

First report on identification of essential oil of *Parietaria officinalis* L., from Constantine (North-East of Algeria)

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Abstract

In this study we were interested (consider avoiding this as it is ambiguous at this level.) in the study of the composition of the essential oil of *parietaria officinalis* L. harvested in the region of Constantine, (north-east of Algeria) which has thusfar never been studied. The essential oil obtained by hydrodistillation showed a yield of $0.15\% \pm 0.03$. The analysis of this essential oil was made by GC-MS. The (3Z) hexenol chemotype was identified with a percentage of 53.23%. Several other compounds have been identified as trans geraniol (7.97%), eugenol (3.97%), (3Z) hexenyl acetate (3.53%), linalool with a rate of 3.23% and myrtenol with a content of 2.27%.

Keywords: *Parietaria officinalis* L., essential oil, GC-MS, (3Z) hexenol

Introduction

Traditional medicine is growing in importance worldwide for the treatment of various health problems and incurable diseases [1]. *Parietaria officinalis* L., is a perennial, dicotyledonous herbaceous plant of the *Urticaceae* family. Often hung on the walls of old walls, it is called wall spinach. It originates from Europe. Although it is little used today, nevertheless in ancient times, it was an excellent food to fight famine. *Parietaria officinalis* L., is the cousin of the widely studied *Urtica dioica* L. [2-9]

The studies found on parity focus on the study of the allergic effect of its pollen because it contributes to hay fever syndrome, especially in southern regions of Europe [10-12]. It has also been studied for its effect on the crystallization of calcium oxalate in urine by A. Amar et. al. [13]. In addition, Z. Lamari et. al., studied its trace element content [14]. *Parietaria officinalis* L. is also considered depurative, cholagogue, antirheumatic in popular practice. The plant extract has been prescribed in certain nervous disorders, against epilepsy, syncope, threats of eclampsia; and ulcers whilst externally, it can be applied to haemorrhoids and inflammations [15].

The biological properties of the essential oils are generally described by their major components. These components generally belong to two distinct groups of biosynthetic origin: terpenes/terpenoids and aromatic/aliphatic constituents. The identification of the composition of the essential oil of *Parietaria officinalis* L. has not been reported in any research article until now despite its numerous and wide use in traditional medicine. Hence, the reason for directing our study to explore the composition of its essential oil, not known until now according to our bibliographic research.

Materials and Methods

Plant material

Constantine is a region located in the northeast of Algeria; it has a hot Mediterranean climate with dry summer (Csa) according to the Köppen-Geiger classification. Over the year, the average temperature in Constantine is 15.3°C and the average rainfall is 501.7 mm. Its Latitude is 36.2833, its Longitude: 6.61667 36° 16' 60" North, 6° 37' 0" East and its Altitude is 694m.

Parietaria officinalis L. was harvested on Sunday April 3rd, 2022 at 8 a.m. The identification of the plants was done in the agronomic institute of Constantine. The voucher specimen of this plant is: P. O: 021-001: april 3rd, 2022: National Polytechnic School of Constantine.

Essential oils extraction

Parietaria officinalis L., essential oil was extracted on Sunday April 3, 2022 at 9 a.m. by steam distillation using Clevenger apparatus from aerial parts of freshly whole plants. The essential oil obtained was analysed by GC-FID and GC-MS immediately after extraction to avoid any storage effect on its composition.

GC-FID and GC-MS conditions

GC-FID Essential oil components were analyzed using a SCHIMADZU GC-2010 chromatograph equipped with Rxi-5ms capillary column (30 m * 0.25 mm, film thickness 0.25 µm). Helium was the carrier gas, at a flow rate of 1.74 ml/min. The oven temperature was maintained at 45°C for 5 min and then increased to 180°C at a rate of 4°C/min and maintained at 180°C for 5 min, then to 330°C at a rate of 10°C/min and maintained at 330°C for 2 min. Injector and detector (FID) temperatures were set at 330 °C. Diluted samples (in dichloromethane) of 1 µl were injected in the split/splitless (30:1 split) mode.

GC-MS analysis was performed using a GCMS-QP2010. The same conditions used in the GC part in GC-FID analysis were applied. For GC-MS detection, an electron ionization system with ionization energy of 70 eV, was used. Injector temperature was: 330°C. Diluted sample (in dichloromethane) of 1 µl were injected in the split/splitless (30:1 split) mode.

Identification of oil components issued from the capillary column was accomplished based on comparison of their retention index (KI, calculated from GC-FID analysis) to those of literature [16] and also comparison of their mass fragmentation patterns with those of existing databases.

Results and Discussion

Yield and organoleptic characterization of the essential oil

The essential oil of *parietaria officinalis* L., was obtained with a yield of 0.15% ± 0.03. It presented a transparent colour, with a viscous appearance and a very pronounced smell.

Identification of essential oil of *Parietaria officinalis*. L

The GC-MS chromatogram of studied essential oil is shown in figure 1. The columns in table1 show: the number of the compound (N°), its retention index (KI), the peak area compared to the global surface (%), the name of the identified compound, its class and PubChem CID, respectively.

60 compounds have been identified, constituting 95.06% of the total essential oil composition, with (3Z) hexenol as a chemotype essential oil (53.23%). Other components were identified such as: geraniol (trans) (7.97%), eugenol (3.97%), (3Z) hexenyl acetate (3.53%) and linalool with 3.23%.

K. Tokumo et al have studied the effect of (3Z) hexenol, one of the main constituent of green odor, on the anxiety-related behavior of mice [17]. They concluded that changes in serotonergic activity in the cortex and hippocampus were suggested to be involved in the anxiolytic effect of (Z)-3-hexenol observed in the elevated plus-maze test. In parallel, Humitoshi Harada et al have studied the effects of (3Z) hexenol on anxiety-related behavior of mice in a hole-board test, the results showed that (3Z) hexenol at 0.03% exhibits

an anxiolytic activity but not at 0.3%, [18]. On the other side, Takakazu Oka et al, suggest that green odor has an anti-stress effect in healthy adults and may have potential for clinical aromatherapy [19].

Unfortunately we were not able to find any studies which talk about the composition of the essential oil of *parietaria officinalis* L. thus we were unable to discuss our results. For this reason, we compared our findings to the composition of the essential oil of *Urtica dioica* L., since they belong to the same *urticaceae* family. Süleyman Gül et al reported that GC and GC-MS analysis of the essential oil of *U. dioica* revealed the following composition: carvacrol (38.2%), carvone (9.0%) and naphthalene (8.9%) [20]. Whereas, Ilies D.C., et al. presented completely different results with a majority composition of hexahydrofarnesylacetone with 31.20% followed by β -Ionone (11.86%) and phytol with 11.20% [21]. The composition of our essential oil was found to be distinctly different, despite the presence of certain common compounds such as benzaldehyde, ionone and humulene.

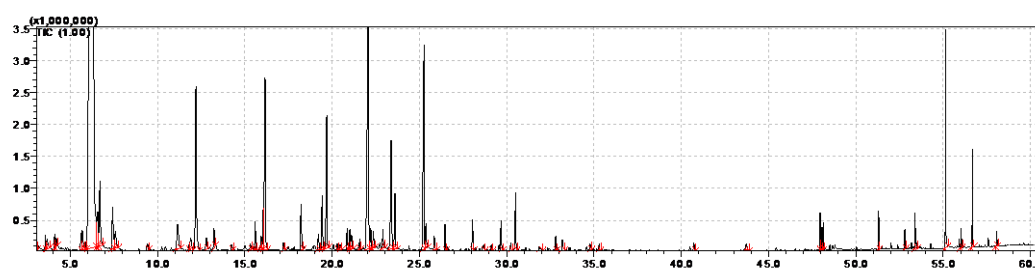


Figure 1. GC-MS chromatogram of essential oil of *Parietaria officinalis* L from Constantine (North-East of Algeria)

Table 1. Compounds identified in essential oil of *Parietaria officinalis* L. from Constantine (North-East of Algeria)

N°	KI	%	Name of compound identified	Class of compound	PubChem CID
01	760	0.13	(2Z) pentenol	Primary alcohols	5364919
02	802	0.12	Hexanal	Saturated fatty aldehydes	6184
03	809	0.25	(2E) Hexenal	Medium chain aldehydes	5281168
04	838	0.18	(3E) Hexenol	Primary allylic alcohols	5284503
05	843	53.23	(3Z) Hexenol	Primary allylic alcohols	5281167
06	845	0.96	(2E) Hexenol	Primary allylic alcohols	5318042
07	854	1.44	Hexanol	alcohols	8103
08	879	1.04	(4Z) Heptenal	aldehydes	5362814
09	890	0.52	Heptanal	aldehydes	8130
10	941	0.15	benzaldehyde	Aromatic aldehydes	240
11	958	0.74	1-octen-3-ol	Alkenyl alcohols	18827
12	967	0.12	1-methyl-4-methylene Cycloheptane	Hydrocarbons	32097
13	981	0.35	β -Myrcene	Monoterpenoids	31253
14	986	3.53	(3Z) hexenyl acetate	Carboxylic acid esters	5363388
15	1005	0.24	benzeneacetaldehyde	Phenylacetaldehydes	998
16	1018	0.35	Eucalyptol	Monoterpenoids	2758
17	1024	0.12	Cis- β -Ocimene	Monoterpenoids	5320250
18	1050	0.10	(3E, 5E) octadien-2-one	alkadienes	5352876
19	1069	0.44	Nonan-2-one	ketones	13187
20	1078	0.30	Benzenethanol	Benzyl alcohols	6054
21	1085	0.62	Nonanal	Aldehydes	31289
22	1090	3.23	Linalool	Monoterpenoids	6549
23	1124	0.13	Camphor	Monoterpenoids	2537
24	1158	0.78	(3E, 6Z) Nonadien-1-ol	Alkenyl alcohols	44630408
25	1180	0.32	Methyl salicylate	O-hydroxybenzoic acid esters	4133

26	1185	0.98	α -terpineol	Monoterpenoids	17100
27	1190	2.27	Myrtenol	Monoterpenoids	10582
28	1208	0.1	β - Cyclocitral	Monoterpenoids	9895
29	1225	0.15	Pulegol (cis)	Monoterpenoids	10080594
30	1227	0.33	Cuminaldehyde	Monoterpenoids	326
31	1227	0.34	Nerol (cis)	Monoterpenoids	643820
32	1235	0.28	Neral	Monoterpenoids	643779
33	1240	0.14	1-methyl octylacetate	Fatty alcohol esters	97987
34	1244	7.97	Geraniol (trans)	Monoterpenoids	637566
35	1254	0.34	Linalyl acetate	Monoterpenoids	8294
36	1275	0.28	Pregeijerene B	Branched unsaturated hydrocarbons	21159122
37	1282	0.28	p-cymen-7-ol	Monoterpenoids	325
38	1292	0.15	Perillyl alcohol	Monoterpenoids	10819
39	1305	0.84	Guaiacol (4-vinyl)	Methoxy phenols	332
40	1355	3.97	Eugenol	Methoxy phenols	3314
41	1357	0.21	Neryl acetate (Z)	Monoterpenoids	1549025
42	1370	0.37	Geranyl acetate (E)	Fatty alcohol esters	1549026
43	1410	0.44	β -Caryophyllene trans	Sesquiterpenoids	5281515
44	1445	0.09	Humulene α	Sesquiterpenoids	5281520
45	1487	0.44	Ionone (E) β	Sesquiterpenoids	638014
46	1518	0.90	Eugenol acetate	Methoxy phenol esters	7136
47	1540	0.11	Elemol α	Sesquiterpenoids	92138
48	1580	0.21	Caryophyllene oxide	Sesquiterpenoids	1742210
49	1590	0.21	Viridiflorol	Sesquiterpenoids	11996452
50	1593	0.13	Eudesm-4(14)-en-11-ol	Sesquiterpenoids	91457
51	1750	0.14	Phytone	Diterpenoids	10408
52	1875	0.13	Hexadecanoic acid, methyl ester	Fatty acid methyl esters	8181
53	2093	0.46	9,12-octadecadienoic acid (Z, Z)	Fatty acid methyl esters	5280450
54	2100	0.25	9,12,15-octadecatrienoic acid, methyl ester (Z, Z, Z)	Fatty acid methyl esters	9316
55	2106	0.30	9-octadecenoic acid, methyl ester (E)	Fatty acid methyl esters	637517
56	2188	0.34	Docosane	Alkanes	12405
57	2292	0.40	Tricosane	Alkanes	12534
58	2399	1.89	Tetracosane	Alkanes	12592
59	2506	0.80	Pentacosane	Alkanes	12406
60	2610	0.13	Hexacosane	Alkanes	12407
Total identified		95.06%			

Conclusion

GC-FID and GC-MS analysis of essential oil of *Parietaria officinalis* L., which was conducted for the first time in Constantine (north-east of Algeria) allowed the identification of the chemotype (3Z) hexenol with 53.23%. This essential oil is essentially composed of primary allylic alcohols, monoterpenoids, sesquiterpenoids, fatty acid, methyl esters and alkanes. The methoxy phenol esters are also present with a rate that exceeds 3%. Essential oil of *Parietaria officinalis* L., given its rich composition in active ingredients, deserves more attention and more exploration in different regions of the world.

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