WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 7.523
Volume 6, Issue 10, 967-972. Research Article ISSN 2277– 7105

STUDY ON THE CHEMICAL CONSTITUENTS OF THE ESSENTIAL OIL OF *TARAXACUM MITALII* COLLECTED FROM KUMAUN, HIMALAYAS, UTTARKHAND

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Article Received on
10 July 2017,
Revised on 30 July 2017,
Accepted on 20 Aug. 2017
DOI: 10.20959/wjpr201710-9404

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ABSTRACT

Medicinal plants are of great importance to the health of individuals and communities in general. The major constituent found to be Citronellol present in the essential oil. The essential oil from the leaves of *Taraxacum mitalii* analyzed by GC-FID, GC-MS. Total of 64 constituents and 97.50 % of essential oil has been identified from the essential oil of *Taraxacum mitalii*. Monoterpene constituent are found (73.20%) with 31 compounds. Monoterpene ware Citronellol (21.93%), Geraniol (18.62%), β- Linalool (9.09%) and Iso- Menthone (5.89%) as a major component. Second constituents were sesquiterpene (24.21%) with 32 compounds. The major components of sesquiterpene were γ.-Eudesmol (5.59), Citronellyl formate (4.40), Geranyl tiglate (3.80%), Viridiflorene (2.03%) and β-Bourbonene (1.88%). The results data obtained in the present study suggest that some essential oils possess strong medicinal activities, which can be utilized for treatment of certain diseases.

KEYWORDS: Citronellol, Chemical Constituent, essential oil, GC-MS, *Taraxacum mitalii*.

INTRODUCTION

Medicinal plants are of great importance to the health of individuals and communities in general. Medicinal plants are of great importance to the health of individuals and communities in general. Dandelion (Taraxacum spp) is used in many traditional and modern herbal medical systems, as particularly has been documented in Asia, Europe and North America. The root is primarily considered a gastrointestinal remedy supporting digestion and

liver function, while the leaf is used as a diuretic and bitter digestive stimulant (Eric Yarnell and Kathy Abascal, 2009).

Taraxacum is a large genus of flowering plants in the Asteraceae family. The species of this genus are widely distributed and cosmopolitan in nature, especially in Kumaun Garhwal hills. Herbs 8-15cm tall, petiole usually purplish to pinkish, arachnoid at base, narrow to narrowly winged, leaf blade grayish green, sometimes brownish purple. Different species of Taraxacum have been screened for their chemical constituents and medicinal properties. Phytochemical constituents were isolated from the aerial parts of Taraxacum coreanum by repeated column chromatography and HPLC. Their structures were identified as β-sitosterol daucosterol, taraxasteryl acetate, chrysoeriol, diosmetin, luteolin, luteolin-7-O-glucoside, esculetin and 5-hydroxypyrrolidin-2-on (Sullim *et.*, 2011). Studies have been conducted on different species of this genus. The compounds mentioned in the scientific literature of Taraxacum officinale are sterols, triterpenes, hydroxycinnamic acid derivatives, flavonoids (aglycones and glycosides) and mucilages. The leaves and flowers also contain tannins and carotenoids (Bruneton, 1999; Codreanu *et al*., 2006; Wichtl and Anton, 2003).

EXPERIMENTAL

Material

The leaves of the plant (5.0 kg) were collected in July 2016 from Mukteshwar (Disst. Nainital, Uttarakhand) District identified Department of Botany, Kumaun University, Nainital and also authenticated by Botanical Survey India, Dehradun. The voucher specimen was deposited in the Herbarium section at B.S.I., Dehradun (voucher no. 113268). All solvents and reagents were of analytical grade.

Extraction and isolation of essential oil

The fresh leaves were completely immersed in water overnight, then water-distilled in a full glass Clevenger-type apparatus to giving greenish-yellow oil. The extraction was carried out for 6 h and the essential oil was dried over anhydrous sodium sulphate and stored at 4^0C before being analyzed. The yield of oil was calculated based on dried weight of plant material.

GC and GC/MS analysis and identification

Essential oil analysis was performed by using GC-MS and GC-FID was performed on a Shimadzu QP-2010 instrument, equipped with FID, in the same conditions. The percentage

composition of the oil samples were computed from the GC peak areas without using correction for response factors. The oils were analyzed using a Shimadzu GC/MS Model QP 2010 Plus, equipped with a Rtx-5MS (30 m ×0.25 mm; 0.25 mm film thickness) fused silica capillary column. Helium (99.999 %) was used as carrier gas adjusted to 1.21 ml/min at 69.0 K Pa, splitless injection of 1 mL, of a hexane solution injector and interface temperature were 270^0C, oven temperature programmed was 50–280^0C at 3^0C/min. Mass spectra were recorded at 70 eV, ion source temperature was 230^0C.

The identification of the chemical constituents was assigned on the basis of comparison of their retention indices and mass spectra with those given in the literature (Adams, 1955, Adams, 2001 and Julain & Konig 1988). Retention indices (RI) were determined with reference to a homologous series of normal alkanes, by using the following formula (Kovats, 1958).

$$KI = 100\left[n + (N-n) \times \frac{\log t^1_R(\text{unknown}) - \log t^1_R(C_n)}{\log t^1_R(C_N) - \log t^1_R(C_n)}\right]$$

t^1_R – the net retention time ($t_R - t_0$).

t_0 – the retention time of solvent (dead time).

t_R – the retention time of the compound.

C_N – number of carbons in longer chain of alkane.

C_n– number of carbons in shorter chain of alkane.

n - is the number of carbon atoms in the smaller alkane.

N - is the number of carbon atoms in the larger alkane.

RESULT AND DISCUSSION

The essential oil from the leaves of Taraxacum mitalii analyzed by GC-FID, GC-MS. A total of 64 constituents and 97.50% of essential oil has been identified (Table -1) from the essential oil of *Taraxacum mitalii*. Citronellol (21.93%) was the major constituents present in the essential oil of Taraxacum mitalii from mukteshwar (distt. Nainital). Citronellol is used in perfumes and insect repellents, and as a mite attractant. Citronellol is a good mosquito repellent at short distances, but protection greatly lessens when the subject is slightly further from the source. Citronellol has antimicrobial, antifungal, antispasmodic and anticonvulsant activities. Since ancient times, essential oils are recognized for their medicinal value and they are very interesting and powerful natural plant products. They continue to be of paramount importance until the present day. Essential oils have been used as perfumes, flavors for foods

and beverages, or to heal both body and mind for thousands of years (Baris et al., 2006; Margaris et al., 1982; Tisserand, 1997; Wei & Shibamoto 2010).

Hemiterpene constituent are found (0.09%) with 6-methyl- Hept-5-en-2-ol. Monoterpene constituent are found (73.20%) with 31 compounds. Monoterpene ware Citronellol (21.93%), Geraniol (18.62%), β- Linalool (9.09%) and Iso- Menthone (5.89%) as a major component and β-Pinene (0.05%), α- Phellandrene (0.09), 1,8-Cineol (0.10%) and Bois de Rose oxide (0.11%) minor components.

Second constituents was sesquiterpene (24.21%) with 32 compound. The major component of sesquiterpene were γ.-Eudesmol (5.59), Citronellyl formate (4.40), Geranyl tiglate (3.80%), Viridiflorene (2.03%) and β-Bourbonene (1.88%). The minor components of sesquiterpene are cis-Guaia-3,9-dien-11-ol (0.06%), trans-Cadina-1,4-diene (0.07%), β-Maaliene (0.09%), β-Eudesmol (0.09%) and β-Elemene (0.10%).

Table 1: Essential oil composition of of *Taraxacum mitalii.*

S.N.	Compound	Area %	Mol. formula	Mol. Wt.	RI	Mode of identification
1	α-Pinene	0.60	$C_{10}H_{16}$	136	936	a,b
2	Bois de Rose oxide	0.11	$C_{10}H_{18}O$	154	968	a,b
3	β-Pinene	0.05	$C_{10}H_{16}$	136	978	a,b
4	Myrcene	0.17	$C_{10}H_{16}$	136	987	a,b
5	6-methyl- Hept-5-en-2-ol	0.09	$C_8H_{16}O$	128	995	a,b
6	α- Phellandrene	0.09	$C_{10}H_{16}$	136	1002	a,b
7	p-Cymene	0.12	$C_{10}H_{14}$	134	1015	a,b
8	α- Limonene	0.26	$C_{10}H_{16}$	136	1025	a,b
9	1,8-Cineol	0.10	$C_{10}H_{18}O$	154	1030	a,b
10	Cis-Ocimene	0.16	$C_{10}H_{16}$	136	1038	a,b
11	(E)-β-Ocimene	0.16	$C_{10}H_{16}$	136	1041	a,b
12	Terpinolene	0.13	$C_{10}H_{16}$	136	1080	a,b
13	β- Linalool	9.09	$C_{10}H_{18}O$	154	1082	a,b
14	trans-Rose oxide	0.76	$C_{10}H_{18}O_1$	154	1116	a,b
15	Iso- Menthone	5.89	$C_{10}H_{18}O$	154	1140	a,b
16	trance- Chrysanthemol	0.14	$C_{10}H_{18}O$	154	1154	a,b
17	Neoisomenthol	0.39	$C_{10}H_{20}O$	156	1164	a,b
18	α- Terpineol	1.43	$C_{10}H_{18}O_1$	154	1176	a,b
19	Citronellol	21.93	$C_{10}H_{20}O_1$	156	1213	a,b
20	6,7-Dihydro-7-hydroxylinalool	0.20	$C_{10}H_{20}O_2$	172	1184	a,b
21	Geraniol	18.62	$C_{10}H_{18}O$	154	1228	a,b
22	Citronellyl formate	4.40	$C_{11}H_{20}O_2$	184	1254	a,b
23	Geranyl formate	3.18	$C_{11}H_{18}O_2$	182	1280	a,b
24	Methyl-Nerate	0.19	$C_{11}H_{18}O_2$	182	1276	a,b
25	(R)-(+)-Citronellic acid	0.41	$C_{10}H_{18}O_2$	170	1293	a,b
26	α-Cubebene	0.12	$C_{15}H_{24}$	204	1330	a,b

27	Citronellyl acetate	0.28	$C_{12}H_{22}O_2$	198	1337	a,b
28	Hydroxycitronellol	0.29	$C_{10}H_{22}O_2$	174	1355	a,b
29	α-Copaene	0.82	$C_{15}H_{24}$	204	1370	a,b
30	β-Bourbonene	1.88	$C_{15}H_{24}$	204	1380	a,b
31	β-Elemene	0.10	$C_{15}H_{24}$	204	1389	a,b
32	Phenethyl isobutyrate	0.09	$C_{12}H_{16}O_2$	192	1395	a,b
33	β-Maaliene	0.09	$C_{15}H_{24}$	204	1412	a,b
34	(E)-Caryophyllene	1.02	$C_{15}H_{24}$	204	1420	a,b
35	β-Copaene	0.28	$C_{15}H_{24}$	204	1421	a,b
36	(+)-Aromadendrene	0.82	$C_{15}H_{24}$	204	1440	a,b
37	α-Guaiene	0.44	$C_{15}H_{24}$	204	1440	a,b
38	α-Humulene	0.40	$C15H_{24}$	204	1450	a,b
39	9-epi-(E)- Caryophyllene	0.67	$C_{15}H_{24}$	204	1464	a,b
40	Germacrene D	1.76	$C_{15}H_{24}$	204	1479	a,b
41	Geranyl propanoate	1.01	$C_{13}H_{22}O_2$	210	1471	a,b
42	β-Selinene	0.14	$C_{15}H_{24}$	204	1490	a,b
43	Viridiflorene	2.03	$C_{15}H_{24}$	204	1493	a,b
44	γ-Amorphene	0.31	$C_{15}H_{24}$	204	1496	a,b
45	(E,E)-α-Farnesene	0.16	$C_{15}H_{24}$	204	1504	a,b
46	Geranyl isobutyrate	0.77	$C_{14}H_{24}O_2$	224	1507	a,b
47	δ-Cadinene	0.91	$C_{15}H_{24}$	204	1520	a,b
48	trans-Cadina-1,4-diene	0.07	$C_{15}H_{24}$	204	1532	a,b
49	Guaia-6,9-dien	0.14	$C_{15}H_{24}$	204	1542	a,b
50	α-Agarofuran	0.70	$C_{15}H_{24}O$	220	1550	a,b
51	Geranyl butyrate	0.53	$C_{14}H_{24}O_2$	224	1559	a,b
52	phenylethyl-Tiglate	1.65	$C_{13}H_{16}O_2$	204	1584	a,b
53	Viridiflorol	0.10	$C_{15}H_{26}O$	222	1594	a,b
54	2-methylbutyrate-Geranyl	0.37	$C_{15}H_{26}O_2$	238	1596	a,b
55	Geranyl isovalerate	0.11	$C_{15}H_{26}O_2$	238	1604	a,b
56	γ.-eudesmol	5.59	$C_{15}H_{26}O$	222	1626	a,b
57	Epicubenol	0.15	$C_{15}H_{26}O$	222	1630	a,b
58	cis-Guaia-3,9-dien-11-ol	0.06	$C_{15}H_{24}O$	220	1647	a,b
59	β-Eudesmol	0.09	$C_{15}H_{26}O$	222	1656	a,b
60	Valerianol	0.18	$C_{15}H_{26}O$	222	1657	a,b
61	(E)-Citronellyl tiglate	0.42	$C_{15}H_{26}O_2$	238	1664	a,b
62	Geranyl tiglate	3.80	$C_{15}H_{24}O_2$	236	1696	a,b
63	Geraniol hexanoate	0.33	$C_{16}H_{28}O_2$	252	1748	a,b
64	Geranyl octanoate	0.15	$C_{18}H_{32}O_2$	280	1943	a,b
65		97.50				

a=Retention Index (RI), b=MS (GC-MS)

CONCLUSION

The current study indicates that chemical composition of *Taraxacum mitalii* oil is of high quality with citronellol and geraniol as dominant compounds. In the present work, 64 constituents of the essential oil from *Taraxacum mitalii* were successfully identified and determined. Concluding, the essential oil mainly comprises mono- and sesquiterpene

hydrocarbons (73.20% and 24.21%, respectively); oxygenated derivatives are only minor constituents of this essential oil.

ACKNOWLEDGMENTS

The authors are grateful to AIRF, Jawaharlal Nehru University, New Delhi for the Gas Chromatography coupled with Mass Spectrometry (GC-MS) and Gas Chromatography with flame ionization detection (GC-FID) analysis facilities.

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