World Applied Sciences Journal 19 (9): 1259-1262, 2012
ISSN 1818-4952

DOI: 10.5829/idosi.wasj.2012.19.09.1270

Variation in the Essential Oil Composition of *Perovskia Abrotonoides* of Different Growth Stage in Baluchestan

[1]A.R. Sardashti, [2]J. Valizadeh and [1]Y. Adhami

[1]Department of Chemistry, Faculty of Sciences,
University of Sistan and Baluchestan, Zahedan Iran
[2]Department of Biology, Faculty of Sciences,
University of Sistan and Baluchestan, Zahedan, Iran

Abstract: Aerial parts of *perovskia abrotonoides* plants from Taftan area of Baluchestan (Iran) were collected at different developmental growth stages including pre-flowering, flowering and post flowering. Their essential oil were obtained by hydrodistallation and analyzed by technique of gas Chromatography/mass spectrometry. The yields of oil (w/w%) in different stages were in the order of:pre- fllowering (2.19%), flowering (2.45%) and post-flowering (2.3 5%). In total 61,59,49 components were identified and quantified in the oil of pre-flowering, flowering and post flowering plants, representing 98.76%,97.02% and 100%. of the oil, have the amounts respectively 1,8 Cineole, Champhor, Linalool, β-Ocimene-x, β-Caryophyllene, α-Humulene, were the main compounds in all samples. Oxygenated-Terpenoids were the main groupof compounds in pre-flowering (50.10%), flowering (53.64%) and post- flowering (54.97%) stages.

Key words: *Perovskia abrotonoids* · Different growth stage · Variation in the Essential oil composition · Linalool, 1, 8 Cineole

INTRODUCTION

Originally, this strain was imported from Afghanistan and selectively breeding Holland for indoor cultivation. Afghan silver sage (Labiates') has a strong acrid aroma [1]. This plant are sustainable with shrub or woody bush, they may be small trees with height of 60-130 cm. Their leaves are of divided shape or with out deep divided traces with out villi or covered by simple villies or branched villies, Full-cellular, nodular with out base. They have a lot of flowers, with out base or have small peduncle, gathered in separated cycles in Festoon of Cyme cluster-plate is pipe-cup. That it's growing in one of endemic aera in around Taftan Mountain [2].

The geographical feature of geological structure and climate of specialTaftan has caused the growth special Species and variety and of unique plants in this area. The photochemical studies on medicinal plants have served the dual purpose of bringing up new therapeutic _ agents and providing useful [3, 4]. Akoto show in their research in 2001 about the essential oil from *Perovskia abrotanoides* in Karakorum-Himalaya components with the higer**:** 1, 8Cineole (25.7%). α-Pinene (20.6%) [5]. Katayoun Morteza-semnani *et al* (2004) has reported the essential oil composition from *Perovskia abrotanoides* Karel. in Mazandaran province in north Iran included. The Camphor (34.1%), 1, 8-Cineole (18.0%), β- Caryophyllene (8.2%) and α-humulene (6.5%) [6].

Dr. Sajjadi *et al*. in their research (2005) about p*erovskiaabrotanoides* Karel from Khorasan, province (northeast Iran) showed which include the 1,8- camphor (9.1%), β-Caryophyllene (7.9%) and α- pinene (10.2%), α-Humulene (6.4%) Cineole (32.4%), Myrcene (13 %) [7].

MATERIALS AND METHODS

Plant Material: The aerial parts of *perovskia abrotanoides* were collected during three periods of pre-flowering on 1th May flowering on the15th June and post-flowering on the 1 the August of 2008 from the Sistan and Baluchestan (Taftan Area) south-eastern of Iran.

Corresponding Author: Alireza Sardashti, Faculty of Sciences, University of Sistan and Baluchestan, Zahedan, Iran.

A voucher specimen was deposited at the Herbarium Research Institute of Forest and Rangelands Iran (Tehran) and identified by Dr. V.Mozaffarian [8].

Isolation of the Essential Oil: The aerial parts (50g) were dried at 25°C in the shade and the subjected to hydro distillation, using a Clevenger-type apparatus for 3.5h. Obtained essential oil was collected in Hexane-solvent and dried with anhydrous sodium Sulphate weighed and stored at 4°C in dark until use.

GC/MS Analysis: The analysis of the essential oils were performed by a Hewlett-Packard 6890 Net work GC System, equipped with a 60m* 0.25mm id, 0.25µm HP-5Ms capillary column and a HP 5973 mass selective detector. Helium was the carrier gas at 1 mL/min. The 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- alkanes that were injected after the oil at the same chromatographic conditions according to Van Den Dool method [9].

Identification of Compounds: The linear retention indices for all the compounds were determined by coinjection of the sample with a Solution containing the homologous series of C_8-C_{26} n-alkanes. 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 Wiley7 mass spectral database [10].

RESULTS AND DISCUSSION

The essential oil of aerial parts of first plant sample which was collected at pre-flowering stage with efficiency of 2.19% w/w, according Table 1 it was prepared with 0.01% error. The essential oil was analyzed by GC/MS Techniques 61 components were indentified that include 98.76% of the total oil. 95.86 % of the total oil, have the amounts of trace >0.05%. According to Table 1. 38 components which comprise 94.95% of the total oil have the amounts of trace >0.1% According to Table 1. the components having the highest percentage, are as following: Linalool (19.12%), delta-3-carene (18.17%), 1, 8 Cineole (15.83%), alpha- Humulene (8.14%), trans- caryophyllene (8.10%). The essential oil of second plant sample was collected at flowering with efficiency of

Table 1: Percentage of the essential oil from *perovskia abrotonoides*, in different growth stages

Compounds	RI	%pre-flowering stage	%flowering stage	%post-flowering stage	compounds	RI	%pre-flowering stage	%flowering stage	%post-flowering stage
Tricycle	921	0.09	0.09	0.10	unknown	1279	-	0.01	-
Verbenene	928	0.01	-	-	Bicyclo[2.2.1]heptan-2-ol,1,7,7-trimethyl-acetate	1293	-	1.90	-
Benzene,1-methyl-3-(1-methylethyl	936	-	0.08	0.06	2-Cyclohexen-1-one,3-methyl-6-(1-methylethylidene	1297	-	0.07	-
α-pinene	937	2.29	-	4.23	Benzenemethonol,α,α,4-trimethyl	1302	-	0.04	-
unknown	938	-	2.97	-	Cyclohaxone-2,2-Dimethyl-5-[3-methyloxiranyl	1313	-	0.05	-
Sabinene	946	0.09	-	-	2,4-Cycloheptadiene-1-one,2,6,6-trimethyl	1317	-	0.05	-
camphene	950	2.21	2.27	2.38	isopulegol	1321	-	0.01	-
β-pinene	976	1.52	0.69	0.44	Eugenol	1332	0.07	-	-
β-Myrcene	984	0.47	0.34	2.82	Piperitenone	1339	0.02	-	0.11
Phellandrene	997	0.21	-	-	Copaene	1348	0.04	0.08	-
Delta-3-Carene	1003	18.17	0.47	-	alpha-terpinenyl acetate	1351	0.61	1.29	1.79
2-Hexenal	1005	0.02	-	-	Trans-Methyl cinnamate	1352	0.10	-	-
p-Mentha-1,5,8-triene	1007	-	0.15		Neryl acetate	1367	-	0.18	8.49
α-Terpinene	1010	0.35	-	0.64	Cis-Jasmone	1369	0.07	-	-
O-Cymene	1015	0.41	0.17	0.21	isocaryophyllene	1383	0.05	-	-
β-ocimene-X	1019	0.22	13.93	12.87	Geranyl acetate	1396	0.07	10.49	-
Benzene,1-methyl 1-4[1-methylethyl]	1028	-	0.03	-	Citronellyl acetate	1398	-	0.08	-
1,8-Cineole	1031	15.83	11.22	7.71	Farnesol	1403	-	0.12	-
t- Terpinene	1036	-	1.11	0.79	(-)-isoledene	1409	-	-	0.07
trans-ocimene	1048	-	0.8 9	3.03	α-Gurjunene	1411	0.02	-	0.17
Gamma-terpinene	1060	0.61	1.01	-	Trans- Caryophyllene	1423	8.10	8.76	5.2
Santolina triene	1062	0.02	-	-	β- Caryophyllene	1442	-	0.76	0.32
Trans sabinene hydrate	1079	0.36	0.27	0.1	Alpha-patchoulene	1445	0.05	-	-
Cis-Sabinene hydrate	1081	0.10	0.07	-	Alpha-Amorphene	1452	0.03	-	-

Table 1: Continue

Compounds	RI	%pre-flowering stage	%flowering stage	%post-flowering stage	compounds	RI	%pre-flowering stage	%flowering stage	%post-flowering stage
Artemisia alcohol	1084	0.22	-	-	α-Humulene	1457	8.14	6.64	4.9
α-Terpinolene	1089	1.56	2.06	2.63	Beta-Cubebene	1457	0.04	-	-
1-Terpineol	1099	0.09	-	-	Beta-Sabinene	1464	0.06	-	-
Linalool	1103	19.12	3.26	10.96	Alpha-Elemene	1469	0.03	-	-
trans- Verbeno	1113	-	0.02	-	β- Selinene	1482	0.18	0.33	-
α-Thujene	1117	-	-	0.36	α- Selinene	1491	-	0.29	-
Chrysanthenone	1123	0.24	-	-	- Cadinene-?	-1498	0.14	1.06	0.83
Alloocimene	1130	-	0.08	0.15	Cadina-1,4-diene	1503	0.02	-	-
Sabinol	1136	0.17	-	-	Cis-calamene	1519	-	0.16	0.27
unknown	1140	0.30	-	-	Nerolidol	1525	0.09	-	-
Camphor	1145	3.34	2.00	1.64	Selina-3,7(11)diene	1538	-	0.14	-
Methyl bornyl ether	1153	-	0.27	-	unknown	1556	0.36	-	-
Borneol	1161	3.37	4.20	1.82	1-Muurolo	1561	-	-	0.43
4-terpineol	1176	0.60	0.54	0.36	Ledol	1571	-	-	0.28
Trans-isolimonene	1187	-	-	0.27	α -Cadinol	1578	-	1.03	0.43
Beta-Fenchy alcohol	1191	1.01	1.13	3.14	Veridiflor ol	1589	0.19	0.42	0.16
3,5-Heptadienol,2-ethylidne-6-methyl	1195	-	-	0.08	unknown	1590	0.51	-	-
p-Mentha—1-en-3-ol	1205	0.04	-	-	(-)caryophyllene oxide	1593	0.48	0.25	0.26
Carvone	1212	0.02	-	-	Humulene oxide	1604	-	0.51	0.38
Chrysanthenyl acetate1	1233	0.08	-	-	Cubenol	1607	-	0.85	-
Nerol	1237	-	-	0.27	Valeranone	1611	-	-	1.04
Lyratyl acetate	1239	0.21	-	-	Biformene	1615	-	-	0.10
Z-Citral	1241	-	0.01	-	1,2-Benzenedicarboxylic acid, dibutyl	1619	-	-	0.04
pulegone	1243	-	3.84	-	Bicyclogermacrene	1626	0.13	1.26	0.42
3,5-Heptadienol.2-ethylidiene-6-methyl	1245	-	0.02	-	Tau-Cadinol	1644	-	3.03	3.75
unknown	1248	0.04	-	-	-Eudesmol β	1652	-	0.61	-
Linaly acetate	12 51	0.91	-	5.12	α -Eudesmol	1656	-	1.11	-
unknown	1252	0.03	-	-	Valeranone(+)-	1670	0.81	2.12	1.69
Geraniol	1264	-	1.57	-	Bicylo[7/2/0]undec-4-ene/4/11/11-trimethyl-8-methylene	1703	-	-	0.44
Cis-Methyl cinnamate	1272	0.06	-	-	Ent-pimara 8,15-diene	1883	0.15	-	0.1
Bornyl acetate	1287	1.12	-	-	5,7-Dimethoxy-1-nophthol	2056	0.24	-	-

Retention index relative to n-alkanes C6-C_{24} on the HP-5Ms capillary column

Table 2: Chemical composition by chemical class

Chemical class	%pre-flowering	% flowering	% post-flowering
Monterpene hydrocarbons	28.84	23.53	29.71
Oxygenated monterpenes	47.12	43.63	44.53
Sesquiterpene hydrocarbons	16.70	19.45	11.97
Oxygenated Sesquiterpenes	2.98	10.01	10.44
Other hydrocarbons	0.17	0.25	0.10
Other Oxygenateds	2.19	0.15	3.25
unknown	1.24	2.98	-
Terpenoid hydrocarbons	45.54	42.98	41.68
Oxygenated Terpenoids	50.10	53.64	54.97
Total	98.76	97.02	100

2.45 w/w, that it has a higher outcome. 59 compound include 97.02% of the total oil. 96.89% of the total oil, have the amounts of trace >0.05%. Which comprise 96.27% of the total oil, have the amounts trace >0.1%. The compounds having the highest percentage include, β-ocimene-x (13.93%), 1,8 Cineole (11.22%). Geranyl acetate (10.49). Linalool (3.26%), alpha- Humulene (6.64 %), trans-Caryophyllene (8.76 %). the essential oil from Third plant sample which was collected at post flowering with efficiency 2.35 w/w. 49 components were indentified which comprise 100% of the total oil. 99.96% the total oil, have the amounts of trace >0.05%. According to Table 1. 45 components which 99.83% of the total weight oil has the amounts of (trace >0.1%). The compounds having the highest percentage include: β-ocimene-x (12.87%) Linalool (10.96 %), highest percentage include: β-ocimene-x (12.87%), Linalool (10.96 %), 1,8 -Cineole (7.71 %), Linalyl acetate(5.12%), alpha- Humulene (4.9%), trans-Caryophyllene (5.20%). The amounts mentioned compounds in these essential oils are in full adaptation with carried out research works in the References of numbers 5, 6, 7. Comparing the results show that the essential oil of second plant sample, which was extracted at flowering stage with a higher outcome has a high percentage of Terpenoids compounds (Table 2).

CONCLUSION

As shown in Table 1, the essential oil of plant sample which was gathered in flowering stage had a better outcome and it has a higher percentage of Terpinoids compounds, oxygenated- having compounds comprise more than 50 percent of the total oil of three plant samples and have 21 similar compounds with high percentage, as Table 1. Show. Compound of 1,8 Cineole is common in the essential oil of three plant samples , that has anti-bacterial effects. So it can be be used in making anesthetic and antiseptic drugs. Another important compound is alpha-pinene which is found only in the essential oilof sample pre-flowering and post- flowering stage in cause of strong light the samples collected at pre-flowering stage and post- flowering stage because of strong light influence. Other important compound is camphor which found in the essential oil of three plant samples. because, this region of Iran has suitable ecological conditions for growing some valuable medicinal plants therefore and more than 60 arbaitmodars unique species of them are growing there. The region is paid a little attention by researches because of it, s wideness as well as it's neighborhood with the countries of Pakistan and Afghanestan. So, because of the importance of the issue, we become determined to carry out the resear. ch.

ACKNOWLEDGMENT

The author's is grateful to Professor Isa Yavari from university of Tehran for corporation in this work and professor Mozaffarian for his Help in identifying plant material.

REFERENCES

1. Site d, information dun professional de la plante 39 du Quebec.
2. Qanavati, F. and F. Moradi, 2003. The culture of the province plants Sistan – Baloochestan publication of organization of agriculture Jihad, Iran, pp: 1763.
3. Aslam, P., 1996. Torpinedoed Constituents of *Perovskia Abrotanoides* and Diecting Effects in Microbiological hydroxylation of Steroids, Hej Research institute of Chemistry, PhD Thesis, university of Karachi (Pakistan). Part a, pp: 3.
4. Aoyagi, Y., Y. Takahashi, Y. Satake, K. Takeya, R. Aiyama, R. Miyama, T. Matsuzaki, S. Hashimoto and T. Kurihara, 2006. Cytotoxicity of abietaned terpenoids from *Perovskia abrotanoides* and of their semisnthetic analogues. *B i. organic and Medicinal Chemistry*, 14: 5285-5291.
5. Akoto, M., 2001. J.essent oil Res, 13:1, 68-72.
6. Morteza-semnani., K. 2004. The essential oil composition of *Perovskia abrotanoides* from Iran,.J.Pharmaceutical Biology, 42(3): 214-216.
7. Sajjadi, E., I. Mehregan, M. Khatamsaz and Gh, Asgari, 2005. Chemical composition of the essential oil of *perovskia abrotonoides* Karel. Growing wild inIran, Flavour Frarg J., 20: 445-446.
8. Mozaffarian, V., 2007. A Dictionary of Iranian plant, Name Farhang Morer Tehran-Iran.
9. Van Den Dool, H. and P.D. Kartz, 1963. A including linear temperature programmed gas liquid generalization of the retention index system partition chromatography Chromatogr, 11: 463-471.
10. Adams, R.P., 1995. Identification of Essential Oil Components by Gas Chromatography/Mass Spectroscopy. Allured Publ Corp, Carol Stream, IL, USA.