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The study of essential oil composition of *Matricaria chamomilla* in Khouzestan

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ABSTRACT

Background and aims: *Matricaria chamomilla* is an important medicinal plant that widely is used in pharmaceuticals and food industries. The present study was aimed to evaluate the essential oil composition of samples of *Matricaria chamomilla* collected from different regions of Khouzestan.

Methods: In this experimental study, samples of *Matricaria chamomilla* were collected from different regions of Khuzestan at full flowering stage. The component identification was achieved by the Gas chromatography–mass spectrometry (GC-MS) analysis. Total GC running time was 75 min. The components of essential oil were identified on the basis of comparison of their retention time and mass spectra with published data. Moreover, they were identified by computer matching with Wiley 7n, National Institute of Standards and Technology (NIST) libraries provided with computer controlling the GC-MS system, and Adams book in Centrallab of Agriculture and Natural Resources University of Khuzestan.

Results: The main oil compounds of samples of Matricaria chamomilla were α-Pinene, Sabinene, β-Pinene, 1,8-Cineole, Citronellol, Aromadendrone, (E).β-farnesene, Spathulenol, Caryophyllene oxide, α-Bisabolone oxide A, α-Bisabolole oxide B, Chamazolene and α-Bisabolole oxide A, collected from different regions of Khouzestan. Also, α-Bisabolone oxide A, Caryophyllene oxide, Chamazolene and α-Bisabolole oxide A were the highest percentage of the main oil compounds of these samples.

Conclusions: The Caryophyllene oxide, α-Bisabolone oxide A, Chamazolene, α-Bisabolole oxide A are dominant components in the essential oil of *Matricaria chamomilla* in weather and geographical conditions of studied samples and different climates are effective on plant essential oil composition.

Keywords: GC-MS analysis, Major Oil Compounds, *Matricaria chamomilla*.

Original article

INTRODUCTION

Matricaria chamomilla is an important medicinal plant that widely is used in pharmaceuticals, cosmetics, health and food industries. This is an annual herbaceous plant and belongs to the Asteraceae.[1,2] Flowers of *Matricaria chamomilla* are the most economical in comparison with other parts. The main constituents of the flowers include several phenolic compounds, primarily the flavonoids, apigenin, quercetin,

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patuletin, luteolin, and their glucosides. The principal components of the essential oil extracted from the flowers are the terpenoids α-bisabolol and its oxides and azulenes, including chamazulene, which is responsible for the strong blue color of the extract.[3] Chamazulene is one of the most volatile that presented at the base of tubular florets. Also Apigenin is found in the side of white florets.[4,5] *Matricaria chamomilla* has therapeutic properties as anti-inflammatory properties, anti-fungal and bacteria. These characteristics have been attributed to the existence of the sesquiterpenes and flavonoids.[1,2] Today, due to increasing resistance of microorganisms to antibiotics, there is more attention for use of plants antimicrobial compounds. Many studies have shown that essential oils have a significant inhibitory effect on pathogenic microorganisms.[6] Chamomile oil, at a concentration of 25 mg/mL, demonstrates antibacterial activity against such gram-positive bacteria as Bacillus subtilis, Staphylococcus aureus, Streptococcus mutans, and Streptococcus salivarius, as well as some fungicidal activities against Candida albicans.[7]

Although active ingredients of the compounds in different regions have already been proven, but percentage of the compounds due to geographical factors is different in each region. The present study was aimed to evaluate the essential oil composition and percentage composition of samples of *Matricaria chamomilla* collected from different regions of Khouzestan in 2016.

METHODS

In this experimental study, samples of *Matricaria chamomilla* were collected from different regions of Khuzestan including Mollasani, Masjed Soleyman, Ramhormoz, Andimeshk, Behbahan and Izeh at full flowering stage (Figure 1). The geographical coordinates of the places where they took samples are shown in Table 1.

Figure 1: *Matricaria chamomilla*

Table 1: Geographical Profile region

Region Name	latitude	Longitude	Height
Mollasani	31º 35′	48º 53′	25 m
Masjed Soleyman	31º 93′	48º 24′	372 m
Ramhormoz	31º 16′	49º 36′	150.5 m
Andimeshk	32º 29′	48º 22′	176 m
Behbahan	30º 36′	50º 14′	313 m
Izeh	31º 13′	50º 22′	3075 m

After recognition by the National Herbarium of Ramin University of Agriculture and Natural Resources, Ahwaz, flowers were dried at a shade place with a suitable temperature. The flowers were crushed and flower essential oil was extracted by Clevenger apparatus, and distillation water. Then, it was dehydrated by sodium sulfate. In the next stage, 5 grams of plant was placed at 50°C for the determination of plant water at the time of extraction. After reaching to the constant weight, it was calculated the moisture content and its percentage.

The component identification was achieved by the GC-MS analysis using Agilent Technologist 7890 series GC

equipped with mass selective detector (MSD), 5975 series in Central lab of Agriculture and Natural Resources University of Khuzestan. Helium was used as carrier gas at a constant flow of 0.8 ml/min and an injection volume of 1µl was employed, injector temperature 290°C; Ion-source temperature 280°C. The oven temperature was programmed from 50°C (isothermal for 5 min), with an increase of 3°C/min, to 240°C and with an increase of 15°C/min, to 280°C held for 10 min. Total GC running time was 75 min.

The components of essential oil were identified on the basis of comparison of their retention time and mass spectra with published data. Moreover, they were identified by computer matching with Wiley 7n, National Institute of Standards and Technology (NIST) libraries provided with computer controlling the GC-MS system, and Adams book in Centrallab of Agriculture and Natural Resources University of Khuzestan.[8]

Essential oil yield was calculated by determining the percentage of moisture to the dry weight of each sample at the time of extraction (Table 2). After obtaining the chromatograms and mass spectra, it was identified chemical composition of the essential oil with retention indices, and a small percentage of the composition and mass spectra using retention indices (KI). Analysis of essential oils is presented in Table 3.

Table 2: The yield essential oil *Matricaria recutita* collected from various regions

Location	Essential oil yield (%)
Mollasani	1.09
Masjed Soleyman	0.95
Ramhormoz	1.34
Andimeshk	1.1
Behbahan	1.58
Izeh	1.94

RESULTS

Table 3: Phyto-components identified in *Matricaria recutita* essential oil

Component (%)	KI*	Mollasani	Masjed Soleyman	Ramhormoz	Andimeshk	Behbahan	Izeh
α-Pinene	939	0.2	0.5	0.63	2.7	0.31	0.28
Sabinene	975	0.35	0.32	0.15	1.9	0.22	0.15
β-Pinene	979	0.4	0.2	0.38	2.1	0.54	0.12
1,8-Cineole	1031	1.9	1.4	1.2	3.1	1.6	1.1
Citronellol	1226	0.45	0.76	1.32	1.9	1.17	0.1
Aromadendrone	1441	1.7	2.5	0.8	1.8	0.47	0.8
(E).β-farnesene	1457	3.49	2.67	2.11	2.1	1.3	0.2
Spathulenol	1578	0.52	1.9	0.4	2.2	0.42	1.3
Caryophyllene oxide	1583	5.8	5.6	6.62	3.24	4.1	3.8
α-Bisabolole oxide B	1658	0.34	1.5	1.56	0.5	0.8	0.4
α-Bisabolone oxide A	1685	63.9	45.15	58.97	42.16	70.26	75
Chamazolene	1732	6.2	18.3	13.45	17.5	8.4	6.3
α-Bisabolole oxide A	1749	8.97	16.4	10.14	13.12	7.15	10.8

**: Kovats Index.*

The results showed that Izeh had the highest essential oil yield with 1.94%. However, Masjed Soleyman had the lowest essential oil yield, 0.95%. The main oil compounds of samples of *Matricaria chamomilla* collected from different regions of Khouzestan were including: α-Pinene, Sabinene, β-Pinene, 1,8-Cineole, Citronellol, Aromadendrone, (E).β-farnesene, Spathulenol, Caryophyllene oxide, α-Bisabolone oxide A, α-Bisabolole oxide B, Chamazolene and α-Bisabolole oxide A. Of these compounds, the highest percentages were Caryophyllene oxide (Figure 2), α-Bisabolone oxide A (Figure 3), Chamazolene (Figure 4), α-Bisabolole oxide A (Figure 5).

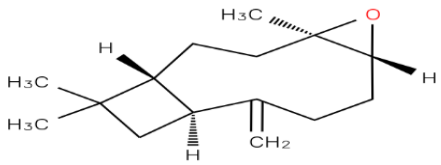

Figure 2: Structure of Caryophyllene oxide

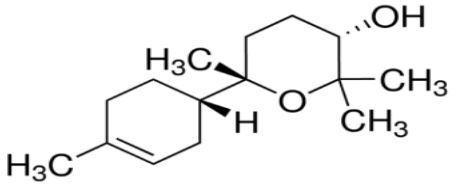

Figure 3: Structure of α-Bisabolone oxide A

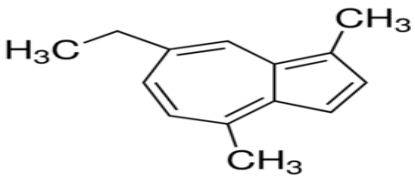

Figure 4: Structure of Chamazolene

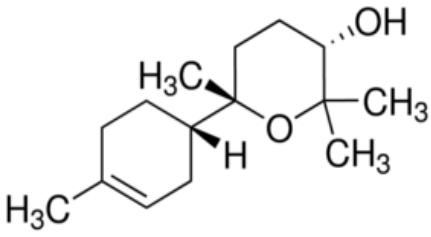

Figure 5: Structure of α-Bisabolole oxide A

DISCUSSION

Due to differences of the essential oil composition of herbal in various climate in the present study, it was evaluated essential oil composition of *Matricaria chamomilla* in Khouzestan by GC-MS. Based on the current findings in this study α-Pinene, Sabinene, β-Pinene, 1,8-Cineole, Citronellol, Aromadendrone, (E).β-farnesene, Spathulenol, Caryophyllene oxide, α-Bisabolone oxide A , α-Bisabolole oxide, B Chamazolene and α-Bisabolole oxide A were the main oil compounds of samples of *Matricaria chamomilla* collected from different regions of Khouzestan. Also, α-Bisabolone oxide A, Caryophyllene oxide, Chamazolene and α-Bisabolole oxide A were the highest percentage of the main oil compounds of samples. Another Iranian study in line with the present results reported that among identified components of essential oil of *Matricaria chamomilla*, Chamazolene was the major component.[9] In another study, Ghanavati et al investigated the chemical composition of the essential oils of *Matricaria chamomilla* belonged to central and south parts of Iran. In this study, it was collected nine chamomile flower samples of central parts and south of Iran including; Tehran, Isfahan, Shiraz, Kerman in central parts, Gachsaran, Baba Meydan, Noor Abad, Behbahan and Larestan belong south of Iran. Based the results of this study, the Zagros mountains sample was rich in α-Bisabolo,l but it had low content of the essential oil. Samples from Baba Mydan and Noorabad were rich in α- Bisabololoxide.[10] In Farhoudi's study, it

was analyzed the composition of essential oil of *Matricaria chamomilla* grew in wild situation in Iran by GC and GC-MS methods. The obtained results demonstrated that chamazulene, 1,8-cineole, β-pinene, α-pinene, α-bisabolol and terpinen-4-ol were main compounds of *Matricaria chamomilla*.[11]

CONCLUSIONS

The Caryophyllene oxide, α-Bisabolone oxide A, Chamazolene, α-Bisabolole oxide A are dominant components in the essential oil of *Matricaria chamomilla* in studied samples. Due to the effectiveness of weather and geographical climates on plant essential oil composition and the percentage composition of each district, it is required to identify the composition according to the weather conditions and different climates.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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