ISSN: 0975-858

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Chemical Composition of the Essential Oil of *Salvia verbenaca* (L.) Briq. ssp *clandestina* (L.) Pugsl.

Zahia Belloum[1], Pierre Chalard[2], Gilles Figuérédo[3], Eric Marchioni[4], Mintje Zao[4], Fadila Benayache[1] and Samir Benayache[1*].

[1]Unité de recherche Valorisation des Ressources Naturelles, Molécules Bioactives et Analyses, Physicochimiques et Biologiques, Université de Constantine. Route de Ain El Bey, 25000, Constantine, Algérie.
[2]Laboratoire de Chimie des Hétérocycles et Glucides, Ecole Nationale Supérieure de Chimie, de Clermont-Ferrand, Ensemble Scientifique des Céseaux, BP 187- 63174.
[3]Laboratoire d'Analyses des Extraits Végétaux et des Arômes (LEXVA Analytique), 460 Rue, du Montant, Beaumont, France.
[4]Equipe de Chimie Analytique, Molécules Bioactives-UMR 7178 IPHC–Université de, Strasbourg- Faculté de Pharmacie, 74 route du Rhin 67401-Illkirch Cedex.

ABSTRACT

The chemical composition of the essential oil of *Salvia verbenaca* (L.) Briq. ssp. *clandestina* (L.) Pugsl. was analysed by GC and GC–MS, the identified components constituting 67.2% of the oil. thirty two components were identified. The main constituents were β-phellandrene (3.8%), α-copaene (10.4%), β-cubebene (2.7%), β-caryophyllene (3.8%), (E)- β-farnesene (3.5%), germacrene D (20.5%), bicyclogermacrene (2.2%), γ-cadinene (2.5%), δ-cadinene (2.6%), 1,10-di-epi-cubenol (2. 6%) and α-muurolol (2.1%),
Keywords: *Salvia verbenaca* (L.) Briq. ssp. *clandestina* (L.) Pugsl., essential oil, α-copaene, germacrene D, β-phellandrene, β-caryophyllene, (E)- β-farnesene.

Corresponding author

ISSN: 0975-858

INTRODUCTION

The genus *Salvia* commonly called "Sage" comprising about 1000 species, is one of the largest and important aromatic genera of the Lamiaceae family. It grows in Central and South America, Asia and Mediteranean regions [1]. Several traditional uses of "Sage" have been described: reducing perspiration and fever [2-4], relieving indigestion and spasmodic pains [5]. It is also used in bath to treat skin problems [6] and in insecticidal preparations [7]. The essential oils showed antibacterial, cytostatic, antiviral and antioxydant activities [8-12]. The essential oils of *Salvia* species were also used as cosmetics, flavoring agents in perfumery, and food condiments [13-16]. Several markers have been identified in *Salvia* oils such as: 1,8-cineole, linalool, borneol, *β*-caryophyllene, germacrene D, bicyclogermacrene, spathule nol, and caryophyllene oxide [15]. In continuation of our works on Saharian species [17-28], we report here the chemical composition of the essential oil *Salvia verbenaca* (L.) Briq. ssp. *clandestina* (L.) Pugsl. from Algeria. To the best of our knowledge, the chemical composition of its essential oil was not previously investigated.

MATERIAL AND METHODS

Experimental

Plant material

The studied sample was collected in April 2011 from flowering plants from the region of Mogheul at fourty km of Bechar in the Southwest of Algeria and identified by M. Benabdelhakem from the National Agency of Preservation of Natural Resources of Bechar. Voucher specimens are kept in the Herbarium of the Research Unity of Valorization of Natural Resources and Bioactive Molecules, University of Constantine, (SVC-N°105-2011).

Isolation of the essential oil

`

The aerial parts (305g) of *Salvia* (L.) Briq. ssp. *clandestina* (L.) Pugsl. were steam distilled in a Kaiser Lang apparatus.

GC and GC-MS analysis

The essential oil was analyzed on an Agilent gas chromatograph (GC-FID) Model 6890, equipped with a HP-5 ms fused silica capillary column having (5%-phenyl) methylpolysyloxane stationary phase (25 m x 0.25 mm, film thickness 0.25 m), programmed from 50°C (5 mn) to 250 °C at 3°/mn and held for 10 mn . Injector and flame ionization detector temperatures were 280 and 300 °C, respectively. The essential oils were diluted in acetone 3.5% (v/v) and injected in split mode (1/60), helium was used as a carrier gas (1.0 mL/mn). Solutions of standard alkanes (C8-C20) was analyzed under the same conditions to calculate retention indices (RI) with Van del Dool and Kratz equation.

Mass spectrometry was performed on an Agilent gas chromatograph-mass spectrometer (GCMS) Model 7890/5975, equipped with HP-5 capillary column (25 m x 0.25 mm, film thickness 0.25 m) programmed with the same conditions as for GC-FID. The mass spectrometer (MS) was in electron impact mode at 70 eV and electron multiplier was at 2200 V. Ion source and MS quadrupole temperatures were 230°C and 180°C, respectively. Mass spectral data were acquired in the scan mode in the *m/z* range 33-450. The essential oil constituents were identified by matching their mass spectra and retention indices (RI) with those of reference compounds from libraries such as Adams [29] and Mc Lafferty & Stauffer [30]. The proportions of the identified compounds were calculated by internal normalization.

RESULTS AND DISCUSSION

The yield of steam distillation was 0.5% (w/w) in relation to the dry weight of the plant. A total of fourty nine constituents were determined which account for about 67.2% of the essential oil of *Salvia verbenaca* ssp. *clandestina*. The identified components in the essential oil are listed in table 1 in order of their experimental retention times and retention indices.

The main constituents of the oil were β-phellandrene (3.8%), α-copaene (10.4%), β-cubebene (2.7%), β-caryophyllene (3.8%), (E)- β-farnesene (3.5%), germacrene D (20.5%), bicyclogermacrene (2.2%), δ-cadinene (2.5%), δ-cadinene (2.6%), 1,10-di-epi-cubenol (2.6%) and α-muurolol (2.1%),

Sesquitepernic components represented the major fraction (57.3%) and the level of monoterpenic hydrocarbons was relatively low (7.8%). The chemical composition of *Salvia verbenaca* ssp. *clandestina* from Algeria may be categorized as sesquiterpene chemotype among the four chemotypes identified for *Salvia* species [31]. Our results showed the presence of the main constituents -caryophyllene (3.8%), germacrene D (20.5%) and bicyclogermacrene (2.2%) which are considered as markers in *Salvia* oils. In addition the relatively high level of α-copaene (10.4%) seems characteristics of our sample.

Table 1: Volatile oil composition of *Salvia verbenaca* (L.) Briq. ssp. *clandestina* (L.) Pugsl.

RI	RT	Compounds	%
976	11.51	sabinene	0.2
980	11.68	β-pinene	0.8
991	12.08	myrcene	0.2
1005	12.58	α-phellandrene	0.2
1031	13.45	limonene	1.2
1031	13.51	β-phellandrene	3.8
1103	15.76	Isoamyl-isovalerate	0.2
1114	15.99	trans-thujene	0.4
1351	22.90	α-cubebene	0.1
1377	23.67	α-copaene	10.4
1388	23.89	β-bourbonene	0.8
1388	23.97	β-cubebene	2.7
1419	24.81	β-caryophyllene	3.8
1450	25.44	selina-4(15),6-diene	0.5
1457	25.54	(E)- β-farnesene	3.5
1455	25.71	α-humulene	1.0
1467	25.86	muurola-4(14),5-diene	0.8
1485	26.33	germacrene D	20.5
1500	26.67	bicyclogermacrene	2.2
1514	27.08	γ-cadinene	2.5
1523	27.18	δ-cadinene	2.6
1521	27.25	cis-calamenene	0.4
1578	28.59	spathulenol	0.4
1583	28.74	caryophyllene oxyde	0.4
1600	29.02	hexadecane	0.6
1619	29.47	1,10-di-epi-cubenol	2.6
1646	30.05	α-muurolol	2.1
1700	31.25	heptadecane	0.2
1900	35.38	nonadecane	0.3
2000	37.28	eicosane	0.6
2100	39.14	heneicosane	0.1
2106	39.27	phytol	1.1

CONCLUSION

This study reported for the first time the chemical composition of the essential oil of *Salvia verbenaca* ssp. *clandestina* from Algeria. Our results showed that this oil was characterized by a high level of the sesquiterpenic fraction and the presence of β-caryophyllene, germacrene D and bicyclogermacrene which are considered as markers in *Salvia* oils. The presence of a high level of α-copaene seems characteristic of our sample.

ACKNOWLEDGEMENT

This research was supported by FNR program of Algerian MESRS and ATRSS.

REFERENCES

[1] Walker JB, Sytsma KJ, Treutlein J and Wink M. American J Bot 2004;91(7): 1115–25.
[2] Fluck H. Medicinal Plants. W. Foulsham & Co. Ltd. 1988. ISBN 0-572-00996-8.
[3] Leung AY. Cosmetics made from Chinese herb extracts. Drug and Cosmetic Industry 1989: 35-40.
[4] Lust L, The Herb Book. 16th. impression, Bantam Publishing 1986. ISBN 0-553-17273-5.
[5] Evans WC, Trease and Evans Pharmacognosy. 13th edition. Balliere Tindall 1989. ISBN 0-7020-1357-9.
[6] Stuart M, The Encyclopaedia of Herbs and Herbalism. Orbis 1986. ISBN 0-85613-700-6.
[7] Valnet J, The Practice of Aromatherapy. C.W. Daniel Co. Ltd. 1986. ISBN 0-85207-143-4.
[8] Janssen AM, Scheffer JJC and Baerheim SA, Planta Med 1987; 53: 395-398.
[9] Gonzalez AG, Abad T, Jimenez IA, Ravelo AG, Luis JG, Aguiar Z, Andres LS, Plasencia M, Herrera JR and Moujir L. Biochem Syst Ecol 1989; 17: 293-295.
[10] Darias V, Bravo L, Rabanal R, Sanchez-Mateo CC and Martin-Herrera DA. Planta Med 1990; 56:70-72.
[11] Tada M, Okuno K, Chiba K, Ohnishi E and Yoshii T. Phytochem 1994; 35: 539-541.
[12] Weng XC and Wang W. Food Chem 2000; 71: 489-493.
[13] Basaif AS, JKAU. Sci, 2004; 16: 33-39.
[14] Longaray Delamare AP, Moschen-Pistorello IT, Artico L, Atti-Serafini L and Echeverrigaray S. Food Chem 2007; 100: 603-608.
[15] Kelen M and Tepe B. Biores Tech J 2008; 99, 4096-4104.
[16] Tepe B, Dönmez E, Unlu M, Candan F, Dimitra D and Vardar-Unlu G. Food Chem 2004; 84: 519–525.
[17] Mezhoud S, Mekkiou R, Chalard P, Figuérédo G, Benayache S and Benayache F. Res J Pharm Biol Chem Sci 2014; 5(3): 1367-1372.
[18] Aissaoui M , León F, Brouard I, Benayache F and Benayache S. Der Pharm Lett 2014; 6(1): 186-189.
[19] Benaissa O, Amrani A, Bicha S, Zama D, Benayache F**,** Marchioni E and Benayache S. Der Pharm Lett 2013; 5 (5):234-240.
[20] Mezrag A, Bouheroum M, Beghidja N, Khalfaoui A, Zaiter L, Benayache S and Benayache F. Chem Nat Compd 2013; 49(4): 749-750.
[21] Bicha S, Chalard P, Hammoud L, León F, Brouard I, Garcia VP, Lobstein A ,Bentamene A, Benayache S, Bermejo J and Benayache F. Rec Nat Prod 2013; 7(2):114-118.
[22] Dendougui H, Seghir S, Jay M, Benayache F and Benayache S. Int J Med Arom Plants 2012; 2(4): 589-595.
[23] Mezhoud S, Derbré S, Ameddah S, Mekkiou R, Boumaza O, Seghiri R , Benayache S, Richomme P and Benayache F. Int J Med Arom Plants 2012; 2(3): 509-513.
[24] Kolli EH, León F, Benayache F, Estévez S , Quintana J, Estévez F, Brouard I, Bermejo J, Benayache S. J Brazil Chem Soc 2012; 23(5): 977-983.
[25] Dendougui H, Seghir S, Belloum Z**,** Benayache F, León F , Brouard I , Bermejo J and Benayache S. Rec Nat Prod 2011; 5(4): 300-304.
[26] Bicha S, Bentamene A , Benaissa O, Benayache S, Garcia VP, Bermejo J and Benayache F. Chem Nat Compd 2011; 47(1): 105-106.
[27] Bentamene A, Benayache S, Creche J, Bermejo J and Benayache F. Chem Nat Compd 2007; 43(6): 749-750.
[28] Dendougui H , Jay M, Benayache F and Benayache S. Biochem Syst Ecol 2006; 34 (9): 718-720.
[29] Adams RP. Identification of essential oil components by gas chromatography /mass spectroscopy. Allured Publishing Co. Carol Stream, Illinois. 1995.
[30] Mc Lafferty FW and Stauffer DB. The Wiley/NBS registry of mass spectral data. 5th Edition, J. Wiley and Sons, New York, 1991.
[31] Jassbi AR, Asadollahi M, Masroor M, Schuman MC, Mehdizadeh Z, Soleimani M and Miri R. Chem Biodivers 2012; 9(7): 1254-1271.