Composition of the Essential oil of Endemic *Helichrysum noeantum* Boiss. (Asteraceae) Growing Wild in Turkey

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Helichrysum genus is currently known and some are used in folk medicines. In Flora of Turkey, it is represented with 27 taxa, 15 of which are endemic to Turkey. Essential oil was obtained from the aerial parts of plant and yielded 0.1 % (v/w). The chemical composition of the essential oil obtained from *Helichrysum noeantum* was analyzed by GC and GC-MS system. Forty one constituents were identified, representing 95.88 % of the total oil. γ -Gurjunene (11.06 %), spathulenol (9.90 %), alloaromadendrene (7.53 %), β -caryophyllene (7.10 %) are the major compounds determined in *H. noeantum* essential oil.

Key Words: *Helichrysum noeantum*, Asteraceae, GC-MS, Essential oil.

INTRODUCTION

Asteraceae is one of the large family of the plant kingdom. The tribe Gnaphalieae of Asteraceae comprises 185 genera and about 1240 species. It is cosmopolitan, but most diverse in the southern hemisphere. *Helichrysum* is the largest genus of this tribe, with about 600 species, occurring in Europe, Asia, Africa and Madagascar¹. This genus is represented, in Turkish flora, by 27 taxa, 15 of which are endemic².

The *Helichrysum* species are xerophytes and growing at a wide range of altitudes from the sea level up to 1700 m, preferably on sandy or loamy soils, which are distributed from the lower-meso-Mediterranean to the lower-sub-humid bioclimatic environment. The name of the plant, from the Greek helios, sun and chryos, gold, relates to the typical bright yellow coloured inflorescences which represent the drug³. *Helichrysum* species are generally known under the names 'olmez cicek or altinotu in Turkish and are widely used as herbal teas in Turkey⁴.

Helichrysum species have been used in folk medicine for at least 2000 years against gall bladder disorders, because of their regulatory and diuretic effects. These effects of *Helichrysum* species are due to the flavonoids that they contain. In Turkey, several *Helichrysum* species are used in folk medicine for removing the kidney stones and as diuretics⁵. Although biological activities of many *Helichrysum* species have been investigated in different countries, there are only a few reports of the *Helichrysum* species belonging to Turkish flora^{6,7}.

The genus is an important source of secondary metabolites^{8,9} and most of the species have been studied for their

content of essential oils^{10,11} which are produced in glandular trichomes located on the flower petals, sepals and bracts and also on the stem leaves¹².

The information concerning the essential oil composition of *H. noeantum* has not been reported before. The composition of the essential oil of a few *Helichrysum* species like *H. chasmolycicum*^{13,14}, *H. graveolens*¹⁵, *H. plicatum* subspecies¹⁶, *H. arenarium* subsp. *aucherii* and *H. chionophilum*¹⁷ has been studied previously. The current study presents the results of GC-MS analysis of the essential oils of *H. noeantum* for the first time from Turkey.

EXPERIMENTAL

Helichrysum noeantum specimens were collected from natural habitats in between Bala and Kaman, 18. km, (Ankara) in 2009 (Elkiran -1001).

Isolation of the essential oil: Air-dried aerial parts of the plant materials (100 g) were subjected to hydrodistillation using a clevenger-type apparatus for 3 h to yield.

Gas chromatographic analysis: The essential oil was analyzed using HP 6890 GC equipped with a FID detector and an HP-5 MS column (30 m $\times$ 0.25 mm i.d., film thickness 0.25 mm) capillary column was used. The column and analysis conditions were the same as in GC-MS. The percentage composition of the essential oils was computed from GC-FID peak areas without correction factors.

Gas chromatography/mass spectrometry analysis: The oils were analyzed by GC-MS, using a Hewlett Packard system. HP-Agilent 5973N GC-MS system with 6890 GC in

Plant Products and Biotechnology Res. Lab. (BUBAL) in Firat University. HP-5 MS column (30 m $\times$ 0.25 mm i.d., film thickness 0.25 mm) was used with helium as the carrier gas. Injector temperature was 250 °C, split flow was 1 mL/min. The GC oven temperature was kept at 70 °C for 2 min and programmed to 150 °C at a rate of 10 °C/min and then kept constant at 150 °C for 15 min to 240 °C at a rate of 5 °C/min. Alkanes were used as reference points in the calculation of relative retention indices (RRI). MS were taken at 70 eV and a mass range of 35–425. Component identification was carried out using spectrometric electronic libraries (WILEY, NIST). The identified constituents of the essential oils are listed in Table-1.

TABLE –1
CONSTITUENTS OF THE ESSENTIAL OILS
FROM *Helichrysum noeantum* Boiss.

No	Compounds	RRI	Percentage (%)
1	β -Pinene	1055	0.17
2	Isodene	1356	0.16
3	α -copaene	1360	0.19
4	α -gurjunene	1383	0.51
5	Caryophyllene	1392	1.95
6	3aH-cyclopenta	1398	0.35
7	7-Epi- α -selinene	1403	0.46
8	Alloaromadendrene	1406	7.53
9	α -Amorphene	1411	1.31
10	Aromadendrene	1421	2.40
11	2-Isopropenyl-4a,8-dimethyl	1430	0.47
12	3-Buten-2-one	1432	0.94
13	β -Selinene	1441	4.55
14	<i>Cis</i> - β -guaiene	1445	0.53
15	α -Murolene	1446	0.43
16	γ -Cadinene	1455	2.05
17	Δ -Cadinene	1458	1.90
18	<i>Cis</i> -calamenene	1460	0.89
19	Epizonarene	1470	0.93
20	α -Calacorene	1473	0.45
21	Δ -Selinene	1483	0.52
22	Nerolidol	1486	3.02
23	(3E, 5E, 8E)-3,7,11-trimethyl-1,3,5,8,10-dodecapentaene	1490	1.51
24	3-Hexen 1 ol, benzoate	1491	2.22
25	Spathulenol	1495	9.90
26	Caryophyllene oxide	1498	2.60
27	γ -Gurjunene	1500	11.06
28	Ledene	1505	3.93
29	Viridiflorol	1506	3.52
30	Longiborneol	1511	1.39
31	Humulene epoxide II	1512	2.55
32	Zonarene	1516	5.39
33	β -Caryophyllene	1522	7.10
34	Cadina-1,4-diene	1524	1.07
35	9,10-dehydro-Isolongifolene	1526	0.71
36	β -Cedrena	1532	6.14
37	<i>t</i> -Murolol	1534	0.70
38	β -Eudesmol	1539	2.46
39	2-Pentadecanone	1627	0.83
40	1,2-Benzenedicarboxylic acid	1639	0.58
41	<i>n</i> -Hexadecanoic acid	1691	0.51
Total			95.88

RESULTS AND DISCUSSION

The essential oil was obtained by hydrodistillation and yield of *H. noeantum* was (0.1%) (v/w). The results of the essential oil GC and GC/MS analyses are given in Table-1, where the compounds are listed according to their order of elution. Total 41 components are identified in essential oils of *H. noeantum*.

Fourty one constituents, representing 95.88 % of the total essential oil extracted from *H. noeantum*. γ -gurjunene (11.06 %), spathulenol (9.9 %), alloaromadendrene (7.53 %), β -caryophyllene (7.10 %) are the major compounds determined in the *H. noeantum* essential oil (Table-1). γ -Gurjunene (11.06 %) was detected as one of the major component in the essential oil of *H. noeantum* (Table-1), it was not detected in *H. graveolens*¹⁵, *H. pallasii*¹⁸, *H. armenium*¹⁹, *H. ocephalum*²⁰, *H. leucocephalum* and *H. artemisioides*²¹. Also, β -caryophyllene (7.10 %) is also one of the major components in *H. noeantum* essential oil and it was reported it in *H. leucocephalum* as 10.1 %, in *H. artemisioides* as 10.6 % from Iran²¹. The second major groups determined in the essential oil of *H. noeantum* were β -cedrena (6.14 %), zonarene (5.39 %), β -selinene (4.55 %), ledene (3.93 %) and viridiflorol (3.52 %). β -selinene was also found in the essential oil *H. italicum* ssp. *microphyllum*²². In view of the compounds mentioned above, the essential oil composition were not similar with the *H. arenarium* from China²³ and *H. Pallasii*¹⁸.

The composition of indigenous South African three species (*Helichrysum dasyanthum*, *H. excisum* and *H. petiolare*) were dominated by the presence of monoterpenes such as 1,8-cineole (20–34 %), α -pinene (3–17 %) and *p*-cymene (6–10 %)^{24–26}. For all three species, 1,8- cineole was the major constituent with viridiflorol (18.2 %) (sesquiterpene) also present in high concentration in *Helichrysum excisum*.

The essential oil profile of *Helichrysum felinum* was reported totally different from that of any of the other species (*Helichrysum dasyanthum*, *H. excisum*, *H. petiolare*), with the monoterpenes largely absent. Its profile consisted of a variety of sesquiterpenes in low concentrations with β -caryophyllene (27.6 %) dominating together with α -humulene (9.4 %), alloaromadendrene (7.3 %) and caryophyllene oxide (6.9 %) as main constituents. This correlates with data obtained for Greek species where sesquiterpenes also dominated^{26,27}. According to the results obtained from the GC-MS. Analysis, It will be said that *H. noeantum* from Turkey also were sesquiterpene dominated essential oil. The chemical constituents of the essential oil of *Helichrysum cymosum* indicated that two major compounds are α -pinene (12.4 %) and 1,8-cineole (20.4 %). 1,8-cineole has known also antimicrobial properties²⁸.

The findings showed that the genus *Helichrysum* had a considerable variation in essential oil composition and this study demonstrates the occurrence of γ -gurjunene chemotype of *Helichrysum noeantum* in central Anatolian region of Turkey. The essential oil composition of the *Helichrysum noeantum* from Turkey show that they have contributed to the medicinal usage of this plant as a crop and their oils in the pharmaceutical, cosmetic and industrial purposes.

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