Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Vol 3 [Special Issue V] 2014: 210-217

Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD
Global Impact Factor 0.533
Universal Impact Factor 0.9804

ORIGINAL ARTICLE

The Evaluation and Determination of Chemical Compositions in the Essential of *Stachys lavandulifolia* Vahl. in Three Sites in Alborz Mt. (Iran)

S.S. Mahzooni Kachapi[1*], M. Mahdavi[2], M.H. Jouri[2], M. Akbarzadeh[3], L. RoozbehNasira'ei[4], F. Rezazadeh[5]
[1]Rangeland Management and Membership of Young Researchers Club, Islamic Azad University, Noor Branch, Iran
[2]Department of Natural Resources, Islamic Azad University, Nour Branch, Nour, Mazandaran, Iran
[3] Research Centre for Agriculture and Natural Resources, Mazandaran Province, Iran
[4]Islamic Azad University, Nour Branch, Nour, Mazandaran, Iran
[5]Rangeland Management, Islamic Azad University, Noor Branch, Iran
Email: Sadatmahzooni@yahoo.com

ABSTRACT
Productivity and growth of plants in terrestrial ecosystems impress under different factors such as species genus, climate, soil environment, and geographic position. Each of these elements can highly influence on quantitative and qualitative production of plants. Wood Betony (Stachys Lavandulifolia vahl) is a type of Stachys genus, belonging to the Labiatea family which amply uses in traditional and modern medicine. The goal of current research was to evaluate and determine the chemical compositions in essential of Wood Betony in three sites of Alborz Mt. (Iran). In order to achieve the goal, aerial organs of Stachys Lavandulifolia were collected in three sites, such as western, central, and eastern section of Alborz Mt.and after shrivelling in vitro thermal position, extracting of essence was done by Hydrodistilation. The compositions of the essential were identified and analyzed using GC and GC/MS and by measuring the Retention Index and Mass spectrums. Data set was analysed by one way ANOVA method in SPSS v.17 software. It was also used Duncan method to grouping of variables. Results showed that efficiency of essence from Stachys Lavandulifolia vahl.in three sites was between 0.48±0.01 to 0.63±0.01. The maximum chemical composition was for eastern Alborz site with 72 combinations and the least was for western Alborz section with 58 syntheses. Central Alborz section, however, had 67 formations and located between others sites. The percentage of essential weight for eastern, western, and central Alborz was respectively 95.53, 96.93, and 96.49. Comparing of essential compositions in three sites showed that the syntheses amount of essence in this plant was different. As for ecological requirements of Stachys Lavandulifolia the western Alborz site had desirable circumstances to growing of this plant because it has semi cool humid climate, more rainfall, less temperature, and karstic formation along with clay-sandy-silty soil texture. Hence, it had the best productivity of essential quantity and quality and consequently the highest effective combination.
Keywords: Eastern alborz, Western alborz, Ccentral, Alborz, Flowering stage, essence, Stachys lavandulifolia

Received 12.05.2014 Revised 03.07.2014 Accepted 15.08. 2014

INTRODUCTION

Application of medicinal plants to remedy the illness refers to many years ago when the man empirically found out their avails to conduct the diseases. Usage of herbal medicine had decreased because of growing of urbanisation and artificial medicine [38] which has mainly role played to heal the sicknesses [9]. Overusing of chemical medicine to cure infectious diseases has caused to appear the resistant-isolated germs which their amounts are daily added [14]. Lateral impaction of the chemical medicines, environmental features, and gradual trend to natural products are caused to increase the using of medicinal plants in the improved countries, especially in recent decade [15]. These plants capable to synthesis, gathering, and dispersing of volatile material that flavour molecules can be produced by living organisms or feedback of them. One of the important compositions of medicinal plants is volatile oils which have abundant biological effects. Because of different chemical combinations existence in essences, the essential plants are used in various illnesses [38] while their lateral impactions are less than the

chemical medicines [10]. Application of essential plants in medicinal industries, food matters, complementary medicine, and herbal remediation are prevail on the basis of anti-microbial of essences against the different organisms [27]. Nowadays, estimation of effective production of medicinal plants is become important because of economic, remediation, industrial, and improved aspects emphasises of medicinal plants in the world. Metabolic reaction in each organism is known through paleo-evolutionary process till now. Dispersion of plant species, including medicinal and non-medicinal species, is affected by ecological features of each region [28]. Production of second metabolisms is controlled by genes, but their yields refer to habitats environments in each area. As these factors, regarding of plant dispersion and geography, are caused to change the growing of medicinal plants and their quality and quantity of effective matters [40]. Hence, qualitative and quantitative distribution of the effective matters in medicinal plants will be differed in each region [28]. Hereunto, identification of habitats, surveying of ecologic requirements, and collection of plants are some proceedings that should be done to medicinal plants [12]. The herbs of *Labiatae* family and some of its types were an area of concern to different researchers in view of identification of essential compositions [42]. Species of this family have globally dispersed, but they specially gather in Mediterranean areas. *Stachys* genus has more than 270 species and it is one of the richest genera in *Labiatae* family. Thirty four species from this genus exist in the Iran's flora that 13 species of it are endemic in Iran. Species of *Stachys Lavandulifolia* is a plant from *Labiatae* family, with 25 cm height, glaucous stems, wooled inflorescence which has long aromatic yarn, and its body seems green to greyish colour that its flowering period is April to Jun [16]. The most dispersion of this species belongs to North America and Europe. It however is seen in southeast of Asia and Middle East as well [10]. Geographic dispersion of *Stachys Lavandulifolia* species is limited to north of Iran [16]. Abundant of this species is more in shallow slopes, especially in humid area of upland crests [17]. The essential of aerial part of the given herb is used in the traditional medicine of Iran, treatment of infection, Asthma, and, and agonal illness, especial rheumatism [24]. The herb has been a nutrient for the stomach upset [4] and is effective to reduce the discomposure [30 & 31], the digestive disorders, and the genital tumours and cancer ulcers [21], as well.

Researches on *Tagetes* species have revealed that percentage of chemical compositions of essence from different areas has been varied [20]. The study of Chalchat et al. [7] delineated that the essential composition of *Stachys recta* from Serbia and Turkey was similar. Rahimmalek et al. [32] in analysis of the essential composition of six species of Achillea, which is gathered from 10 natural habitats, have also observed different rates of essences in samples. Surveying of essence of *Artemisia annua*, which is planted in Monsoon condition in north of India, has showed that the most essential compositions refer to Camphor, Camphene, Artemisia Ketone, Germacrene D, 1,8-Cineole. In the other study has been shown that Artemisia Ketone, as the most compositions of the *Artemisia* species, was found a little bit in the composition [5]. Different percentage of essences has been seen in *Thymbra spicata* species from eastern Mediterranean and southeast of Anatolia areas [22]. The study of Saei'Dehkordi et al. (2010) on *Zataria multiflora* species from different areas of Iran have showed that with a view to quality trait, there were a similarity between them, but the rate of essence was different from various regions. Barazandeh [6] studied on aerial-flowered organs of *Salvia hydrangea* species, which was collected from Isfahan province, and analyzed it; 28 elements have been recognized that Beta-Caryophyllene and Caryophyllene Oxide was the main combination of the essence. Whereas researching on the quality and quantity of essence component in each area can represent different features of species with the object of rangeland, medicinal, and industrial traits, studying on the essence can appear the ecological characteristics. Hence, this study endeavors to identify the essential compositions of S*tachys lavandolifolia* in three sites from Alborz Mt. (Iran).

MATERIALS AND METHODS

A. Collection of herbs and extraction of essential

In the present study, aerial partsof *Stachys Lavandulifolia*were collected in flowering stage, from Jun to July 2011 from three sites (eastern, western, and central Alborz) which are located at Alborz Mt. (Iran) in Mazandaran province so that traits of three sits is shown in table 1 [36]. Sampling was done two times and collected plants were dried in vitro condition. As much as 100 gr of the essential oil in the herb's aerial parts extracted using Clevenger instrument with Hydrodistilation method for 3 hours [18]. In order for the essential not to be mixed with water, 1 mili-litter of pentane solvent was poured into the store inlet of the essential. Considering the moisture percentage, the essential output was measured in dry weight (w/w). The essential, when extracted, is collected and distilled using Sodium Sulfate, and kept in the fridge at 4˚C. until it was injected into Gas Chromatography (GC) [2].

Table 1: Habitats traits of *Stachys lavandulifolia* Vahl.

Site position	Climate*	Rainfall (mm)	Altitude (m)	Temperature (°C)
Eastern Alborz	Semi-dry cool	383	2400	12.44
Central Alborz	Cool dry	282	2400	8.9
Western Alborz	Semi-humid cool	527	2400	10.5

* is calculated by Emberger's method

B. Essential analysis

The extracted essential oil was first injected into the GC. The most suitable programing of thermal column then was obtained for complete separation of the essential oil. In addition, the relative percentage and Deterrence Index of each component was measured. Then, the essential oil was analyzed using GC/MS in order to identify its composition. The components were identified using under area of mass spectrometry curve, and were compared with the standard compositions and the data in the mass database Wiley275.L (1).

C. Data analysis

In order to compare the percentage of the essential composition of *Stachys Lavandulifolia* in three sites of Alborz Mt. (Iran), one-way ANOVA method was employed using SPSS v.17 software. Duncan test was administered to compare the means of these sites.

RESULTS

Comparing of essential compositions percentages in *Stachys Lavandulifolia* from three sites showed that maximum number of chemical combination is referred to eastern Alborz with 72 components and the least elements is referred to eastern Alborz with 58 components. The central Alborz, however, was the middle of two sites and had 67 components. The percentage of essence weight of eastern, western, and central Alborz was respectively 89.17, 96.75, and 94.19%. The essential oil components in the eastern Alborz included Hexadecanoic acid (14.75±0.2%), alpha-Pinene (10.72±0.4%), Germacrene D (6.23±0.15%), Spathulenol (5.23±0.1%),Bicyclogermacrene (3.56±0.1%), and Tetradecanal (3.15±0.1%). In the central Alborz, it comprised Hexadecanoic acid (10.29±0.1%), alpha-Pinene (8.46±0.6%), Germacrene D (8.41±0.1%), beta-Myrcene (7.20±0.2%), Spathulenol (4.68±0.01%), and Bicyclogermacrene (3.66±0.05%). It, however, in the eastern Alborz is made up of Hexadecanoic acid (13.78±0.2%), alpha-Pinene (13.62±0.1%), Germacrene D (8.98±0.04%), beta-Pinene (7.6±0.8%), beta-Phellandrene (5.7±0.02%), and beta-Myrcene (4.44±0.05%). The evaluation of analysis is shown that Hexadecanoic acid, alpha-Pinene, and Germacrene D were common elements in three sites whereas Spathulenol (in eastern and central Alborz) and beta-Myrcene (in central and eastern Alborz) were the indicator elements (Table 2). The average efficiency of essential oil of *Stachys Lavandulifolia* in eastern, central, and western Alborz habitats were respectively 0.48±0.01, 0.5±0.01, and 0.63±0.01 that the western and eastern Alborz sites had respectively the most and the least essential efficiency (Fig. 1).

Table 2: Chemical compositions of the essencial oil of *stachys lavandulifolia* in three sites

row	Component name	Composition percentage			Retention Index
		Eastern Alborz	Central Alborz	Western Alborz	
1	α-Thujene	0.32±0.10	0.45±0.1	0.99±0.03	907
2	α-Pinene	10.72±0.4	8.46±0.6	13.62±0.1	924
3	β-Myrcene	3.42±0.2	7.20±0.2	4.44±0.05	932
4	α-Phellandrene	0.2±0.09	-	0.40±0.04	963
5	1-Phellandrene	-	0.43±0.1	-	967
6	β-Pinene	3.18±0.2	5.46±0.4	7.6±0.8	985
7	Delta 3-carene	0.38±0.05	0.34±0.1	0.15±0.04	990
8	α-Terpinene	0.07±0.05	-	0.19±0.06	1002
9	O-Cymene	0.14±0.07	0.27±0.09	-	1012
10	β-Phellandrene	-	3.04±0.01	5.7±0.02	1018
11	1,8-Cineole	0.06±0.02	-	0.36±0.03	1021
12	β-Ocimene	-	2.38±0.1	-	1030
13	Cis-Ocimene	1.17±0.09	-	3.30±0.07	1032
14	β-Ocimene Y	0.11±0.09	-	0.39±0.02	1039
15	Gamma-Terpinene	0.30±0.09	0.66±0.07	0.90±0.04	1049
16	Cis-sabinene hydrate	-	-	0.16±0.06	1060
17	α- Terpinolene	0.08±0.04	0.18±0.09	0.19±0.04	1080
18	Linalool L	0.07±0.04	0.39±0.02	0.18±0.03	1096
19	Nonanal	0.09±0.06	0.19±0.09	-	1099
20	Terpinene-4-ol	0.30±0.1	0.17±0.07	0.19±0.03	1175
21	α-Terpineol	10.85±0.6	0.5±0.2	0.19±0.02	1190

row	Component name	Composition percentage			Retention Index
		Eastern Alborz	Central Alborz	Western Alborz	
22	Decanal	2.88±0.12	-	-	1202
23	Bornyl acetate	-	0.18±0.09	0.16±0.07	1284
24	Tetradecanal	3.15±0.1	-	-	1304
25	Carvacrol	-	0.34±0.09	-	1310
26	α-Cubebene	-	-	2.18±0.06	1375
27	α-Copaene	0.09±0.04	2.19±0.04	-	1377
28	Delta-Cadinene	0.32±0.1	2.79±0.1	1.79±0.07	1379
29	Copaene	0.2±0.09	-	-	1380
30	β-Bourbonene	0.09±0.02	0.67±0.09	0.84±0.06	1383
31	β- Elemene	0.13±0.07	0.73±0.02	0.74±0.04	1390
32	Camphene	0.06±0.02	0.35±0.09	0.29±0.04	1397
33	Dodecanal	1.13±0.1	0.38±0.01	-	1408
34	Caryophyllene	0.14±0.04	1.85±0.09	1.28±0.03	1420
35	β-Cubebene	0.26±0.1	0.55±0.05	0.27±0.04	1428
36	Cadina-1,4-Diene	-	0.43±0.09	-	1433
37	α-Humulene	0.08±0.02	-	-	1453
38	Trans-β-Farnesene	0.09±0.06	0.88±0.09	0.50±0.04	1455
39	Octadecane, 1-chloro	0.25±0.1	-	-	1460
40	Germacrene D	6.23±0.15	8.41±0.1	8.98±0.04	1487
41	β-Ionone	0.12±0.07	-	-	1488
42	gamma.-Cadinene	-	-	0.58±0.09	1494
43	Bicyclogermacrene	3.56±0.1	3.66±0.05	2.21±0.09	1500
44	β-Bisabolene	0.74±0.09	1.30±0.04	0.61±0.05	1508
45	α-Amorphene	0.10±0.06	0.64±0.09	0.25±0.05	1514
46	Bicyclo[4.4.0]dec-1-ene, 2-isoprop yl-5-methyl-9-methylene	0.14±0.1	-	0.41±0.06	1518
47	Cis-α-bisabolene	0.62±0.1	0.81±0.02	0.63±0.02	1542
48	Styrene, o-isopropyl-α-methyl-	0.08±0.04	-	-	1554
49	α-Costol	-	0.26±0.1	-	1557
50	Dodecanoic acid	1.57±0.1	-	-	1583
51	Spathulenol	5.23±0.1	4.68±0.01	3.40±0.04	1586
52	Caryophyllene oxide	-	0.44±0.01	-	1588
53	Veridiflorol	-	-	0.55±0.06	1589
54	Ledene	-	0.73±0.07	-	1591
55	salvial-4(14)-en-1-one	-	-	0.44±0.02	1595
56	Gamma-Gurjunene	0.42±0.09	0.56±0.08	-	1597
57	1-4 Methano-1H-indene, octahydro-1,7a-dimethyl-4-(1-methylethenyl)	-	-	0.74±0.03	1609
58	Epizonaren	-	1.36±0.007	-	1610
59	Diepicedrene-1-oxide	1.53±0.1	-	-	1612
60	Naphthalene, 1,2,3,5,6,7,8,8a-octahydro-1,8a-dimethyl-7-(1-methylethenyl)	-	-	0.10±0.03	1621
61	1H-Cycloprop[e]azulene, decahydro-1,1,7-trimethyl-4-methylene	-	-	0.27±0.04	1630
62	Isospathulenol	0.71±0.07	-	-	1645
63	α-Cadinol	2.11±0.1	2.89±0.15	2.57±0.09	1647
64	Thujopsene	0.31±0.1	-	-	1651
65	Aromadendrene	0.26±0.09	0.35±0.07	-	1655
66	Valencene	-	-	0.29±0.04	1656
67	α-Gurjunene	-	0.37±0.07	-	1664
68	Azulene, 1,2,3,3a,4,5,6,7-octahydro-1,4-dimethyl-7-(1-methylethenyl)	0.25±0.1	-	-	1667
69	Murolan-3,9(11)-diene-10-peroxy	-	0.38±0.01	-	1672
70	1,1,4,4-Tetramethyl-2-tetralone	1.89±0.1	1.49±0.007	1.17±0.04	1679
71	Cadina-1(10),6,8-triene	-	0.58±0.07	-	1685
72	Levomenol	-	0.93±0.07	-	1689
73	Anymol	1.19±0.1	-	0.57±0.02	1690
74	IsoCaryophyllene	-	-	2.16±0.04	1699
75	Octadecanal	0.1±0.07	-	-	1712
76	4-Bromo-1-naphthalenamine	-	-	0.07±0.06	1723
77	7-Tetradecene	0.11±0.07	0.20±0.06	-	1734
78	Tetradecanoic acid	2.13±0.16	1.09±0.09	0.51±0.05	1775
79	2-Pentadecanone, 6,10,14-trimethyl	1.81±0.09	2.54±0.02	1.4±0.04	1845
80	Palatinolic	0.19±0.1	0.52±0.03	0.29±0.04	1869
81	Pentadecanoic acid	0.18±0.09	-	-	1874
82	1-Octadecanol	-	0.56±0.08	-	1878
83	1-Tetradecanol	0.6±0.1	-	-	1879
84	Tetradecane	-	0.18±0.1	-	1893
85	Nonadecane	0.07±0.03	-	-	1895
86	3-Cyclohexene-1-methanol, α-4-dimethyl-α-(4-methyl-	-	0.19±0.07	-	1950

row	Component name	Composition percentage			Retention Index
		Eastern Alborz	Central Alborz	Western Alborz	
	3pentenyl)				
87	(E,E,E)-3,7,11,15-Tetramethylhexadeca-1,3,6,10,14-pentaene	0.30±0.1	0.33±0.02		1965
88	Hexadecanoic acid	14.75±0.2	10.29±0.1	13.78±0.2	1995
89	7-Ethyl-6-methyl-5-methylthiopyrazolo[1,5-a]pyrimidine	-	0.32±0.09	-	2073
90	Heptadecanoic acid	0.2±0.08	-	0.17±0.03	2074
91	E-15-Heptadecenal	0.21±0.09	0.27±0.02	-	2083
92	Phytol	0.89±0.1	1.16±0.03	1.19±0.04	2114
93	Linoleic acid	-	-	2.51±0.05	2149
94	7,10,13-Hexadecatrienoic acid, methyl ester	1.96±0.08	1.5±0.08	-	2153
95	Methyl linolenate	0.82±0.1	0.69±0.09	-	2157
96	Ethyl linolenate	-	0.23±0.04	-	2166
97	Octadecanoic acid	-	0.49±0.09	-	2175
98	1-Cyclohexenylacetic acid	0.82±0.09	0.55±0.07	-	2181
99	Eicosane	0.46±0.1	0.68±0.01	0.13±0.05	2293
100	Tricosane	0.12±0.04	-	-	2295
101	Pentacosane	0.24±0.09	0.42±0.09	0.45±0.06	2493
102	Compound 889	0.26±0.1	0.41±0.07	0.21±0.02	2545
103	Heptacosane	0.93±0.09	1.15±0.04	1.28±0.04	2695
104	Heneicosane	-	1.42±0.09	-	2893
105	Nonacosane	1.09±0.1	-	-	2895
106	Octadecane	-	-	1.32±0.04	2897
107	Tetracosane	-	-	0.69±0.03	3094
Total percentage of components		**63/95**	**49/96**	**93/96**	**-**

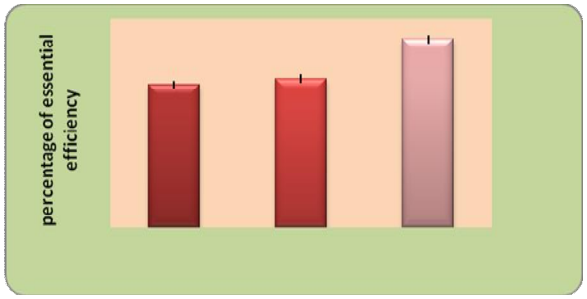

Fig. 1: The average of essential efficiency in *Stachys Lavandulifolia* from three sites

The effects of the habitat on essential efficiency are significant in 1 % critical probability as the one way ANOVA result showed it. The Duncan test also clears the highest and the least rate of essential efficiency respectively to eastern Alborz and eastern Alborz (Tables 3 & 4). As it is seen in table 3, the altitude effects on composition percentage, such as alpha-Pinene, beta-Myrcene, Bicyclogermacrene, beta-Pinene, α-Terpineol, Germacrene D, Hexadecanoic acid was 1 % of critical probability whereas it was 5 % for α-Cadinol composition. Furthermore, as table 4 gave the result of average comparing via the Duncan test, percentages of alpha-Pinene, beta-Myrcene, beta-Pinene, Germacrene D, and Hexadecanoic acid were divided into three individual groups inasmuch as percentage of Bicyclogermacrene, α-Terpineol, and α-Cadinol were divided into two groups. Therewith, regarding to figure 3, the highest percentages of composition refer to Hexadecanoic acid from eastern Alborz site and the least amounts refer to α-Terpineol from western Alborz site.

Table 3: ANOVA result for the three habitats effects on common compositions percentages of essential oil in *Stachys Lavandulifolia* species

Component as variable reference	F-ratio
Essential output	260.5**
alpha-Pinene	65.93**
beta-Myrcene	158.52**
Bicyclogermacrene	120.6**
beta-Pinene	28.41**
α-Terpineol	454.72**
Germacrene D	185.37**
α-Cadinol	18.78*
Hexadecanoic acid	257.59**

** $P_{value} < 0.01$, * $P_{value} < 0.05$

Table 4: comparing of the means from efficiency and common components in *Stachyslanvandulifolia* from three habitats

Habitat site	number of component	total percentage of components	Essential output	Hexadecanoic acid	α-Cadinol	Germacrene D	α-Terpineol	beta-Pinene	Bicyclogermacrene	beta-Myrcene	alpha-Pinene
Eastern Alborz	72	95.63	0.48±0.01 c	14.75±0.2 a	2.11±0.1 b	6.23±0.15 c	10.85±0.6 a	3.18±0.2 c	3.56±0.1 a	3.42±0.2 c	10.72±0.4 b
Central Alborz	67	96.49	0.5±0.01 b	10.29±0.1 c	2.89±0.15 a	8.41±0.1 b	0.5±0.2 b	5.46±0.4 b	3.66±0.05 a	7.20±0.2 a	8.46±0.6 c
Western Alborz	58	96.93	0.63±0.01 a	13.78±0.2 b	2.57±0.09 a	8.98±0.04 a	0.19±0.02 b	7.6±0.8 a	2.21±0.09 b	4.44±0.05 b	13.62±0.1 a

a,b, and *c* alphabets show the group division that *a* is the most and *c* is the least level.

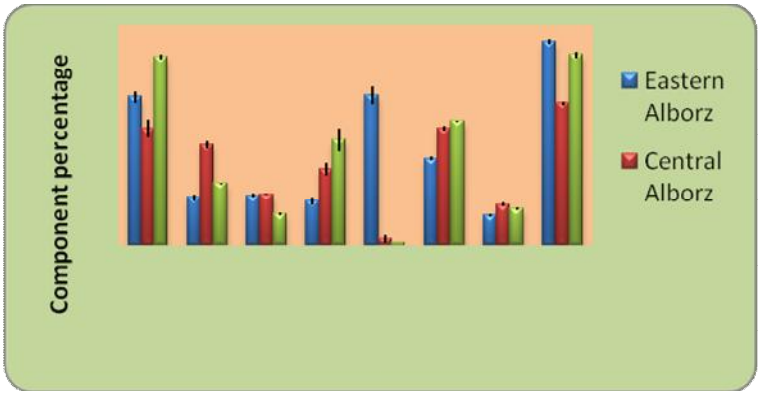

Fig. 2: the effects of habitats on common composition percentages of essential oil from Stachys Lavandulifolia species

DISCUSSION

As heretofore is told, the geographic dispersion of plants species depended to ecological circumstances in each area. The production rate of these species, however, change because of metabolically activities of plant are considerably influenced by the environmental conditions which effect on the growth of medicinal plants and their effective matters' quality and quantity. On the basis of current results, the essential efficiency of *Stachys Lavandulifolia* species has varied in three sites, so that it was the highest rates in the western Alborz and the least rate in the eastern Alborz. The eastern Alborz has some environmental feature such as desirable rainfall and temperature to growing of this species, in order that the species has abled to more establishing around of debris and bouldery areas. While in the eastern Alborz site, the altitude of Alborz is reducing and the low rain and increasing of temperature are caused to disturb the establishing and dispersion of the species. Therewith, soil formation of the western Alborz is karstic formation along with clay-sandy-silty soil texture that provides the best situation to growing of *Stachys Lavandulifolia*. The eastern Alborz area, however, has marn formation in soil together with conglomerated rocks and it is plutonic rocks along with marn-clay soil texture in the central Alborz. The results of current research prove the others achievements; for instance, Hethelyi *et al.* [20] and Craveiro et al. [11], in their studies on *Tagetes* species, have similarly revealed that the percentages of essential oils compositions were different in various areas. Rahimmalek *et al.* [32], in their researches on Achillea species, have also pointed out that there were different components of the essential oils in some areas. Moreover, the results have shown that habitat effects on essential efficiency and grouping of sites via the Duncan method has shown that the essential efficiency of the western Alborz apropos of the eastern and central Alborz habitats was the highest rates. The researches of Bagchi et al. [5] on essential oil of *Artemisia annua*, Kizil [22] on essential oil of *Thymus spicata*, Saei'Dehkordi *et al*. (2010) on essential oil of *Zataria multiflora*, and Barazandeh [6] on essential oil of Salvia hydrangea in different area have

similarly achieved the same results as the quantity and quality of the essential components in each species depend to physiologic and environmental conditions.

As the result section can be seen, the habitats effects on components percentages of alpha-Pinene, beta-Myrcene, Bicyclogermacrene, beta-Pinene, α-Terpineol, Germacrene D, and Hexadecanoic acid in $P<0.01$ and on α-Cadinol in $P<0.05$ were significant. This situation refers to fluctuating of metabolical activities of the species under different factors of growing area condition. Qua the highest percentages of compositions refer to Hexadecanoic acid in the eastern Alborz and the least rates depend on α-Terpineol component from the western Alborz. Into the bargain, the component of Hexadecanoic acid, as the main elements in the species, apropos of the others was the most in three sites. Some components were also found in one or two habitats. For instance, Tetradecanal,Dodecanoic acid, and Nonacosane in the eastern Alborz; β-Ocimene,Epizonaren, and Heneicosane in the central Alborz; and α-Cubebene, IsoCaryophyllene, and Linoleic acid in the western Alborz habitat were found. If there is some differences between the essential rate and components percentages of Hexadecanoic acid and alpha-Pinene as well as the differences in detail components percentages in three sites, it is because of habitats circumstances such as climate, temperature, and soil textures. From the other point of view, these varieties can be referred to metabolic processes and their path to build up the components. If there are borderline components to form a specific element in the essence, it can change the path of metabolism based upon changing of environmental conditions [25].

CONCLUSION

As for order is discussed, *Stachys Lavandulifolia* has been mostly found on shallow slopes, especially on the upland humid crests. Hence, the western Alborz is the best environments for the species because of semi humid cool climate, higher rainfall, less temperature, and karstic formation along with clay-sandy-silty soil texture. Therefore, the western Alborz is the place where provides desirable condition to obtain the best production of essential oil of the species for different application, especially for medicinal requisitions.

REFERENCES

1. Adams, R P., 2007. Identification of Essential Oil Components by Gas Chromatography/Mass Spectrometry, 4th Edition, Allured Publishing Corporation. USA, 804p.
2. Ahmadi, F., Sadeghi, S., Modarresi, M., Abiri, R. And Mikaeli, A., 2010. Chemical composition, in vitro anti-microbial, antifungal and antioxidant activities of the essential oil and methanolic extract of Hymenocrater longiflorus Benth, of Iran. Food and Chemical Toxicology 48(5): 1137–1144.
3. Ayliffe, G.A., Green, W., Livingston, R. and Lowburry, E.J.L., 1997. Antibiotic resistant *staphylococcus aureus* in dermatology and burn wards. Journal of Clinical Pathology, 30: 40-44.
4. Babakhanlo, p., Mirzai, M., Sefidkon, F., Ahmadi, L., Barazandeh, M.M. and Asgari, F., 1998. (Flor of Iran) Medical and aromatic plant research instate of forests and rangelands. 1st ed.Tehran, Ministry of Jahan-e-Agriculture: 64-82.
5. Bagchi, G.D., Haider, F., Singh, P.D. and Naaqvi, A.A., 2003. Essential oil constituents of *Artemisia annua* during different growth periods at Monsoon conditions of subtropical North Indian Plains. Journal of Essential oil Research, 15, 248-250.
6. Barazandeh, M.M., 2004. Volatile constituents of the oil of *Salvia hydrangea* DC, ex Benth. from Iran. J. Essent, Oil Res, 16: 20-21.
7. Chalchat, J. C., Petrovoic, S. D., Maksimovic, Z. A. and Gorunovic, M. S., 2000. Journal of Essential Oil Research, 12: 445.
8. Christos, N.H., 2010. Chemical compounds and essential oil release through decomposition process from *Lavandula Stoechas* in Mediterranean region. Biochemical Systematics and Ecology 38: 493–501.
9. Clark, A.M., 1996. Natural Products as a resource from new drugs. Pharm, Res. 13: 1133 -1144.
10. Cowan, M.M., 1999. Plant products as antimicrobial agents. Clinical Microbiology Review, 12: 564-582.
11. Craveiro, A.A., Matos, F.J.A., Machado, M.I.L. and Alencar, J.W., 1988. Essential oils of *Tagetes minuta* L, from Brazil. *Perfumer & Flavorist*, 13: 35-36.
12. Davazdahemami, S., 2002. Application of medicinal plants. Nasooh publications, Isfahan, 113p.
13. Demirci, F., Guven, K., Demirci, B., Dadandi, M.Y. and Baser, K.H.C., 2008. Antibacterial activity of two *Phlomis* essential oils against food pathogens. Food Control 19(12): 1159–1164.
14. Dupont, B.F., Dromer, F. and Improvisi, L., 1996. The problem of resistance to azoles in Candida. Journal of Medical Mycology, 6(II): 12-19.
15. Farzaneh, M., Ghorbani-Ghouzhdi, H., Ghorbani, M. and Hadian, J., 2006. Composition and antifungal activity of essential oil of *Artemisia sieberi* Besser on soil borne on phytopathogen. Pakistan Journal of Biological Sciences, 9(10): 1979-1982.
16. Ghahraman, A., 1994. Cormophytes of Iran. Iran University Press, Tehran.
17. Ghelichnia, M., 2001. Surveying of dispersion and ecology of 36 aromatic species in Mazandaran province, publication of plan and programing and coordination in research occupations of Jehad Sazandegi ministration, 111p.

18. Goncalves, M.J., Cruz, M.T., Cavaleiro, C., Lopes, M.C. and Salgueiro, L., 2010. Chemical, antifungal and cytotoxic evaluation of the essential oil of *Thymus zygis* subsp. Sylvestris. Industrial Crops and Products, 32: 70–75.
19. Harborne, J.B., 1988. Introduction to ecological biochemistry. Dept. of Botany, the university of Reading, England.
20. Hethelyi, E., Danos, B., Tetenyi, P. and Koczka, I., 1986. GC/MS analysis of essential oils of some *Tagetes Species*, In: Progress in Essential Oil Research.Edit, Brunke EJ, Walter de Gruyter, Berlin: 131 - 7.
21. Javidnia, K., Miri, R., Moein, M.R., Kamalinejad, M. and Sarkarzadeh, H., 2006. Constituents of essential oil of *Stachys pilifera* benth. Iran J Essential Oil Res (JEOR), 18: 275-7.
22. Kizil, S., 2010. Determination of essential oilvariations of *Thymbra Spicata* var. *spicata* L. naturally growing in the wild flora of East Mediterranean and Southeastern Anatolia regions of Turkey. Industrial Crops and Products, 32(3): 593-600.
23. Lai, F., Wissing, S.A., Müller, R.H. and Fadda, A.M., 2006. *Artemisia arborescens* L. essential oil-loaded solid lipid nanoparticles for potential agricultural application, Preparation and characterization. AAPS Pharmaceutical Science and Technology, 7(1): 10- 18.
24. Maleki, N., Garjani, A., Nazemiyeh, H., Nilfouroshan, A., Eftekhar, S. and Allameh, h., 2001. Potent anti-inflamatory activities of hydroalcholic extract from aerial parts of *Stachys inflate* on rat. J Ethnopharmacol, 75(2): 13-218.
25. Mehrpour, Sh., Sefidkon, F., Mirzaei'nadoshan, H., Majd, A, 2002. The essential compering of four associates of Thymus kotschyanus in filed and greenhouse conditions. Iranian journal of aromatic and medicinal plants, 20(2): 159-169.
26. Mos'hefi, M.H., Mofidi, A., Mehrbani, M., &Mehrbani, M., 2009. Investigation of factures and ani-bacterial effects of essential oil in Stachysacerosa Boiss., Medicinal plants journal, 9(33): 108-115.
27. Nascimento, G.G.F., Locatelli, J., Freitas, P.C. and Silva, G.L., 2000. Antibacterial activity of extracts and phytochemicals on antibiotic resistant bacteria. Brazilian Journal of Microbiology, 31(4): 245-256.
28. Omidbeygi, R., 1995. Approaches of production and output of medicinal plants, Fekre Now publications, 283p.
29. Palevitch, D., 1987. Recent advances in cultivation of medicinal plants. Acta Horticulturae, 208: 29-34.
30. Rabbani, M., Saggadi, S.E. and Jalali, A., 2005. Hydroalcohol extractandfractions of *Stachys Lavandulifolia* vahl: effect on spontaneous motor activity and elevated plus – maze behavior. phytother Res, 19(10): 8-854.
31. Rabbani, M., Saggadi, S.E. and Zarei, HR., 2003. Anxiolytic effects of *Stachys Lavandulifolia* vahl on the elevated plus – maze model of anxiety in mice. J Ethnopharmacol, 89(2-3): 6 -271.
32. Rahimmalek, M., Sayed Tabatabaei, B., Etemadi, N., Goli, A., Arzani, A., Zeinali, H., 2009. Essential oil variation among and within six *Achillea Species* transferred from different ecological regions in Iran to the field conditions. Industrial Crops and Products, 29(2-3): 348-355.
33. Rana, B.K., Singh, U.P. and Taneja, V., 1997. Antifungal and kinetics of inhibition by essential oil isolated from leaves of *Aegle marmelos*. Journal of Ethnopharmacology, 57(1): 29-34.
34. Rechinger, K.H. and Hedge, I.C., 1982. Flora Iranica Akademiche Druck verlag sanstalt ,Gras . Austria, 150-159 , 360 – 365.
35. Saei-Dehkordi, S., Tajik, H., Moradi, M., Khalighi-Sigaroodi, F., 2010. Chemical composition of Essential oil in *Zataria multiflora* Boiss, From Different parts of Iran and their radical scavenging and antimicrobial activity. Food and Chemical Toxicology, 48(6): 1562-1567.
36. Savadkoohi, F., 2007. Investigation of vegetation covers of upland rangeland of Gaddook in Mazandaran province using eco-phytosociology, Ms. Thesis, 147p.
37. Tatian, M.R., 2001. The phytosociologic study of upland rangeland of Hezarjarib (Beh'shahr). Ms. Thesis, 128p.
38. Theriault, M., Caillet, S., Kermasha, S. and Lacroix, M., 2006. Antioxidant, Antiradical and antimutagenic activities of phenolic compounds present in maple products Food chem. 98: 490 - 501.
39. Vagionas, K. , Graikou, K. , Ngassapa ,O. , Runyoro , D. and Chinou, I., 2007. Composition and antimicrobial activity of the essential oils of three *Satureja Species* growing in Tanzania. Food Chemistry 103: 319–324.
40. Vagujfalivi, D., 1968. Studies on the physiology of plants containing alkaloid. Ph.D. Dissertation, Budapest.
41. Yanive, Z. and Palevitch, D., 1982. Effect of drought on the secondary metabolites of medicinal and aromatic plants, In: cultivation and utilization of medicinal plants Regional Research Laboratory council of Scientific and Industrial Research, Jammu-Tawi.1-12. CSIR, 294: 837-843.
42. Zargari, A., 1993. Medicinal plants, University of Tehran press, Iran, Vol. 4, 1-153pp.

CITATION OF THIS ARTICLE

S.S. Mahzooni Kachapi, M. Mahdavi, M.H. Jouri, M. Akbarzadeh, L. RoozbehNasira'ei, F. Rezazadeh. The Evaluation and Determination of Chemical Compositions in the Essential of *Stachys lavandulifolia* Vahl. in Three Sites in Alborz Mt. (Iran). Bull. Env. Pharmacol. Life Sci., Vol 3 [Spl Issue V] 2014: 210-217