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Essential Oils of Lamiaceae Family from South East Mediterranean Region (Turkey)

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Abstract: The plants belonging to Lamiaceae family were collected in K.Maras City during 1998-2000 vegetation period. During floristic studies 23 genera and 70 species were determined. The distribution of these taxa according to phytogeographic regions were as fallow; 27-Mediterranean, 15-Cosmopolitan, 2-Euro-Siberian and 26-Irano-Turanian. 15 of which were endemic and 6 species were rare. The proportion of the endemism in area was 21.4 % for this family. The essential oil contents of the plants were also identified.

Key words: Lamiaceae, essential oil, flora, Turkey.

Introduction

Aromatic plants have a wide variety of economic uses for many centuries, in areas of cooking, medicine, cosmetics, fuel (Box, 1982). Lamiaceae (Labiatae) family is known for the wealth of species with medicinal properties, which have been used since early times and many of these species are very common in Mediterranean region (Yaniv, 1982). Turkey is situated in temperate Mediterranean climate zone, and it belongs to Eurasia provinces between three floristic region, Mediterranean, European-Siberian, Irano-Turanian. The complex physic-geographical structure of this country has objectively determined the formation of various, specific edaphic and climatic conditions together with other environmental conditions.

Turkey is regarded as an important gene-center for Labiatae. The family is represented in Turkey by 45 genera, 546 species and a total of 731 taxa. The rate of endemism in the family is 44.2%. In terms of endemism, Labiatae family is the third richest family in Turkey (Baser, 1993). More than fifty plants are named and used as " kekik" in Turkey. Most of them belong to genus Thymus but some are of other genera *Origanum, Majorana, Satureja* and *Thymbra* (Ozguven and Tansý, 1998). *Origanum* is the principle crop exported as kekik from Turkey and exportation of the kekik has reached 6.000 tonnes in 1995 (Ozhatay and Atay, 1997). These materials obtained from natural habitats and thus some valuable species are threatened from extinction (Ceylan *et al.*, 1999).

Present study reports the distribution of the South East Anatolian Labiataes and their essential oil contents. A few literature (Kara, 1997; Duman, 1990) mentioned about the vegetation and flora of some parts of the K. Maras provinces, but there has been no previous reports on distribution of Labiatae essential oils in these areas.

Materials and Methods

The research materials consist of plant specimens collected during field studies of K.Maras provinces on different dates and different periods of vegetation from 1998-2000.

The research area, falls within C_6 of the grid system adopted by Davis (1982), in South East Mediterranean Region and an altitude of 37^0 36'N and longitude 37^0 56' E and 568 m above sea level. The study area covers Ahýr (2100m), Baskonus (1800 m) and Cimen (2300 m) mountains, which are the highest points in area. Three main vegetation types can be distinguished in study area: Macchie vegetation (from 500m to 980m), Forest vegetation (From 600m to 1800m), Steppe vegetation (mostly found just above the timber line at 1600m and 1900m in clearing the forest), (Turkmen and Duzenli, 1998). The main characteristics of this area are dry summer, warm- and rainy winters.

The survey was conducted during vegetation period March-October. The taxonomic identity of the collected plants was confirmed by authors using various floristic studies (Davis, 1982., Duman, 1990., Kara, 1997). Voucher specimens were deposited at Department of the Biology, Faculty of Science, University of K.S.U.

The collected plants were dried at room temperature and before the analysis, flowering parts were separated from stem.

The essential oils of dried flowering parts was extracted by distillation for 3 hours under continuous steam using a Clevenger apparatus according to standard procedure described in European Pharmacopoeia (1975) for determining the oil content (%).

Results and Discussion

Floristic records: In the study area 23 genera and 70 species belonging to Lamiaceae family were identified. The dispersion of plant taxa that were defined in the study area are given in Table 1. According to Table 1, 27 of the species are Mediterranean element, 26 are of Irano-Turanian, 2 are of Euro-Siberian, and 15 are of cosmopolitan element. The data obtained about floristic research indicate that the most common element is Mediterranean element. Irano-Turanian elements are almost similar species number with Mediterranean region, as there are many steep and Plato areas spread in study area.

Salvia is the largest genus in study area and 15 species (*Ajuga relicta, Scutellaria salviifolia, Scutellaria orientalis* ssp. *santalonoides, Phlomis linearis, Lamium garganicum* ssp.*nepetifolium, Wiedemanniana orientalis, Marrubium globosum* ssp.*globosum, Stachys cretica* ssp., *anatolica, Stachys cretica* ssp. *mersinae, Stachys pumila, Nepeta sorgerae, Nepeta aristata, Micromeria cristata* ssp., *orientalis, Salvia recognita, Salvia pilifera)* are obtained as endemic plants. The proportion of endemism in the area is high (21.4%). The endemism ratio of Lamiaceae for Turkey is 44.2%. It is well known that endemic species are mostly found on high mountains and in places, where ecological diversity is rich (Ocak and Tokur, 2000). Also altitude for this area is limited to 500-2300m.

According to literature (Anonymous, 1989) *Ajuga relicta* is insufficiently known, and collected only in K. Maras City (Ahýrdagi mountain) by Davis in 1907 (Davis, 1982). *Micromeria cristata* spp. *orietalis, Origanum bargyli, Stachys pumila, Phlomis kotschyana* and *Salvia cassia* are of rare category and the other taxa are not threatened.

Table 1: Data on Lamiaceae family and essential oil content in K. Maras

Genus Name	Species Name	Yield (%)	Altitude (m)	Collected area	Herbarium No
Ajuga	*A. orientalis*	0.03 ml	1450	Forest	811
	A. relicta		1500	Forest	799
	A. chamaepitys ssp. *laevigata*	0.05 ml	500	Open places	728
Teucrium	*T. multicaule*	0.034 ml	750	Forest	744
	T. chamaedrys ssp.*lydium*	0.16 ml	1600	Steppe	814
	T. polium	0.20 ml	1650	Steppe	725
Scutellaria	*S. ribicunda* ssp.*subvelutina*	0.04 ml	580	Open places	763
	S. salviifolia		1550	Openness forest	823
	S. orientalis ssp.*pinnatifida*	0.075 ml	1700	Steppe	721
	S. orientalis ssp.*santolonoides*	0.083 ml	1300	Open places	731
	S. tomentosa	0.22 ml	1550	Quercus Shrubs	822
Eremostachys	*E. laciniata*	-------	1400	Open places	805
Phlomis	*P. pungens var.hirta*	0.025 ml	600	Field sides	785
	P. viscosa	0.083 ml	1100	Stony places	742
	P. kotschyana	0.066 ml	1500	Stony places	755
	P. linearis	0.03 ml	1100	Open places	752
Lamium	*L. garganicum* ssp. *nepetifolium*	0.03 ml	1200	Stony slopes	729
	L. aleppicum	------	1600	Stony places	730
Wiedemanniana	*W. orientalis*	------	1000	Ostraya Shrubs	727
Ballota	*B. nigra* ssp.*uncinata*	0.044 ml	650	Open places	753
Marrubium	*M.vulgare*	-----	580	Roadsides	765
	M. parviflorum ssp. *parviflorum*	-----	650	Screes	782
	M. globosum ssp. *globosum*	0.04 ml	1600	Steppe	732
	M. astracanicum ssp. *astracanicum*	0.03 ml	1800	Steppe	817
Sideritis	*S. syriaca* ssp. *nusairiensis*	0.07 ml	1600	Forest	714
	S. perfoliata	0.48 ml	550	Open places	764
Stachys	*S. ehrenbergii*	0.02 ml	1400	Stony slopes	724
	S. cretica ssp. *anatolica*	0.066 ml	1400	Stony slopes	726
	S. cretica ssp. *cassia*	0.033 ml	1500	Forest	787
	S. cretica ssp. *mersinae*	-----	800	Stony slopes	770
	S. pumila	0.13 ml	850	Rocky	786
	S. lavandulifolia ssp. *lavandulifolia*	0.066 ml	1600	Steppe	809
	S. iberica ssp. *stenostachya*	0.027 ml	1100	Open places	783
Melissa	*M. officinalis* ssp. *inodora*	0.125 ml	600	Water sides	774
Nepeta	*N. flavida*	1.16 ml	750	Open places	769
	N. nuda ssp. *albiflora*	0.41 ml	950	Roadsides	758
	N. sorgerae	0.09 ml	1450	Stony places	756
	N.glomerata	0.024 ml	1300	Open places	722
	N. aristata	0.07 ml	1400	Roadsides	736
Prunella	P. orientalis	0.08 ml	1000	Open places	766
	P. laciniata	0.02 ml	550	Roadsides	740
Origanum	*O. bargyli*	0.5 ml	1650	Forest	820
	O. onites	2.9 ml	550	Sandy rocky	772
	O. laevigatum	0.05 ml	1400	Forest	719
Satureja	*S. thymbra*	0.95 ml	580	Forest	762
Micromeria	*M. fruticosa* ssp. *brachycalyx*	4.5 ml	1400	Open places	738
	M. myrtifolia	0.1 ml	1200	Open places	757
	M. cristata ssp. *orientalis*	1.43 ml	1450	Open places	810
Thymus	*T. kotschyanus var. glabrescens*	1.56 ml	1600	Steppe	759
	T. sipyleus ssp. *rosulans*	2.5 ml	1600	Steppe	816
Thymbra	*Thymbra spicata var. spicata*	2.52 ml	750	Sandy Places	761
Mentha	*M. aquatica*	0.66 ml	1000	Water sides	796
	M. longifolia var. typhoides	1.23 ml	1500	Brook sides	715
Lycopus	*L. europaeus*	----	1450	Open places	824
Ziziphora	*Z. capitata*	-----	1300	Forest	808
Salvia	*S. tomentosa*	0.62 ml	1500	Quercus Shrubs	784
	S. recognita	0.21 ml	1600	Steppe	735
	S. pilifera	0.93 ml	1150	Open places	748
	S. verbenaca	-----	1500	Open places	751
	S. bracteata	0.24 ml	950	Open places	745
	S. multicaulis	0.066 ml	1200	Forest	734
	S. syriaca	0.02 ml	1150	Quercus Shrubs	750
	S. viridis	0.066 ml	1100	Open places	737
	S. palaestina	0.13 ml	950	Rocky	749
	S. sclarea	0.078 ml	950	Open places	747
	S. ceratophylla	0.13 ml	1000	Open places	746
	S. candidissima ssp. *candidissima*	0.3 ml	1150	Open places	754
	S. cassia	1.16 ml	600	Open places	739
	S. napifolia	0.1 ml	1050	Open places	797

But now-a-days, the destruction of research area because of the medicinal and spice properties for domestic consumption and export has a great influence on the floristic structure of the region.

Essential oil content: Essential oil content of the Lamiaceae family in the study area are shown in Table 1. Because there is no report about the essential oil content in the study area, our findings have been compared the different collecting

areas.

Lamiaceae family in Turkey is classified on the basis of essential oil content as rich (>2%), moderately rich (0.5-2.0%) and poor (<0.5%) by Baser (1993). According to our findings as general *Thymbra, Thymus* are oil rich genera, *Origanum, Satureja, Micromeria, Mentha, Salvia, Nepeta* are oil moderately rich and *Ajuga, Teucrium, Scutellaria, Eremostachys, Phlomis, Lamium, Wiedemanniana, Ballota, Marrubium, Sideritis, Stachys, Melissa, Prunella, Lycopus* are oil poor genera. We can add to report of Baser (1993) that one species, *Micromeria fruticosa* ssp. *brachycalyx* (4.5%) was found with high essential oil content according to literature.

Taking into account plant genus, our findings about essential oil content have shown similarity with referee (Guillen and Manzanas, 1998; Senatore *et al.*, 1997; Darioti *et al.*, 1997; Vila *et al.*, 1995; Krimer *et al.*, 1993; Özek *et al.*, 1991; Ezer *et al.*, 1996; Rustaiyan *et al.*, 2000).

Present findings are similar to Baser's report (Baser, 1993., Baser and Duman, 1998), but some of species have shown high essential oil content like *Thymus spyleus* ssp. *rosulans*, *Salvia ceratophylla*, *Origanum bargyli* . Furthermore also *Salvia recognita*, *Salvia multicaulis*, *Salvia syriaca and Salvia napifolia* oils have been found with small content.

Many factors such as collecting time, drying conditions, mode of distillation, geographic and climatic factors, altitude and plant parts play important role in composition of the essential oils (Baser, 1993; Kokkini *et al.*, 1997; Ozguven and Tansý, 1998).

The area was dominantly affected by the Mediterranean and Irano-Turanian region. Considerable destruction of vegetation of the area because of heavy collecting has a great influence on floristic structure and continuation of species. We agree with Ozhatay and Atay (1997), that the way for protection and sustainable use of these plants must be established of the cultivation areas.

As a result, these plants can be used as base for breeding and selection in order to obtain a high-yielding population with good aromatic properties and may be a significant basis for possible variations in future due to economic, agricultural and medicinal effects.

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