

## Essential Oil Component in Flower of Lemon Balm (*Melissa officinalis* L.)

Jafer Adinee, Khosro Piri and Omid Karami  
Department of Biotechnology,  
Faculty of Agriculture, Bu-Ali Sina University, Hamedan, Iran

**Abstract:** This research focuses on the analysis of the chemical composition lemon balm essential oil. The essential oil of flowers was obtained by steam distillation with a Clevenger apparatus. The chemical components of the essential oil of lemon balm were analyzed by capillary GC and GC/MS and 12 substances were identified. The flower oil contained trans-carveol (28.89%), citronellol (25.24%),  $\delta$ -3-carene (5.26%), citronellal (4.9%), geraniol (2.2%), 1-octene-3-ol (2.03%) and spathulenol (2.06%). The trans-carveol in flowers was dominant among components.

**Keywords:** Lemon balm, essential oil, GC-MS

### INTRODUCTION

Lemon balm (*Melissa officinalis* L.), a member of Lamiaceae, is a perennial plant growing up to 100 cm. This species originates from southern Europe, Asia Minor and southern parts of North America. Lemon balm populations are distributed in all Mediterranean countries including the coastal regions of Turkey and northern Iran<sup>[6]</sup>.

Lemon balm is used for several purposes such as an additive in food, a herb tea, an ingredient in cosmetics, an ornamental and a medicine<sup>[8]</sup>. Its essential oil is currently used in medicine and pharmacology (anti-tumor, anti-bacterial, antimicrobial, antihistaminic, antispasmodic and antioxidant, by means of its antiviral effect curing of the herpes<sup>[11]</sup>, antiulcerogenic, moderate Alzheimer's disease, modulation of mood and cognitive performance, stimulating the immune system (against anti HIV-1)<sup>[12]</sup>. In addition, lemon balm has traditionally been used due to its memory enhancing properties, but using of which is currently more widely used as sedative or calm, spasmolytic and antibacterial agent and sleep aid has been more popular recently<sup>[2,5,7]</sup>.

The goal of the present work was to study the composition and content of the essential oil of lemon balm. The composition of these oils may be useful in the identification of aromatic compounds of lemon oil obtained commercially by steam distillation.

### MATERIALS AND METHODS

**Plant material:** The lemon plant used in the present study was prepared from Medicinal Plants Garden of

Ebne-Sina at Hamedan of Iran. During summer flowers were collected from field grown plants.

**Essential oil extraction:** For the isolation of the essential oil, the hydrodistillation method with the use of a Clevenger apparatus was used. The flowers were carefully cleaned and distilled separately for 3 h. Oil samples were over anhydrous sodium sulfate and stored in sealed vial at low temperature before analysis.

**GC:** GC analysis was performed using a Shimadzu GC-9A gas chromatograph equipped with a DB-1 fused silica column (60 m  $\times$  0.25 mm, film thickness 0.25  $\mu$ m), oven temperature was held at 40°C for 5 min and then programmed to 250°C at a rate of 4°C min<sup>-1</sup>, injector of 32 cm sec<sup>-1</sup>. Quantitative data was obtained from FID area percentage without the use of correction factors.

**GC/MS:** GC/MS analysis was carried out on a Varian 3400 GC/MS system equipped with a DB-1 fused silica column (60 m  $\times$  0.25 mm, film thickness 0.25  $\mu$ m). Oven temperature 50- 250°C at rate of 4°C min<sup>-1</sup>, transfer line temperature 260°C, carrier gas, helium with a linear velocity of 31.5 cm sec<sup>-1</sup>, split ratio 1/60, ionization energy 70 e V, scan time 1s, mass range 40-300 amu.

**Identification of components:** The components of the oil were identified by comparison of their mass spectra with those of a computer library or with authentic compounds and confirmed by comparison of their

**Corresponding Author:** Khosro Piri, Department of Biotechnology, Faculty of Agriculture, University Bu-Ali Sina, Hamedans, Iran Tel: +9183163372 Fax: +8114227012

Table 1: Percentage of lemon balm flower essential oil components

Components	Peak number	(%)
1-octen-3-ol	2	2.030
$\delta$ -3-Cavene	3	5.260
Linalool	6	4.050
Lavendulol	7	0.390
Trans-carveol	16	28.89
Citronellol	20	25.24
Geraniol	23	02.20
$\gamma$ -Murolol	27	01.69
Germacrene. D	28	00.49
Spathulenol	29	02.06
a-Cadinol	30	00.16
Trans-Murolol	31	00.36

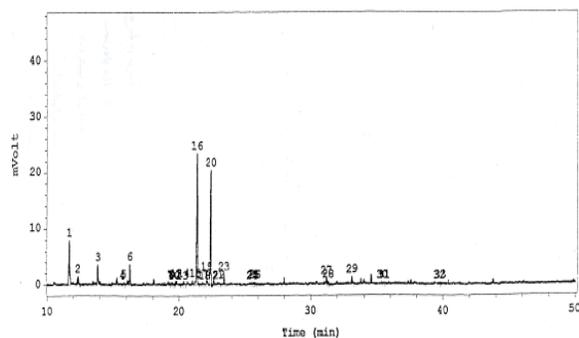


Fig. 1: Chromatogram of lemon flower essential oil

retention indices, either with those of authentic samples or with data published in the literature<sup>[4]</sup>.

## RESULTS AND DISCUSSION

In Fig. 1 the chromatogram of lemon flowers essential oil are presented. The principal components of essential oil of the flowers are presented on Table 1: *trans*-carveol (28.89%), citronellol (25.24%),  $\delta$ -3-carene (5.26%), citronellal (4.9%), geraniol (2.2%), 1-octene-3-ol (2.03%) and spathulenol (2.06%).

The citronellal, citronellol, linalool and geraniol as major chemical compositions of the essential oil of the lemon balm has been previously reported,<sup>[6,9,10,11]</sup> but *trans*-carveol is not reported as main components of essential oil in lemon. Carveol is a natural monoterpene alcohol. It is used as a fragrance in cosmetics and as a flavor additive in the food industry. It has been found to exhibit chemoprevention of mammary carcinogenesis (prevents breast cancer<sup>[3]</sup>). Monoterpenes in plants are believed to play ecological roles mainly, serving as herbivore-feeding deterrents, antifungal defenses and attractants for pollinators<sup>[13]</sup>. Their oxidised derivatives, known as terpenoids, are used as flavours, fragrances and pharmaceuticals<sup>[13]</sup>.

## REFERENCES

- Allahverdiyev, A., N. Duran, M. Ozguven and S. Koltas, 2004. Antiviral activity of the volatile oils of *Melissa officinalis* L. against herpes simplex virus type-2., *Phytomedicine*, 11: 657-661.
- Coleta, M., M.G. Campos, M.D. Cotrim and A. Proenca Cunha, 2001. Comparative evaluation of *Melissa officinalis* L., *Tilia europaea* L., *Passiflora edulis* Sims and *Hypericum perforatum* L. in the elevated plus maze anxiety test. *Pharmacopsychiatry*, 34: 20-21.
- Crowell, P.L., H. Kennan and V. Ahmad, 1992. Chemoprevention of mammary carcinogenesis by hydroxylated derivatives of d-limonene. *Carcinogenesis*, 13:1261-1264.
- Davis, N.W., 1990. Gas chromatographic retention indices of monoterpenes and sesquiterpenes on methyl silicone and carbowax 20m phases. *J. Chromatogr.*, 503: 1-24.
- Kennedy, D.O., W. Little and A.B., 2004. Schley, Attenuation of laboratory-induced stress in humans after acute administration of *Melissa officinalis* (lemon balm). *J. Pharm Pharmacol.*, 56: 677-681.
- Mrljanova, M., D. Tekelova, M. Felklova, J. Toth, P. Musil and D. Grancai, 2001. Comparison of the quality of *Melissa officinalis* L. cultivar Citra with Mellissas of European origin. *Pharmacopsychiatry*, 34: 20-21.
- Sadraei, H., A. Ghannadi and K. Malekshahi, 2003. Relaxant effect of essential oil of *Melissa officinalis* and citral on rat ileum contractions. *Phytother. Res.*, 17: 599-604.
- Sari, A.O. and A. Ceylan, 2002. Yield characteristics and Essential oil composition of lemon balm (*Melissa officinalis* L.) grown in the Aegean Region of Turkey. *Turk. J. Agric. For.*, 22: 217-224.
- Sorensen, J.M., 2000. *Melissa officinalis*, Essential oil-authenticity, production and pharmacological activity. *Int. J. Aromather.*, 10: 1-8.
- Tittel, G., H. Wagner and R. Bos, 1982. Chemical composition of the essential oil from *Melissa*. *Planta Med.*, 46: 91-98.
- Vaverkova, S., J. Tekel and M. Holla, 1995. The effect of herbicides on the qualitative properties of medicinal plants. Part 3: Content and composition of the essential oil from *Melissa officinalis* L. after application of basagran. *Pharmazie*, 50: 835-836.
- Yamasaki, K., M. Nakano, T. Kawahata, H. Mori, T. Otake, N. Ueba, I. Oishi and R. Inami, M. Yamane, M. Nakamura, H. Murata and T. Nakanishi, 1998. Anti- HIV-1 activity of herbs in Labiatae. *Biol. Pharm. Bull.*, 21: 829-833.
- Keith Owens, M., L. Chii-Dean, A. Charles, J. Taylor and G. Steven, 1998. whisenant4seasonal patterns of plant flammability and monoterpene content in juniperus ashei. *J. Chem. Ecol.*, 24: 2115-2129.