THE ESSENTIAL OIL COMPONENTS OF MUSA SAGE (*Salvia tigrina* Hedge & Hub.-Mor.)

HAMİT AYANOĞLU¹, FİLİZ AYANOĞLU²

¹Ministry of Agriculture, Retired Undersecretary, Ankara, Turkey, hamitayanoglu@yahoo.com

²Hatay Mustafa Kemal University, Faculty of Agriculture, Field Crops Department, Turkey, filizayanoglu@gmail.com

There are more than 100 species of *Salvia* genus distributed in the flora of Turkey, and 58 of them are endemic. 24 *Salvia* species are distributed in Hatay flora and 5 of them are endemic. *Salvia tigrina* Hedge & Hub.-Mor., named Musa Sage, because it is found in the Musa mountain in Hatay, is a species that attracts attention with its red-spotted flowers on yellow. In the study, which was the first study on the essential oil of Musa sage (*S. tigrina* Hedge & Hub.-Mor.), the essential oil components of leaf samples of plants collected from Musa Mountain were determined. Plant samples were dried and then hydrodistilled with neo-clevenger apparatus. Since the plant contained essential oil very low levels, hexane was used as solvent in the obtaining essential oil. As a result of the GCMS analysis 38 different compounds (98,64%) were analyzed in the essential oil of Musa sage (*S. tigrina* Hedge & Hub.-Mor.). The main compound of species was characterized by a high content of α -humulene (C₁₅H₂₄) with 17.52%, followed by 2,5,9-Trimethylcycloundeca-4,8-dienone (C₁₄H₂₂O), α -cadinol with 6,68% and α -cedrene with 5,92% respectively.

Keywords: *Salvia tigrina*, Musa sage, essential oil.

INTRODUCTION

Turkey is as an important center because of its rich biological diversity. The flora of Turkey has around 12000 taxa (species, subspecies, varieties) with 8988 native plant species and 2,991 endemic plant species (Ekim, 2000; Erik and Tarıkahya, 2004; Bayram *et al.*, 2010; Tan, 2010). Hatay province where the study conducted especially with Amanos Mountains is one of the richest place among the location which is rich for their biological wellness in Turkey. There are more than 250 endemic species in this mountain region. Endemic plants are rare plants which are endangered (Erik and Tarıkahya, 2004; Çakan and Byfield, 2005; Vural and Aytaç 2005; Avcı, 2005). The area which is rich for their biological diversity is represented by 107 family, 520 cins and 1300 taxa (Anonymous, 2008).

With around 900 species of the genus *salvia* in the world, 96 in Turkey and 24 species are naturally found in Hatay (Davis, 1988; Kandemir, 2003; Demirci *et al.*, 2002, Düzenli and Çakan, 2001; Turkmen and Düzenli, 1998; Ayanoğlu *et al.*, 2017, Bahadırılı *et al.*, 2017). Some of endemic ones of these species, endangered species (EN) group, some of them in vulnerable species (VU) group and one the other threatened with the lower risk (LR) species group. In addition, there are two species which are not endemic included in the vulnerable (VU) group (Ekim *et al.*, 2000).

Salvia tigrina Hedge & Hub.-Mor. described as “a perennial herb. Endemic. East Mediterranean element. Stems erect, to 60 cm, unbranched, quadrangular, glabrous and glaucous below, glandular-villous above. Leaves pinnatisect, 8-11 x 5-7 cm and 2 pairs of smaller lateral segments, margins subentire; petiole c. 8 cm. Verticillasters 3-5-flowered, clearly distant. Bracts oblong, c. 4 mm. Pedicels 6-9 mm, erecto-patent. Calyx tubular-infundibular, 16-19 mm, glandular-villous; upper lip tridentate with c. 2 mm spinulose teeth. Corolla yellow with dark brown spots, 32-36 mm; tube straight, densely annulate c. 9 mm from base; upper lip $\pm$ straight, 8-10 mm. Stamens A. Nutlets $\pm$ ovate, smooth, c. 5x4 mm. Fl. 6. Hedges, c. 800 m. Known only from the type gathering.

Differing from *S. recognita* in the yellow corollas, longer pedicels and flowering calyces" (Davis, 1988).

Salvia essential oil has an important place in pharmacy, because it brings back the body lost energy, memory and strengthens the liver and also sage known to be used strengthening the nervous system. In addition to use for medical purposes, as well as cosmetics, food, tea, and there is also the use as an ornamental plant (Gurbuz, 1993; Demirci *et al.*, 2002).

Studies on the essential oils of some species of sage that grows naturally in Anatolia, main components of *S. albimaculata*, *S. aucheri* var. *canescens*, *S. syriaca*, *S. potentillifolia*, *S. candissima* ssp. *occidentalis*, *S. macrochlamys*, *S. poculata*, *S. tomentosa*, *S. recognita*, *S. virgata*, *S. palaestina* and *S. ceratophylla* were identified and it was determined that some of them has 14 monoterpenes and 13 oxidized monoterpene (Karaman, 2006; Tanker *et al.*, 1985; Gören *et al.*, 2006; İpek *et al.*, 2008). The aim of the study is to determine the essential oil components of *S. tigrina* Hedge & Hub.-Mor. which is endemic to Turkey and grows naturally in the region. This is the first report on the essential oils of *S. tigrina* Hedge & Hub.-Mor.

MATERIALS AND METHODS

Plant Materials

S. tigrina Hedge & Hub.-Mor. grow naturally on the Musa Mountain which is part of The Amanous mountains in province of Hatay was used as material. Plants were harvested at the beginning of flowering period, when the amount of active substance was most intense and after being dried in the shade at room temperature. The following features of these examples were taken from the plants natural habitat environments.

Essential Oil

Dried leaves of *S. tigrina* Hedge & Hub.-Mor. were hydrodistilled for three hours and the essential oil ratio were determined volumetrically by using Neo-Clevenger apparatus.

GC/MS Analysis

Essential oil components were determined by using "Single quadrupole Thermo Scientific ISQ" gas chromatography and mass spectra with TR-5MS (5% Phenyl Polysilphenylene-siloxane, 0.25 mm x 30 m id, film thickness 0.25) column. 99.9% purity, helium as carrier gas of 1 mL / min was used. Ionization energy of 70 eV. Amu mass range 1.2-1100, MS transfer line temperature 250°C, ion source temperature 220°C, injection temperature 220°C is set to block. Samples were injected with 250 split ratio. Injection amount and oven temperature of 50°C to 220°C 1µl set to 3°C/min is set to increase. As a result of analysis of each component using the Xcalibur software library (Wiley and NIST) by comparing the automatically defined.

RESULTS

The results of analysis of the essential oils obtained by water distillation are shown in Table 2.

The results of analysis of the essential oils obtained by hydrodistillation are shown in Table 1 and chromatogram in Figure 1. Because the plant contain of essential oil has very low levels, hexane was used as solvent in the obtaining essential oil.

Figure 1. GC/MS chromatogram of *Salvia tigrina* Hedge & Hub.-Mor.

Table 1. Essential oil components of *Salvia tigrina* Hedge & Hub.-Mor.

RT	Compound Name	SI	RSI	Cas #	%
3,38	α -pinene	992	995	80-56-8	0,94
5,97	β -myrcene	974	986	123-35-3	0,43
6,80	l-limonene	976	993	5989-54-8	0,62
7,04	β -phellandrene	981	988	555-10-2	0,47
8,90	P-cymene	956	960	99-87-6	0,34
15,25	α -cubebene	970	979	17699-14-8	1,51
16,41	α -copaene	961	978	3856-25-5	0,79
17,27	Camphor	971	981	76-22-2	0,60
20,23	trans-caryophyllene	991	994	87-44-5	1,62
22,89	α -humulene	991	995	6753-98-6	17,52
23,68	α -muurolene	961	983	31983-22-9	1,25
26,19	δ -cadinene	962	987	483-76-1	2,17
26,54	Neryl acetate	989	990	141-12-8	1,54
28,82	Calamenene	972	989	483-77-2	4,12
30,79	Junipene	869	875	475-20-7	1,02
31,27	Geranyl Butyrate	888	963	106-29-6	0,34
31,61	Naphthalene, 1,2-dihydro-1,5,8-trimethyl	785	824	4506-36-9	0,37
32,54	Ledene	884	889	21747-46-6	1,40
33,60	Caryophyllene oxide	973	982	1139-30-6	8,75
35,45	2,5,9-Trimethylcycloundeca-4,8-dienone	866	868	NA	16,35
35,72	Bicyclogermacrene	860	899	100762-46-7	0,58
36,21	Junipene	878	880	475-20-7	0,57
36,43	α -cedrene	877	880	469-61-4	5,92
37,06	Veridiflorol	934	967	552-02-3	2,64
37,17	Elemol	971	972	639-99-6	2,65

RT	Compound Name	SI	RSI	Cas #	%
38,39	Spathulenol	973	974	77171-55-2	3,35
39,02	Ledene	853	857	21747-46-6	0,37
39,14	Alloaromadendrene oxide	851	878	NA	0,79
39,76	Guaial	920	924	489-86-1	0,49
39,85	δ -cadinol	947	947	36564-42-8	4,75
41,27	Azulene, 1,4-dimethyl-7-(1-methylethyl)	701	976	489-84-9	2,42
41,48	β -cudesmol	893	944	473-15-4	1,84
41,65	α -cadinol	963	981	481-34-5	6,68
44,26	2H-Pyran, 2-(7-heptadecyloxy)tetrahydro-	853	853	56599-50-9	1,28
44,81	1-Naphthol, 1,2,3,4-tetrahydro-4,5,7-trimethyl-	700	775	32281-79-1	0,43
45,19	Neocloven oxid-alcohol	886	911	NA	0,37
45,65	Isolongifolene, 4,5,9,10-dehydro-	760	792	156747-45-4	0,52
54,69	Phenethyl benzoate	952	986	94-47-3	0,84

DISCUSSION AND CONCLUSION

Thirty eight compounds were determined in the oil of *S. tigrina* Hedge & Hub.-Mor. representing 98.64% of the total oil. The main compound of species was characterized by a high content of α -humulene ($C_{15}H_{24}$) with 17.52%, followed by 2,5,9-trimethylcycloundeca-4,8-dienone ($C_{14}H_{22}O$) with 16.35%, caryophyllene oxide with 8.75%, α -cadinol with 6.68% and α -cedrene with 5.92%, respectively. GCMS analyzes show that *S. tigrina* Hedge & Hub.-Mor. essential oil consists of mainly sesquiterpenes.

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