conditions and on 8 species of bacteria. It showed that the essential oil of this species considerably prevented the growth of microorganisms [9]. Javidnia et al studied the composition and antimicrobial activities of the essential oil of a population of *Z.tenuior*in Iran. The essential oil compounds of these species were studied using GC and GC-MS and the results demonstrated that pulgone was the main compound in the essential oil of the species[10].

Regarding the importance of *Z.tenuior*species in terms of medical, health and food purposes, the presented study was carried out with the aim of investigating the effect of warm and dry climate (weather conditions of Kahnooj, Iran) on the quality and the essential oil compounds of *Z.tenuior*.

MATERIALS AND METHODS

Plant material

Fresh aerial parts of wild *Ziziphoratenuiar* were collected in Eastern Iran (Kahnooj, Coordinates: 27°56′N57°52E) in April 2014. Identification of the species was confirmed in Islamic Azad University, Kahnooj Branch. Samples were ground to a suitable size and stored in plastic container before analysis.The essential oils were extracted by hydro distillation by Clevenger-type apparatus of dried plant material for 3h (40 g of sample in 350mL of distilled water). The oil was separated from water by using n-hexane and then oils were dried by anhydrous sodium sulfate and stored in sealed glass vials at 4-5°C prior to analysis.

Gas Chromatography-mass Spectrometry

Analysis of the essentials oils was performed using a Shimadzu GC-17A equipped with a Shimadzu GCMSQP5050A mass selective detector and a HP-5 MS capillary column (30m×0.25mm, film thickness 0.25 μm). For GC/MS detection, an electron ionization system with ionization energy of 70 eV was used. Helium at a flow rate of 0.8 mL/min was used as carrier gas. Injector and MS transfer line temperatures were set at 250 and 270 °C, respectively. Oven program temperatures were the same as for the GC analysis. Diluted samples (1/10 acetone, v/v) of 0.2 μL were injected automatically in the split mode. The components were identified by comparing their relative retention times and mass spectra with those of standards (for the main components), Wiley library data of the GC/MS system, Kovats Index and literature data.All the tests were performed in triplicate.

RESULTS AND DISCUSSION

Ziziphoratenuior samples were collected after initial preparation isolated from the aboveground plant parts and plant samples preparation by water distillation using Clevenger apparatus after determining the optimal conditions for making essential oil was obtained. Essential oil with an efficiency of 1/1 percent (g/g) was obtained and by GC-MS to determine the composition of the essential oils was analyzed.The analysis resultsof the essential oils of Z.*tenuior* can be seen in Table 1.

Table1. Chemical composition of essential oils *of Ziziphoratenuior*

No.	Compounds	RI	%
1	Tricyclene	925	0.7
2	α-thujene	930	0.5
3	α-pinene	937	3.4
4	Sabinene	968	1.5
5	β-pinene	977	1.8
6	Myrcene	993	2.2
7	Limonene	1021	4.8
8	Isopulegone	1066	1.2
9	Terpinolene	1081	3.1
10	Pulegone	1213	69.9
11	2-cyclohexen	1248	4.1
12	α-copaene	1334	0.2
13	β-bourbonene	1388	0.3
14	Benzenepropanoic acid	1392	1.2
15	trans-caryophyllene	1398	0.1
16	α-humulene	1417	0.1
17	β-cubebene	1431	1.4
18	Germacrene D	1492	1.8
19	γ-cadinene	1516	0.9
20	Caryophyllene oxide	1578	0.5
21	Hexadecanoicacid	1682	0.3

Results from the plant oils, indicates 21 effective combinations of *Z.tenuior* essential oils that have a considerable amount of the phenolic compounds that this indicates that there is anti-microbial nature of the essential oils of *Z.tenuior*. Major compounds in the oils of this plant include: Pulegone with 69.9% and Limonene with 4.8%.

CONCLUSIONS

The chemical composition of the essential oil of *Ziziphoratenuior* growing kahnooj in Iran was investigated. The data obtained in this study showed that the essential oil of aerial part of Z. *tenuior* has variability of hydrocarbons and can be a good source of them.

*Z.tenuior*is one of herbs which several studies in various fields have been done on it, especially in Iran. One such study was conducted by P. Babakhanlou et al. that the phyto chemical studies on the one species of *Z.tenuior*around Tehran that used organs were aerial parts of the plant and using the water and steam distillation method of Kasier& Lang was done essential oils making that the extracted essential oils with yield about 80% relative to the dry weight of plant and key combinations were as: pulegone (82.6 %), limonene (6.8%), cineol (1.9 %) which was extracted. [11]

Compounds identified in essential oilsof the aerial parts of *Z.tenuior*are close tithe research conducted by Babakhanlou et al. However, there are significant differences in the amount of compounds that can be caused by climatic differences, environmental factors and harvest time.

Due to the extent of the inhibitory effect of the oil on micro-organisms being attributed to the presence of aromatic nuclei containing a polar functional group, it can be awaited that the studied essential oil would exhibit good antimicrobial properties, but this was not evaluated and further investigation should be carried out for use of this essential oil in various industries.

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