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ORIENTAL JOURNAL OF CHEMISTRY
An International Open Free Access, Peer Reviewed Research Journal

www.orientjchem.org

ISSN: 0970-020 X
CODEN: OJCHEG
2014, Vol. 30, No. (1):
Pg. 365-367

Essential Oil Components of *German chamomile* Cultivated in Firoozabad, Iran

SHAHRAM AMIRI and SHAHRAM SHARAFZADEH*

Department of Agriculture, Firoozabad Branch, Islamic Azad University, Firoozabad, Iran.
*Corresponding author E-mail: shahramsharafzadeh@hotmail.com

http://dx.doi.org/10.13005/ojc/300151

(Received: December 10, 2013; Accepted: January 29, 2014)

ABSTRACT

Plant essential oils have medicinal properties. Flowers of German chamomile cultivated in Firoozabad, Iran were subjected to hydrodistillation. Isolated essential oil was analyzed by GC and GC-MS. Main oil constituents were α-Bisabolol oxide A, Chamazulene, En-in-dicycloether, α-Bisabolone oxide A, n-Octanal, α-Bisabolol oxide B, 1,8-Cineole, α-Terpineol and Germacrene D.

Key words: Chamazulene, Volatile oil, Bisabolol oxide, Medicinal plants, GC-MS.

INTRODUCTION

People around the world use between 50,000 to 80,000 flowering plants for medicinal purposes [1].

Matricaria recutita L. (syn. *M. chamomilla* L., *Chamomilla recutita* L. Rauschert) known as true chamomile or German chamomile is from family Compositae. This plant has white ligulate flowers, smells pleasantly of chamomile and is annual, grows 10 to 80 cm in height [2].

Phenolic compounds, glucosides and principal components of the essential oil extracted from the flowers like α-bisabolol and its oxides and azulenes, including chamazulene are active substances of chamomile[3-4].

The subject of this study was identification of essential oil components of German chamomile cultivated in Firoozabad, State of Fars, Iran.

MATERIALS AND METHODS

Plant materials and experimental conditions

This study was conducted on Firoozabad Branch (28°35' N, 52°40' E; 1327 m above sea level), Islamic Azad University, Firoozabad, State of Fars, Iran, on October (autumn), 2012. The pots were filled by a mixture contained 2/3 soil and 1/3 sand (v/v) which was amended by cow manure vermicompost. This mixture was tested before sowing and showed PH=7.79, organic C=1.14%, total N=0.1%, available P=5.5 mg/kg, available K=184 mg/kg, TNV=52.5% and EC=0.7 ds/m. Chamomile seeds were germinated in pots and thinned at 2-4 leaves stage to one plant per each pot. The experiment was

carried out using three replications. Each replicate contained 14 pots. The flower heads were collected each 20 days during flowering (four times), and were dried at room temperature.

Essential oil isolation

Isolation of essential oils was performed using hydrodistillation of dried sample of flower heads using a Clevenger-type apparatus over 3 hours. The oils were dried over sodium sulphate.

Gas chromatography (GC)

Gas Chromatography analysis was performed on an Agilent technologist model (7890A) equipped with flame ionization detector and capillary column HP-5 (30 m × 0.32 mm, 0.25 µm film thicknesses). The chromatographic conditions were as follows: The oven temperature increased from 60 to 210ºC at a rate of 3ºC/min then 210 to 240 ºC at a rate of 20ºC/min. The injector and detector temperatures were 280 and 290ºC, respectively. N_2 used as the carrier gas (0.5 ml/min).

Gas chromatography-mass spectrometry (GC-MS)

Essential oil was also analysed by GC-MS (Agilent Technologies-5975C-MS, 7890A-GC) equipped with a HP-5 capillary column (phenyl methyl siloxane (30 m × 0.25 mm, 0.25 µm film thickness) with He as the carrier gas and a split ratio of 1:50. The retention indices for all the components were determined according to the Van Den Doll method using n-alkanes as standard. The compounds were identified by comparison of retention indices (RRI-AP-5) with those reported in the literature and by comparison of their mass spectra with the Wiley and mass finder 3 libraries or with the published mass spectra.

RESULTS AND DISCUSSION

Qualitative and quantitative analysis of essential oils have been shown in Table 1. Twenty nine components were identified in chamomile oil. The major components were α-Bisabolol oxide A (17.14%), Chamazulene (15.12%), En-in-dicycloether (6.22%), α-Bisabolone oxide A (6.15%), n-Octanal (6.00%), α-Bisabolol oxide B (5.17%), 1,8-Cineole (3.86%), α-Terpineol (3.11) and Germacrene D (3.02%).

Presibella *et al*. (2006) analyzed commercial samples of *Chamomilla recutita* in Brazil and indicated that α-Bisabolol oxide A was 11.61-16.57% whereas in Egyptian sample was 46.55% [5].

Gamal El-Din and Abd El-Wahed (2005) in an Egyptian experiment revealed that α-Bisabolol oxide A and Chamazulene were 57.81% and 11.78%, respectively, in control chamomile plants [6].

Table 1: Essential oil components of German chamomile cultivated in Firoozabad, Iran

No	RI	Component name	%
1	935	α-Pinene	0.10 ± 0.00
2	947	Camphene	0.23 ± 0.01
3	975	Sabinene	0.09 ± 0.02
4	1003	Yomogi alcohol	0.15 ± 0.01
5	1006	n-Octanal	6.00 ± 0.02
6	1026	p-Cymene	0.59 ± 0.04
7	1030	Limonene	0.52 ± 0.03
8	1037	1,8-Cineole	3.86 ± 0.01
9	1047	(E)- β-Ocimene	0.18 ± 0.01
10	1059	γ-Terpinene	0.38 ± 0.02
11	1064	Artemisia ketone	0.14 ± 0.00
12	1087	Artemisia alcohol	1.17 ± 0.02
13	1104	Linalool	0.81 ± 0.01
14	1107	n-Nonanal	0.54 ± 0.04
15	1171	Terpinene-4-ol	0.55 ± 0.00
16	1196	α-Terpineol	3.11 ± 0.02
17	1394	β-Elemene	0.30 ± 0.02
18	1422	(E)-Caryophyllene	0.47 ± 0.01
19	1458	(E)-β-Farnesene	0.31 ± 0.02
20	1484	Germacrene D	3.02 ± 0.01
21	1499	Bicyclogermacrene	0.07 ± 0.00
22	1567	(E)-Nerolidol	0.10 ± 0.02
23	1583	Spathulenol	0.20 ± 0.04
24	1589	Caryophyllene oxide	0.10 ± 0.42
25	1663	α-Bisabolol oxide B	5.17 ± 0.01
26	1692	α-Bisabolone oxide A	6.15 ± 0.02
27	1740	Chamazulene	15.12 ± 0.01
28	1763	α-Bisabolol oxide A	17.14 ± 0.03
29	1888	En-in-dicycloether	6.22 ± 0.03

RI, retention index

All data are means of three replications ± standard deviation

SzQke *et al*. (2003) in a Hungarian study with wild and cultivated chamomile showed that Bisabolol oxide A varied from 0.42% to 36.27 in the essential oil of flowers and this range for Chamazulene was 5.23% to 24.50% [7].

Orav *et al.* (2001) in Estonia reported that the main constituents of Chamomile were bisabolol oxide A (20-33%) and B (8-12%), bisabolon oxide A (7-14%), (E)-β-farnesene (4-13%), α-bisabolol (8-14%), chamazulene (5-7%), and en-yn-dicycloether (17-22%)[8].

In conclusion, composition of the essential oils could be markedly affected by the geographical environment, places that plants is grown, physical and chemical characteristics of soil, plant age, oil isolation method, etc.

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