

ESSENTIAL OIL COMPOSITION IN THREE CULTIVARS OF *OCIMUM* L. IN ALBANIA

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Abstract - Basil is an important medicinal and aromatic plant. This paper presents quantitative and qualitative analyses of the essential oils obtained from an autochthon cultivar of *Ocimum basilicum* L. and two other Italian cultivars, *O. basilicum* L. cv. purple and *O. basilicum* L. green basil with wide leaves. In the volatile oil of *O. basilicum* L. cv. with green wide leaves, twelve components were characterized, representing 90% of the total oil, of which linalool (45.3 %) and eugenol (42.06 %) were the major components. In the volatile oil of *O. basilicum* L. cv. purple, nine components were characterized representing 90% of the total oil, of which farnesene (14.94%), elemol (11.29%) and carvacrol (9%) were the major components. In the *O. basilicum* L. cv. (autochthon) cultivar with green narrow leaves, twelve components were characterized representing 90% of the total oil, with Linalool (48 %) and eugenol (36.09 %) as the major components. Linalool (Raguso et. al., 1999) is the dominant constituent in the two cultivars; There was no big difference between the two green cultivars with different leaf morphology in their oil content. These results suggest that further research to improve the quality of the essential oil content is necessary.

Keywords: Essential oil; GC-MS; linalool.

INTRODUCTION

The family *Lamiaceae* is a pleasant smelling perennial shrub that grows in several regions all over the world. Basil is one of the species used for commercial seasoning. The presence of essential oils and their composition determines the specific aroma of plants and their flavor. The genus *Ocimum* is characterized by great variability of species, including morphology, the color of flowers, leaves and stems, and chemical composition. Different authors have grouped basil into a subgenus based on its chemical composition or morphology (Chiang et. al., 2005; Moudachirou et. al., (1999).

The leaves and flowering tops of sweet basil are used as stomachic and antispasmodic medicinal plants in folk medicine (Chiej 1988; Duke 1989). There are many cultivars of basil which vary in their leaf color (green or purple), flower color (white, red, purple) and aroma (Morales et.al., 1996). *Ocimum* spp. contains a wide range of essential oils rich in phenolic compounds and a wide array of other natural products including polyphenols such as flavonoids and anthocyanins (Phippen et. al., 1998). There is extensive diversity in the constituents of the basil oils, and several chemotypes have been established from various phytochemical investigations, (Simon et.al., 1990). Linalool, eugenol, farnesene

and elemol are the major components of the oils of different chemotypes of *O. basilicum* (Grayer et. al., 1996; Marotti et. al., 1996; Chalchat et. al., 1999). The present study describes the composition of the essential oils of three basil cultivars cultivated in the Botanical Garden near the Agricultural University of Tirana, Albania. This is the first study of the oil contents of *Ocimum* specimens with different morphological characteristics. The aim was not only to evaluate the basil cultivars according to their essential oil content and composition but also to distinguish their ornamental value. The morphological development of cultivars was observed to assess the best time of harvest for aromatic and medicinal purposes, (Svecova et. al., 2010). The essential oil content was examined qualitatively and quantitatively to assess the potential of the cultivars for industrial use (Svecova et. al., 2010).

MATERIALS AND METHODS

The plants were cultivated in the Botanical Garden near the Agricultural University of Tirana, Albania. The average temperature from April to July was 18°C with 200 mm of rainfall. A drip-irrigation system was installed to provide water when necessary.

The plants were transferred to a field 40 to 45 days after germination. Each cultivar was represented by 20 plants. The distance between the plants was 0.4 m in the rows and 0.6 m between the rows. Plants were harvested at the beginning of flowering from the middle of June to the end of July in 2011. The plants were identified at the Botany Department of the Faculty of Agriculture and Environment, Tirana.

For laboratory analyses, we used the GS-MS method.

Isolation of the oils

The essential oils were isolated by hydrodistillation, using a Clevenger-type apparatus. The distilled oils were dried over anhydrous sodium sulfate and stored in tightly closed dark vials at 4°C until the analysis. GC-MS analysis was carried out on a Shimatzu 20-10

gas chromatograph fitted with a fused silica HP-5MS capillary column (30 m × 0.25 mm; film thickness 0.25 µm). The oven temperature was programmed from 60°-280°C, 4°C/min. Helium was used as carrier gas at a flow rate of 2 ml/min. The gas chromatograph was coupled to a Shimatzu 20-10 mass selective detector. The MS operating parameters were: ionization voltage 70 eV, ion source temperature, 300°C.

Identification of the components of the volatile oils was based on a retention index and computer matching with the Wiley 275.L library, as well as by comparison of the fragmentation patterns of the mass spectra with those reported in the literature (Adams 1995; Swigar et. al., 1981). The retention index (RI) was measured on an HP-5MS column. For RI calculation, a mixture of homologues *n*-alkenes (C9-C18) was used under the same chromatographic conditions as for the analysis of the essential oils.

RESULTS AND DISCUSSION

Only a few articles have examined the concentration and composition of essential oils in basil with specific morphological characteristics (Morales 1996; Keita et. al., 2000; Moudachirou et.al., 1999; Sanda et. al., 1998).

The chemical compositions of the essential oils of *Ocimum basilicum* L. are given in Table 1 in the order of the retention times of the constituents. Twelve components of the oil of *O. basilicum* L. cv. green wide leaves, nine components of the oil of *O. basilicum* L. cv. purple and twelve components of the oil of *O. basilicum* L. cv. green narrow leaves, were identified. The main components in the *Ocimum* with wide leaves were linalool (45.03%), representing the most important compound in the genus, followed by eugenol (42.06%). In the oils obtained from aerial parts of *O. basilicum* grown in Colombia and Bulgaria, linalool was reported as the major component of volatile oils (14% and 15%, respectively) (Vina et. al., 2003; Benitez et. al., 2009; Jirovetz et. al., 2001). Nine components of the oil of *O. basilicum* L. cv. purple were identified and the main constituents were farnesene (14.94%), elemol

Table 1. Essential oil composition in three cultivars of *Ocimum* L. in Albania.

Nr	Compounds	Retention time	Composition (%)		
			Cv. wide leaf	Purple basil	Cv. Narrow leaf
1	Thymol	2.859	1.81	2.93	0.99
2	Carvacrol	2.943	4.31	9	4.36
3	Trans- Caryophyllene	3.280	7.58		6.66
4	Linalool	5.059	45.3		48
5	Farnesene	6.578	1.58	14.94	1.05
6	Eugenol	7.463	42.06	1.34	36.09
7	Neryl acetate	8.292	0.68		0.12
8	Lavandulol	10.998			0.84
9	Caryophyllene oxide	11.223	3.50	5.14	3.02
10	Cardinol	14.476	0.80		0.62
11	Elemol	14.798		11.29	
12	γ -cadinene	15.291		3.36	
13	Spathulenol	16.548	2.78	5.78	
14	α -cadinol	18.416	0.56	0.4	0.33
15	Oxalic acid	20.299	2.07		2.10

Cv – Cultivar; RT – Retention time in minutes.

(11.29%) and carvacrol (9%). According to other studies, geraniol and methyl chavicol are the main components in the oil of *O. basilicum* L. cv. purple in Turkey and Iran (Özcan et. al., 2002; Sajjadi 2006). In the *O. basilicum* L. cv. green narrow leaves (autochthon cultivar), twelve components were identified and the main components were linalool (48%) and eugenol (36.09%). The observed differences may be due to different environmental and genetic factors, different chemotypes and the nutritional status of the plants, as well as other factors that can influence the oil composition.

The results of this study indicate that the composition of the volatile oils of cultivars cultivated in Albania is similar to those reported from Iran (Sajjadi 2006) and Turkey (Özcan et. al., 2002). These results show that *O. basilicum* green narrow leaves (autochthon cultivar) is the most interesting species from an economic point of view. Lawrence (1988) proposed several chemotypes based on the composition of the essential oils. For determination of probable chemotypes, further investigations are required.

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