



GC-MS Analysis of the Steam and Hydrodistilled Essential Oil of *Matricaria recutita* L. Flowers of North East Region of India

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The composition of the flowers of *Matricaria recutita* (*Chamomile*) steam (I) and hydro distilled (II) essential oil of north east regions of India were examined by gas chromatographic-mass spectroscopic analysis. The essential oil yield (mL/100 g dry weight) were 0.40 % and 0.50 %, respectively. Thirty two and 34 compounds comprising 99.95 and 100 % of the total peak area were identified in the (I) and (II) respectively. The common major components of essential oils have been identified as β -farnesene (10.23, 11.96 %), *trans*-limonene oxide (3.48, 3.31 %), bisabolol oxide B (16.91, 17.43 %), α -bisabolol (23.14, 23.30 %), azulene 7-ethyl-1,4-dimethyl (camazulene) (5.42, 4.82 %), bisabolol oxide A (16.17, 14.91%), 1,6-dioxaspiro non-3-ene (11.20, 10.52 %). The identity of components of essential oil was confirmed on the basis of retention time, mass and supplemented library of NIST, USA.

Key Words: *Matricaria recutita* L. Asteraceae, Steam and hydrodistilled essential oil, Major and minor constituents.

INTRODUCTION

Matricaria recutita L. (syn. *Chamomilla recutita* L., family Asteraceae), popularly known as German chamomile, is a native of Europe and adjoining Asian countries. It is an important medicinal and aromatic plant used in both traditional and modern systems of medicine. The flowers of this plant yield blue essential oil, which has wide application in medicine, cosmetics, foodstuffs and in the flavouring of alcoholic and non-alcoholic beverages. Both the flowers and the essential oil have been reported to possess antiinflammatory, spasmolytic, antiseptic, carminatic, sedative and ulcer-protecting properties^{1,2}. The therapeutic value of *chamomile* flowers has been attributed due to the presence of flavonoids and coumarins in the essential oils³.

German *chamomile* was introduced long back in the country and is being presently cultivated in H.P., J & K, Assam and in some regions of northern India. The flowers of German *chamomile* accumulate blue essential oil from 0.2 to 1.0 % yield and possesses strong characteristic odour and bitter flavour. It is more or less viscous liquid. The quality of oil is usually judged on the basis of the contents of α -bisabolol and chamazulene that are reported to have high antiphlogistic activity.

The main constituents of the essential oil were identified as bisabolol oxides A and B, β -farnesene, α -bisabolol, chamazulene and 1,6-dioxaspiro non-3-ene. All the compounds

except β -farnesene were reported to possess antiinflammatory and antispasmodic activities at different levels⁴. The blue colour of the essential oil is due to chamazulene (an azulene), which is an artifact formed from matricine (prochamazulene), a natural constituent of the flower during hydro or steam distillation.

Although the composition of essential oil of *M. recutita* have been studied by several groups⁵⁻¹² and substantial data of its chemical composition is available, there are no complete previous essential oil reports that have been recorded for north east region of India. In the present work, we have investigated the chemical composition of the steam and hydro distilled volatile oil of *Matricaria recutita* flowers by gas chromatography-mass spectroscopy analysis and identified 32 (I) and 34 (II) compounds, respectively.

EXPERIMENTAL

Dried flowers of *M. recutita* were obtained from north east regions of India

Essential oil isolation: The dried flowers *Chamomile* were subjected to hydro and steam distillation in a stainless steel mini distillation unit for a minimum period of 10-12 h. The resulting essential oils were obtained in a yield of 0.40 and 0.50 % respectively. The essential oils after drying over anhydrous sodium sulphate were stored at 4 °C until use.

Gas chromatography-mass spectrometry analysis of essential oil: The GC-MS data were obtained on a Shimadzu

QP-2000 instrument. GC conditions were: 60-250 °C at 10 °C/min, with an internal hold time of 5 min; carrier gas, He at a flow rate of 2 mL/min. A fused silica capillary column HP-5 was used (25 m. 0.25 mm i.d., film thickness 0.25 µm). MS conditions were: EI mode, 70 eV; ion source temperature, 250 °C.

The identification of the compounds was performed by matching their recorded mass spectra of the GC-MS data system. Quantitative data were obtained from electronic integration peak areas and comparing their retention time and mass spectra library with those found in the literature and supplemented by the Wiley (Wiley 7th Mass Spectral Library) & NIST MS Search 2.0 (National Institute of Standards and Technology) GC-MS libraries.

RESULTS AND DISCUSSION

Chemical constituents of the steam and hydrodistilled essential oil: The constituents identified by GC-MS analysis in order of elution of VB-WAX bonded capillary column are presented in Tables 1 and 2. The oil was dominated by variety of sesquiterpenes and sesquiterpene alcohols. The major components have been identified as β -farnesene (10.23, 11.96 %),

TABLE-1
CHEMICAL COMPOSITION OF STEAM DISTILLED
ESSENTIAL OIL OF flowers of *MATRICARIA RECUTITA*
FROM NORTH EAST REGION

Retention time	Compounds	% age
9.82	1,5-Heptadien-4-one, 3,3,6-trimethyl	0.24
23.40	β -Elemene	0.14
26.15	β -Farnesene	10.23
26.58	<i>trans</i> -Limonene oxide	3.48
27.03	Germacrene-D	0.66
27.23	β -Selinene	0.20
27.63	Bicyclogermacrene	0.34
27.76	2,3-Dihydro-2-methyl phenol	0.14
28.10	β -Bisabolene	0.27
30.22	1,3,6,10-Dodecatetraene 3,7,11-trimethyl	0.36
30.62	Furan-3-(4,8-dimethyl-3,7-nonadienyl)	0.40
30.76	(-)-Spathulenol	0.97
31.57	6-Methoxyfuro chromen-2-one cyclohexanone	0.23
32.07	1,3,4,5,6,9-Hexahydrobenzocyclohepten-2-one	0.52
32.28	Benzofuran 2,3-dihydro-2-methyl	0.75
32.63	Pentanal-(4-nitrophenyl)hydrazone	0.18
32.78	6-Aza-2-thiothymine trimethadione	0.85
32.99	3-Trifluoromethylbenzoic acid octyl ester	0.17
33.13	Naphthalene 1,2,3,5,6,8 α -hexahydro-4,7-dimethyl-1-(1-methylethyl)	1.09
33.81	Bisabolol oxide B	16.91
33.96	3-pyrrolidinone 4,4-dimethyl-5-thioxo	1.85
34.83	α -Bisabolol	23.14
34.97	Bicycloheptane 2-methyl-3-methylene-2-(4-methyl-3-pentenyl)	1.38
36.39	Azulene 7-ethyl-1,4-dimethyl	5.42
37.07	Bisabolol oxide A	16.17
38.81	Bicyclohexane 6-isopropylidene-1-methyl	0.28
40.31	2-Pentadecanone 6,10,14-trimethyl	0.40
41.67	1,6-Dioxaspiro non-3-ene	11.20
42.02	1,6-Dioxaspiro non-3-ene 2-(2,4-hexadiynylidene)	1.18
42.77	2-Aminophenol	0.19
43.78	Azulen-2-ol 1,4-dimethyl-7-(1-methylethyl)	0.30
59.38	<i>n</i> -Pentacosane	0.38

TABLE-2
CHEMICAL COMPOSITION OF HYDRODISTILLED
ESSENTIAL OIL OF flowers of *MATRICARIA*
RECUTITA FROM NORTH EAST REGION

Retention time	Compounds	% age
9.83	1,5-Heptadien-4-one, 3,3,6-trimethyl (artemisia ketone)	0.58
13.07	Bicycloheptan-2-one 1,7,7-trimethyl	0.12
23.40	β -elemene	0.23
24.50	β -Caryophyllene	0.19
26.16	β -farnesene	11.96
26.58	<i>Trans</i> -Limonene oxide	3.31
27.04	Germacrene-D	0.77
27.23	β -selinene	0.25
27.63	Bicyclogermacrene	0.41
27.76	1-Ethenyl-4-methoxy-benzofuran 2,3-dihydro-2-methyl	0.17
28.10	β -Bisabolene	0.31
28.68	δ -Cadinene	0.17
30.22	1,3,6,10-dodecatetraene 3,7,11-trimethyl	0.41
30.62	Squalene	0.44
30.76	(-)-Spathulenol	1.06
31.57	6-Methoxyfuro chromen-2-one cyclohexanone	0.22
32.07	Benzene 1-(1,5-dimethyl-4-hexanyl)-4-methyl	0.50
32.28	Cyclobutene bis (1-methylethylidene)-	0.76
32.63	α -Acoradiene	0.18
32.78	Nonane 5-butyl 6-aza-2-thiothymine	0.76
33.13	Naphthalene 1,2,3,5,6,8 α -hexahydro-4,7-dimethyl-1-(1-methylethyl)	1.01
33.80	Bisabolol oxide B	17.43
33.95	3-Pyrrolidinone 4,4-dimethyl-5-thioxo	1.61
34.83	α -Bisabolol	23.30
34.96	1H-pyrrole-2-ethyl-4-methyl	1.18
36.38	Azulene 7-ethyl-1,4-dimethyl (camazulene)	4.82
37.06	Bisabolol oxide A	14.91
38.81	1,5-dimethyltricyclo octane	0.24
40.31	2-Pentadecanone 6,10,14-trimethyl	0.36
41.65	1,6-Dioxaspiro non-3-ene	10.52
42.01	2-(2,4-hexadiynylidene)-1,6-dioxaspiro non-3-ene	1.04
42.77	None-3-ene 3-methyl-2-(3,7, 11-trimethyl-dodecyl) furan	0.17
43.78	Azulen-2-ol 1,4-dimethyl-7-(1-methylethyl)	0.28
59.38	Pentacosane	0.31

limonene oxide (3.48, 3.31 %), bisabolol oxide B (16.91, 17.43 %), α -bisabolol (23.14, 23.30 %), azulene 7-ethyl-1,4-dimethyl (camazulene) (5.42, 4.82 %), bisabolol oxide A (16.17, 14.91%) and 1,6-dioxaspiro non-3-ene (11.20, 10.52 %) in steam and hydrodistilled oil. However, the comparison of our results with literature^{3,4,6} shows some qualitative and quantitative differences in the composition of *chamomile* oil. The identification of the compounds was performed by matching their recorded mass spectra of the GC-MS data system. Quantitative data were obtained from electronic integration peak areas and comparing their retention time and mass spectra library with those found in the literature and supplemented library. Other methods of identification and took help of by comparing mass data with data of library^{13,14}. Variation in the chemical composition of the essential oil of *M. recutita* during steam and hydrodistillation revealed that the change concentration of constituents have been observed.

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