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Comparison of *Salvia lachnocalyx* Hedge. Essential Oil Components in Wild and Field Population.

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ABSTRACT

Aerial parts of *Salvia lachnocalyx* were collected in full flowering stage from natural sites. The seeds of this plant cultivated in research farm. Aerial parts of the cultivated plants harvested at full flowering stage. The essential oils (Eos) obtained by hydro-distillation of dried aerial parts and analyzed by GC and GC/MS. Thirty-one components were characterized for cultivated plants with bicyclogermacrene (40.7%), (E)-caryophyllene (11.1%) and spathulenol (9.3%) dominating constituents, 36 constituents were identified for wild plants with . bicyclogermacrene (18.1%), α-pinene (15.3%), β-pinene (13.5%) and sabinene (12.9%) as the major constituents.

Key words: *Salvia lachnocalyx,* EO, wild, cultivated

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INTRODUCTION

Salvia is an important genus of the *Lamiaceae* family that includes more than 700 species which are spread throughout the world [1]. *Salvia* species called Maryam-Goli in Persian [2] has been famous for its medicinal properties [3]. Numerous species of the genus *Salvia* have been used since ancient times in folk medicine and have been subjected to extensive pharmacognostic research intended to identify biologically active compounds [4,5]. Most of *Salvia* species are commonly utilized for their essential oils in the foods, medicines and perfumery industries [6-8]. With total of 70 species and 40% endemism, *Salvia* has a consequential center of diversity in Iran. It exhibits an interesting range of morphological variation which is as great as, if not more than, anywhere in the whole world [9]. Despite this huge diversity in Iran and considering very rare species, natural or even anthropogenic processes are not included within the current conservation management. It is striking that biology researchers have paid so little attention to biological conservation of Iranian endemic species of salvia. For instance, there is a major source of essential oils in *S. lachnocalyx* [10], endemic and perennial species that grows only in too narrow region near Eghlid in Fars province which is threatened to extinct in near future [11]. Due to some problems such as destroying pastures and their replacement with farm, uncontrolled use, lack of conservation, extension of urban areas and their narrowness of geographical stretch, some exclusive species of Iran are in threat of extinction and their gene pool is experiencing genetic drift so cultivation and domestication for this plant is essential therefore, the aim of this study was to examine the chemical composition of *S. lachnocalyx* oil in wild and field condition.

MATERIALS AND METHODS

Plant material

The aerial parts of *S. lachnocalyx* were collected in full flowering stage from natural sites in Eghlid (Fars province) on Jul. 2012. Also, the seeds of this plant cultivated in research farm of Sadra city in Fars province on November 2011. The plant material was identified by staff at the herbarium of Fars Research Center for Agriculture and Natural Resources, Shiraz, Iran.

EO extraction

Air dried aerial parts of the plants at the flowering stage were subjected to hydro-distillation for 3 h using a Clevenger-type apparatus according to the method recommended in the European Pharmacopoeia[12]. The obtained oils were dried over anhydrous sodium sulfate and stored in sealed vials at +4°C in the dark until analyzed and tested.

Identification of the oil components

GC analysis was carried out using an Agilent-technology chromatograph with a HP-5 column (30 m × 0.32 mm i.d. × 0.25 µm). Oven temperature was from 60°C to 210°C at 3°/min; then 210°C to 240°C at 20°C/min, and held for 8.5 min, injector temperature 280°C; detector temperature, 290°C; carrier gas, N2 (1 mL/min); split ratio of 1:50. GC-MS analysis

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was carried out using an Agilent 7890 operating at 70 eV ionization energy, equipped with a HP-5 MS capillary column (phenyl methyl siloxane, 30 m × 0.25 mm i.d. × 25 µm.) with he as the carrier gas, and a split ratio of 1:50. Retention indices were determined using retention times of *n*-alkanes that were injected after the EO under the same chromatographic conditions. The retention indices for all components were determined according to the method using *n*-alkanes as standard. The compounds were identified by comparison of retention indices (RRI, HP-5) with those reported in the literature and by comparison of their mass spectra with the Adams library and stored in NIST and Wiley libraries [12-14].

RESULTS AND DISCUSSION

Table 1. Essential oil composition (%) of *S. lachnocalyx* in wild and field conditions.

NO	Compound	RIa	Cultivated (%)	Wild (%)	NO	Compound	RIa	Cultivated (%)	Wild (%)
1	α-Thujene	925.5	0.096	0.276	20	Terpinene-4-ol	1175	0.21	0.702
2	α-Pinene	933.5	5.063	15.297	21	α-Terpineol	1189	0.174	0.605
3	Camphene	947.5	0.219	1.593	22	Linalyl acetate	1254	-	0.151
4	Sabinene	972.5	2.992	12.857	23	Bornyl acetate	1284	0.077	0.61
5	β-Pinene	977.5	3.809	13.531	24	δ-Elemene	1336	6.364	2.844
6	Myrcene	990	0.602	1.537	25	α-Terpinyl acetate	1348	2.444	7.688
7	α-Phellandrene	1005	0.028	0.084	26	Neryl acetate	1363	-	0.08
8	α-Terpinene	1016	0.196	0.265	27	β-Bourbonene	1383	0.367	0.234
9	p-Cymene	1023	0.057	0.03	28	□-Elemene	1390	0.327	0.198
10	Limonene	1027	1.422	3.558	29	(E)-Caryophyllene	1419	11.09	5.286
11	1,8-Cineole	1030	0.023	0.033	30	α-Humulene	1451	1.695	0.37
12	(Z)- β-Ocimene	1035	-	0.018	31	allo-Aromadendrene	1458	1.213	0.387
13	(E)- β-Ocimene	1045	-	0.07	32	Germacrene D	1479	3.963	3.246
14	γ-Terpinene	1056	0.863	0.563	33	Bicyclogermacrene	1499	40.666	18.106
15	cis-Sabinene hydrate	1065	0.027	0.106	34	δ-Cadinene	1521	0.116	-
16	Terpinolene	1087	0.808	0.545	35	Spathulenol	1577	9.278	5.626
17	Linalool	1098	-	0.182	36	Caryophyllene oxide	1581	2.766	1.203
18	trans-Verbenol	1143	-	0.035	37	cis-Cadin-4-en-7-ol	1636	2.95	-
19	Borneol	1163	0.091	0.729	38	epoxy-allo-Aromadendrene	1635	-	1.352

* RI, retention indices relative to C8-C25 n-alkanes on the HP-5 column; t, trace <0.1%

The essential oils were analyzed by GC and GC–MS. In total, 36 and 31 constituents representing 99.9 and 99.9 % of the total were identified and quantified in the wild and cultivated plants, respectively (Table 1). bicyclogermacrene (40.7%), (E)-caryophyllene (11.9%), spathulenol (9.3%), δ-elemene (6.4%), β-pinene (5.1%), germacrene D (4.0%) and β-pinene (3.8%) were found to be the major constituents in the cultivated plants. The main components in wild plants were bicyclogermacrene (18.1%), α-pinene (15.3%), β-pinene (13.5%), sabinene (12.9%), α-terpinyl acetate (7.7%), spathulenol (5.6%), (E)-caryophyllene (5.3%), limonene (3.5%) and germacrene D (3.2%). It was found that the chemical profiles of both oils were similar (Table 1). Bicyclogermacrene, (E)-caryophyllene, spathulenol and □-elemene as a major compounds, were increased in cultivated plants. The Bicyclogermacrene showed an enhancement equal to 100%. The α-pinene, β-pinene and sabinene were increased in wild population. *S. lachnocalyx* have not been cultivated previously in Iran and any other countries but Mirza and Baher 2007, studied the chemical composition of the essential oils in *S. lachnocalyx* growing wild in Fars province, thirty-four compounds were

identified in the essential oil. The major components were bicyclogermacrene (31.3%), α-pinene (13.2%), sabinene (11.7%) and β-pinene (10.3%) which found that the chemical profiles of both oils in wild plants were similar. There are several reports in the literature on the phytochemical analysis of species belonging to *Salvia*. These scientifics showed that β-caryophyllene is the major component of the oil of aerial parts of *S. nemorosa*, *S. virgata, S. aethiopis, S. verticillata*, *S. hypoleuca and S. atropatana* [15-16]

REFERENCES

[1] Ewans WC. Trease and Evans Pharmacognosy. W.B. Saunders, London, 1996.
[2] Mozaffarian V. A dictionary of Iranian plant names, Farhang Moaser, Tehran,1996.
[3] Rivera D, Obon C, Cano F. Econ Bot 1994; 48: 190-195.
[4] Lu Y, Foo LY. Phytochem 2002; 59: 114–140.
[5] Sivropoulou A, Nikolaou C, Papanikolaou E, Kokkini S, Lanars T, Arsenakis M. J Agric Food Chem 1997; 45: 3197–3201.
[6] Goron AC, Kilic T, Dirmenci T, Bilsel G. Biochem Syst Ecol 2006; 34:160- 164.
[7] Ozcan M, Tzakou O, Couladis M. Flavour Fragrance J 2003: 18:325-327.
[8] Ulubelen A, Topcu G. Stud. Natural Prod Chem 1998; 20:659-718.
[9] Rechinger K. Flora Iranica, Labiatae, No 150 (Austria) 1982.
[10] Mirza M, Baher Nik Z. Iranian J Med Aromatic Plants 2007; 23: 278-284.
[11] Jalili A and Jamzad Z. Red Data Book of Iran. Research Institute of Forests and Rangelands, Tehran 1999.
[12] McLafferty FW, Stauffer DB. Jornal Wiley and Sons New York, 1989.
[13] Joulain D, König WA, Hochmuth DH. Library of MassFinder, 2.1, Hamburg, Germany 2001.
[14] Adams RP. Allured Publishing Corporation, Illinois, 2007.
[15] Mirza M, Sefidkon F. Flavour Fragrance J 1999; 14: 230-232.
[16] Mirza M, Ahmadi L. J Essent Oil Res 2000; 12: 575-576.