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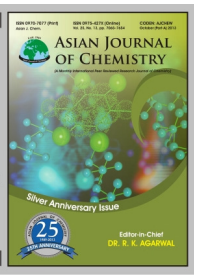

# Composition of the Essential oil of Endemic *Helichrysum noeanum* Boiss. (Asteraceae) Growing Wild in Turkey

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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 noeanum* was analyzed by GC and GC-MS system. Fourty 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. noeanum* essential oil.

**Key Words: *Helichrysum noeanum*, 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, occuring in Europe, Asia, Africa and Madagascar[1]. This genus is represented, in Turkish flora, by 27 taxa, 15 of which are endemic[2].

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 drug[3]. *Helichrysum* species are generally known under the names 'olmez cicek or altinotu in Turkish and are widely used as herbal teas in Turkey[4].

*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 diuretics[5]. 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 leaves[12].

The information concerning the essential oil composition of *H. noeanum* 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* subspecies[16], *H. arenarium* subsp. aucheri and *H. chionophilum*[17] has been studied previously. The current study presents the results of GC-MS analysis of the essential oils of *H. noeanum* for the first time from Turkey.

## EXPERIMENTAL

*Helichrysum* noeanum 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 × 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 × 0.25 mm i.d., film thickness 0.25 mm) was used with helium as the carrier gas. Injector temperature was 250 ºC, split flow was 1 mL/min. The GC oven temperature was kept at 70 ºC for 2 min and programmed to 150 ºC at a rate of 10 ºC/min and then kept constant at 150 ºC for 15 min to 240 ºC at a rate of 5 ºC/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 noeanum* Boiss.

| No | Compounds | RRI | Percentage (%) |
|---|---|---|---|
| 1 | β-Pinene | 1055 | 0.17 |
| 2 | Isoledene | 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 | *Cis*-β-guaiene | 1445 | 0.53 |
| 15 | α-Muurolene | 1446 | 0.43 |
| 16 | γ-Cadinene | 1455 | 2.05 |
| 17 | Δ-Cadinene | 1458 | 1.90 |
| 18 | *Cis*-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 | *t*-Muurolol | 1534 | 0.70 |
| 38 | β-Eudesmol | 1539 | 2.46 |
| 39 | 2-Pentadecanone | 1627 | 0.83 |
| 40 | 1,2-Benzenedicarboxylic acid | 1639 | 0.58 |
| 41 | *n*-Hexadecanoic acid | 1691 | 0.51 |
| Total | | | 95.88 |

## RESULTS AND DISCUSSION

The essential oil was obtained by hydrodistillation and yield of *H. noeanum* 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. noeanum.*

Fourty one constituents, representing 95.88 % of the total essential oil extracted from *H. noeanum.* γ-gurjunene (11.06 %), spathulenol (9.9 %), alloaromadendrene (7.53 %), β-caryophyllene (7.10 %) are the major compounds determined in the *H. noeanum* essential oil (Table-1). γ-Gurjunene (11.06 %) was detected as one of the major component in the essential oil of *H. noeanum* (Table-1), it was not detected in *H. graveolens*[15], *H. pallasii*[18], *H. armenium*[19], *H. oocephalum*[20], *H. leucocephalum* and *H. artemisioides*[21]. Also, β-caryophyllene (7.10 %) is also one of the major components in *H. noeanum* essential oil and it was reported it in *H. leucocephalum* as 10.1 %, in *H. artemisioides* as 10.6 % from Iran[21]. The second major groups determined in the essential oil of *H. noeanum* 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 China[23] 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. noeanum* 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 properties[28].

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 noeanum* in central Anatolian region of Turkey. The essential oil composition of the *Helichrysum noeanum* 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.

## REFERENCES


1. S.G. Senol, Ö. Secmen, B. Öztürk and M. Galbany-Casals, *Ann. Bot. Fennici*, **48**, 145 (2011).
2. S. Albayrak, A. Aksoy, O. Sagdic and E. Hamzaoglu, *Food Chem.*, **119**, 114 (2010).
3. R. Perrini, I. Morone-Fortunato, E. Lorusso and P. Avato, *Ind. Crops Prod.*, **29**, 395 (2009).
4. T. Baytop, Türkçe Bitki Adlari Sözlügü., Türk Dil Kurumu Yayinlari No. 578, (1997) (In Turkish).
5. S. Süzgec, A.H. Mericli, P.J. Houghton and B. Cubukcu, *Fitoterapia*, **76**, 269 (2005).
6. G. Ozkan, O. Sagdic and H. Ozcelik, In Fourth International Congress Environmental Micropaleontology, Microbiology and Meiobenthology, Isparta, pp. 151-154 (2004).
7. B. Tepe, M. Sokmen, H.A. Akpulat and A. Sokmen, *Food Chem.*, **90**, 685 (2005).
8. B.M. Lawrence, *Perf. Flavor.*, **23**, 55 (1998).
9. G. Appendino, M. Ottino, N. Marquez, F. Bianchi, A. Giana, M. Ballero, O. Sterner, B.L. Fiebich and E. Munoz, *J. Nat. Prod.*, **70**, 608 (2007).
10. A. Angioni, A. Barra, M. Arlorio, J.D. Coisson, M.T. Russo, F.M. Pirisi, M. Satta and P. Cabras, *Food Chem.*, **51**, 1030 (2003).
11. J. Paolini, J.M. Desjober, J. Costa, A.F. Bernardini, C. Buti Castellini, P.L. Cioni, G. Flamini and I. Morelli, *Flav. Fragr. J.*, **21**, 805 (2006).
12. A. Fahn, Secretory Tissues in Plants. Academic Press, London (1979).
13. C. Chalchat and M.M. Özcan, *J. Med. Food*, **9**, 287 (2006).
14. S. Süzgec and A.S. Birteksöz, *South Afr. J. Botany*, **77**, 170 (2011).
15. E. Bagci, Ö. Elkiran and H. Evren, *Asian J. Chem.*, **25**, 7254 (2013).
16. Ö. Elkiran, Ph.D. Thesis, Firat Üniversitesi Fen Bilimleri Enstitüsü (2012).
17. Ö. Elkiran, E. Bagci and H. Evren, Ulusal Biyoloji kongresi, Ege Üniversitesi, Izmir (2012) (In Turkish).
18. C. Formisano, E. Mignola, D. Rigano, F. Senatore, NA. Arnold, M. Bruno and S. Rosselli, *J. Med. Food*, **12**, 203 (2009).
19. K.A. Oji and A. Shafaghat, *Nat. Prod. Commun.*, **7**, 671 (2012).
20. A. Firouznia, M.T. Akbari, A. Rustaiyan, S. Masoudi, M. Bigdeli and M. Tabatabaei-Anaraki, *J. Essen. Oil Bearing Plants*, **10**, 88 (2007).
21. K. Javidnia, R. Miri, M. Soltani and A.R. Khosravi, *J. Essen. Oil Res.*, **21**, 54 (2009).
22. R. Vassilios, T. Maria, P. Panos, C. Ioanna, S. Melpomeni and H. Jeffrey, *Biochem. Syst. Ecol.*, **28**, 163 (2000).
23. F. Yong, H.A. Aisa, R.F. Mukhamatkhanova, I.D. Sham'yanov and M.G. Levkovich, *Chem. Nat. Comp.*, **46**, 872 (2011).
24. W. Lwande, A. Hassanali, O.B. Wanyama, S. Ngola and J.W. Mwangi, *J. Essent. Oil Res.*, **5**, 93 (1993).
25. P.A.R. Ramanoelina, J.-P. Bianchini and E.M. Gaydou, *J. Essen. Oil Res.*, **4**, 531 (1992).
26. A.C.U. Lourens, D. Reddy, K.H.C. Baser, A.M. Viljoen and S.F. Van Vuuren, *J. Ethnopharmacol.*, **95**, 253 (2004).
27. V. Roussis, M. Tsoukatou, P.V. Petrakis, I. Chinou, M. Skoula and J.B. Harborne, *Biochem. Syst. Ecol.*, **28**, 163 (2000).
28. S. Pattnaik, V.R. Subramanyam, M. Bapaji and C.R. Kole, *Microbios*, **89**, 39 (1997).