Research Article

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Volatile Constituents of the Flower of *Perovskia atriplicifolia* from Taftan Area

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ABSTRACT

The current study describes the photochemical composition of essential oil from *Perovskia atriplicifolia.* The genus *Perovskia atriplicifolia.* Benth belonging to the family *Lamiaceae*, these flowers were collected from Taftan area in Sistan and Baluchestan province of Iran in July 2009. The essential oil was isolated by hydro distillation method from flower with efficiency 1.37% w/w. The essential oil was analyzed by mean of gas chromatography coupled with mass spectrometer (GC-MS technique) as well as Kovat's retention indices. Fifty eight components which was composed 80.13%of the total oil were identified, the highest precent are mentioned in the blow: linalyl acetate (12.43%), 1,8 -cineole(8.60%), α-pinene(6.56%), Δ -3- carene(5.60%), 4-terpineol(5.10%), trans-caryophyllene(4.15%), α-humulene(3,82), vridiflorol(3.24%). The results show that the extracted essential oil is rich in oxygenated monoterpenes. As a renewable bioresource, this low α-pinene content essential oil can serve as a good source of safe and natural medicines and cosmetics with a traditional background.

Keywords: *Lamiaceae,* Essential oil, GC-MS technique, Oxygenated terpenoids.

INTRODUCTION

Perovskia atriplicifolia known as Russian sage is a deciduous perennial with upright, grayish white stems and lobed, deeply notched silvery-grey leaves 5 cm long and 2.5 cm wide older stems are woody at the base, and younger stems are herbaceous and square in cross section these plants are in an area that gets very little care. Water can be sporadic and infrequent. Obviously, this is one tough plant it adapts too many kinds of climates and has great tolerance to cold here in the arid west, Russian sage starts blooming mid to late spring; in colder areas it may not bloom until the heat of summer arrives. We cut our flowers back once or twice each season and within no time we have a new stand of gorgeous color. Flowers may be pruned any time, but it is best to wait and see what reprouts in the spring before pruning branches[1,2,3]. This plant grows in northern part of the Taftan mountain, the valley whit a height of 2100m, and the valley of Tamondan which is a of stony place, full of steeps and heights, on average more than 40% slope. It has dry and cold climates with average annual rain fall rate of 300-400 mm, the precipitations usually occur in the form of snow fall.

This plant grows in soils with light texture, low amount lime, without saltiness, and with a small rate of alkali, pH 7.4-7.7, which is considered relatively poor, regarding organic materials[4].

The plant is used as stomachic, antifever, anti-inflammatory, sedative and flavoring agent in Iranian folk medicine. In class study, using vacuum distillation and chemical tests, Rao, in 1926 found α- pinene, β-pinene, camphene, borneol, bornyl acetate, α-caryophyllene and aromadendrene in the essential oil of the flower-heads of *P.atriplicifolia*[5]. The essential oil of *P.atriplicifolia* from Pakistan, have been characterized by means of GC and GC-MS and ^{13}C-MNR spectroscopy out of 19 compounds identified in this oil, the monoterpenes, delta -3- careen (22.3%) and 1,8 –cineole (27.5%) amounted to 50% of the total oil β-caryophyllene (10.8%) and α-humulene (5.7%) were the dominant sesquiterpenes[6]. In this research, the chemical of essential oil from *Perovskia- atriplicifolia* plant collected in Taftan area (Sistan and Baluchestan-Iran) was studied.

MATERIALS AND METHODS

Plant Materials

Aerial parts mentioned species were collected from the heights of Taftan mountain and sangkan village, in july-2009. All security consideration was fallowed during their transfer to the university of Sistan and Baluchestan. The sample of each barium was sent to research Institute of forests and rangelands in order to identify the scientific name as *Perovskia*. *atriplicifolia* Benth[7].

Preparation of Laboratory Sample

Collected species was dried by sun light by 10% moisture a humidity– free environment. The aerial part flowers were freeze-dried in the shade at the ambient temperature and storage of samples should be under deep freeze or in refrigerator, protected from the direct light, until further analysis. All solvents and reagents were of analytical grade.

Essential Oil Extraction

50±0.1 g of powder of prepared sample was put in a 2L-ballon with 300 mL water, they were distilled two times. Essential oil was extracted by a Clevenger-type, apparatus in duration of 3.5 h and by hydro-distillation method. Obtained essential oil was collected in n-hexane-solvent and water the purified essential was maintained in sample container in the temperature of 4 °C until their analysis by GC-MS technique[8,9].

Gas Chromatography / Mass Spectrometer (GC-MS Technique)

The analysis of the essential oils was performed using a Hewlett-Packard 6890 Net work GC System, equipped with a HP-5Ms capillary column,(60m* 0.25mm id, 0.25µm) and a HP 5973 mass selective detector in the electron impact mode. Helium was the carrier gas at a rate of 1 ml/mi injector and MS transfer line temperature were at 250 and 260 °C respectively. Column temperature was set at 40°C for 1 min, then programmed from 40°C to 250°C at a rate of 3°C/min, and finally held isothermally for 20 min for GC/MS detection an electron ionization system was used with ionization energy of 70 eV. Retention indices were calculated by using retention times of C_8-C_{26} n-alkenes that were injected after the oil at the same chromatographic conditions according to Van Den Dool method[10,11]. The linear retention indices for all the compounds were determined by injection of the sample with a solution containing a homologous series of C_8-C_{26} n-alkenes. The individual constituents were identified by their identical retention indices, referring to known compounds from the literature and also by comparing their mass spectra with either the known compounds or with the Wiley[7] mass spectral database[12].

RESULTS AND DISCUSSION

Essential oil of flower sample was extracted with efficiency of 1.37%w/w. Fifty eight components, containing 80.13% of whole essential oil were identified. The compositions with the highest percent are linalyl acetate (12.43%), 1,8- cineole (8.60%) and α-pinene (6.56%) geranyl acetate (6.08%),Δ-3- careen (5.60%), 4-terpineol (5.10%), linalool (4.22%), trans-caryophyllene (4.15%), α-humulene (3.82%), vridiflorol (3.24%) in Table 1.

Among them, the monoterpenes constituted the major fraction in sample of the oil 62.33% respectively, with linalyl acetate (12.43%), 1,8- cineole (8.60%), geranyl acetate (6.08%), 4-terpineol (5.10%) (O.M), linalool (4.22%), bornel (2.49%), bornyl acetate (2.38%), cis-sabinene hydrate (1.60%), α-pinene (6.56%), delta-3-carene (5.60%), β-pinene (1.90%), camphene (1.30%)(M.H) being the main metabolites in the sample. The sesquiterpene hydrocarbons accounted to 10.62% in sample with trans-caryophyllene (4.15%), α-humulene (3.82%). The oxygenated sesquiterpenes amounted to almost equal amounts 5.91% in sample caryophyllene oxide (1.16 %), veridiflorol (3.24%) being the dominant constituents (Table 1).

The results are in agreement with the results of a chemical composition of the plant reported in the Table 1 regarding the isolation of the major constituents, since oxygenated monoterpenes are the dominant compounds (Table 2).

Table 1: Chemical composition of essential oil from flower of *perovskia atriplicifolia* Benth.

Compound	RI	Percentage
methylcyclohexane	617	0.10
3-methyl-2-butenal	679	0.01
2-hexenal	747	0.02
isoamyl acetate	789	0.01
α-thujene	849	0.12
α-pinene	857	6.56
camphene	867	1.30
sabinene	892	0.12
β-pinene	895	1.90
β-myrcene	912	0.70
pellandrene	921	0.13
delta-3-carene	931	5.60
α-terpinene	933	0.25
p-cymene	936	0.10
o-cymene	938	0.15
1,8-cineole	946	8.60
limonene	947	0.57
cis-ocimene	954	0.36
β-ocimene Y	964	0.26
gamma-terpinene	972	0.40
trans-sabinene hydrate	976	0.25
dehydro-p-cymene	995	0.04
α-terpinolene	1001	0.80
cis-sabinene hydrate	1003	0.16
linalool	1012	4.22
iso-amyl isovalerate	1017	0.05
camphor	1032	0.43
borneol	1063	2.49
4-terpineol	1073	0.51
cumyl alcohol	1076	0.05
α-terpineol	1085	1.51
bornyl formate	1115	0.03
nerol	1123	0.30
β-citronellol	1126	0.06
linalyl acetate	1155	12.43
bornyl acetate	1172	2.38
α-terpinyl acetate	1196	1.60
cis-2,6-dimethyl-2,6-	1207	0.10

neryl acetate	1248	0.52
geranyl acetate	1276	6.08
methyleugenol	1292	0.10
isocaryophillene	1301	0.05
trans-caryophyllene	1321	4.15
6 -amyl alpha pyrone	1327	0.20
α-humulene	1346	3.82
germacrene D	1360	0.13
neryl 2-methylpropanoate	1368	0.41
bicyclogermacrene	1374	0.14
α-amorphene	1382	0.38
delta-cadinene	1388	0.21
caryophyllene oxide	1435	1.16
veridiflorol	1452	3.24
3,4-dimethyl-3-	1459	1.01
α-copaene	1467	0.35
cadinene	1486	0.48
epi-	1511	1.59
α-eudesmol	1531	0.68
cinnamyl isovalerate	1535	0.77

Table 2: Chemical composition of essential oil from flower of *perovskia atriplicifolia* Benth by chemical class

Chemical Class	Percentage
Total of monoterpenes	62.33
Monoterpene hydrocarbons	18.49
Oxygenated monoterpenes	43.84
Total of sesquiterpene	16.53
Sesquiterpenes hydrocarbons	10.62
Oxygenated sesquiterpene	5.91
other hydrocarbons	0.17
other oxygenated	1.10
Total	80.13
Terpenoid hydrocarbens	29.11
Oxygented terpenoids	49.75
Total terpenoids	78.86

CONCLUSION

The essential oil of plant flower of *perovskia.atriplicifolia* was extracted with a higher yield (1.37% w/w) than those of other aerial parts which were collected from the same place. 49.75% percent of the whole essential oil is comprised of the compounds of oxygenated terpenoids. It has a higher percent of hydrocarbon monoterpene than other aerial parts of the plant, and it has such important compounds as 1, 8 -cineole and α-pinene and camphor that are utilized in drug industry. This flower is not only ornamental but it is used in food and cosmetic industries. This work shows that further investigations on the essential oil and evaluation of the biological activities of *perovskia.atriplicifolia* should be initiated.

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REFERENCES

1. *Perovskia atriplicifolia* Russian Sage.htm.
2. *Perovskia. Atriplicifolia-Wikipedia*, the free encyclopedia.htm.
3. Vegetative propagation of *perovskia. atriplicifolia*.htm.
4. J, Mogimi. 2007. Introducing some of pasture species in Iran, Iran: Arvan Publishing.
5. M.G Rao, 1926. Essential oil from the flower heads of *Perovskia. atriplicifolia* Benth. Q. *J.* Indian Chem. Soc. 3, 141−147.
6. A.R Jassbi., Vu Ahmad., RB Tareen. Constituents of the essential oil of *Perovskia atriplicifolia* Benth. Flavour Fragrance. J. 14, 1999, 34-40.
7. V Mozaffarian. A Dictionary of Iranian Plant Names. Farhang Moaser. 5th Edition. Tehran. 2007, 400.
8. A.R Sardashti., M.H Sahgtarash., A Asadi. Study of the Effect of the Drying Method on Essential oil from Cultivated Lippia citriodora.TEOP, 18(5), 2015, 1275-1281.
9. F.Z. Erdemgil., S. Iihan, F. Korkmaz., C Koplan., A Mercangos., M Arfan., S.H Ahmad. Chemical Composition and Biological Activity of the Essential Oil of *Perovskia atriplicifoli* Benth. From Pakistan, Anadolu university, Plant and Drug and Scientific. 2008, 18-20.
10. H Van Den Dool and P.D Kratz. A generalization of the retention index system including linear temperature programmed gas-liquid partition chromatography. J. Chromatogr. 11, 1963, 463-471.
11. M.M Saleh and H Kating. Gas chromatographic analysis of the Volatile oil of *Perovskia atriplicifolia* Karel. Plant Med. 1978, 3385-88.
12. R.P Adams. Identification of Essential Oil Components by Gas Chromatography/Mass Spectroscopy. Allured Publ. Corp, Carol Stream, IL. 1995.

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