Journal of Herbal Drug
journal homepage: www.jhd.iaushk.ac.ir

Essential oil composition of *Elaeagnus angustifolia* and *Elaeagnus orientalis* from Sistan and Baluchestan, Iran

Malek Taher Maghsoodlou[1]*, Nasrin Kazemipoor[2], Rohallah Jafarazad[3], Nahid Rahneshan[4]

[1]*Professor, Department of Chemistry, University of Sistan and Baluchestan, Zahedan, Iran;*
***Email:** mt_maghsoodlou@yahoo.com*

[2]*Associate Professor, Department of Agriculture, Shiraz University, Shiraz, Iran;*

[3,4]*Master of Science, Department of Chemistry, University of Sistan and Baluchestan, Zahedan, Iran;*

ARTICLE INFO

Type: *Original Research*
Topic: *Phytochemistry*
Received *March 30th 2014*
Accepted *July 20th 2014*

Key words:
- ✓ *Volatile constituents*
- ✓ *Elaeagnus angustifolia*
- ✓ *Elaeagnus orientalis*
- ✓ *hydro-distillation*
- ✓ *GC/MS*

ABSTRACT

Background & Aim: *Elaeagnus angustifolia* and *Elaeagnus orientalis* have a lot of medical utilization. In folk medicine, the fruit and flower of these plants are used as a tonic and antipyretic agent. The aim of the present study was to chemical analysis of volatile constituents of *E. angustifolia* and *E. orientalis* flowers.

Experimental: The essential oils of *E. angustifolia* and *E. orientalis* flowers collected from Zahedan in Sistan and Baluchestan province were obtained by hydro-distillation. Chemical composition of oils were determined by GC/MS.

Results & Discussion: 12 compounds representing 100% were identified in the essential oil of *E. angustifolia* flowers in which Ethyl cinnamate (73.24%), Cyclohexanecarboxylic acid, ethenyl ester (6.94%), Isobutyl cinnamate (4.74%), Palmitic acid (4.39%), Buthyl cinnamate (2.38%), Ethanol (2.24%) and Methyl 9,9- Dideutero- Octadecanoate (2.05%) were the major constituents. In the essential oil of *E. orientalis* flowers twelve constituents representing 100% were identified in which Ethyl cinnamate (84.80 %), Ethanol (7.86%), Tetra hydrogeranyl acetone (2.18%) and Phenantrenol (1.26%) were the major ones. The results showed that there are some differences and similarities between the oil compositions of *Elaeagnus* species growing in the same weather conditions. Although the main component of the essential oils of *Elaeagnus* species was Ethyl cinnamate, but its relative content was higher in the oil of *E. orientalis.* The percentage of Ethanol in the oil of *Elaeagnus* species also was less than 10%. Moreover, although the Isobutyl cinnamate, Buthyl cinnamate and Methyl 9, 9-Dideutero- Octadecanoate compounds were the main component of the essential oil of *E. angustifolia* flowers, but these compounds were not identified in the essential oil of *E. orientalis.*

Industrial and practical recommendations: The results of the present study showed that the *E. angustifolia* and *E. orientalis* flower oils can be utilized as cheap commercially sources to isolation Ethyl cinnamate. In addition, extraction of the identified components can be useful for medicinal uses.

1. Introduction

E. angustifolia (Russian olive, oleaster) belongs *to Elaeagnus* genus and *Elaeagnaceae* family. *E. angustifolia* is a shrub or tree with a height of up to 7 m and a capacity to grow under a wide range of environmental conditions (Klich, 2000). This species shows a broad geographical range, occurring widely in Asia and Europe, particularly in Turkey and Central Asia (Aksoy and Sahin, 1999). It is used as an ornamental tree in many European cities (Sastre *et al*., 2004). Its fruits are used as diuretic, tonic, antipyretic, antidiarrheal and as a medication against kidney disorders in traditional Turkish medicine (Lev and Amar, 2002; Ahmadiani *et al*, 2000). Decoction and infusion of its fruits are considered to be a good remedy for fever, jaundice, asthma, tetanus and rheumatoid arthritis. Its flowers also are used in flavoring some liqueurs (Zargari, 1990).

E. orientalis belongs *to Elaeagnus* genus. It is a diffused shrub with small pale green leaves and a woody stem growing to 6-12 m. In Iran, this plant is in Mazandaran, Sistan and Baluchestan and Gilan province (Ghahraman, 1986). *E. orientalis* is used by local physicians for the treatment of tumours, certain type of cancer and viral diseases (Matthews, 1994).

For this reason, the importance of *E. angustifolia* and *E. orientalis* plants as an herbal medicine, the aim of the present study was to elucidate the chemical composition of the essential oil of *E. angustifolia* and *E. orientalis* flowers in Sistan and Baluchestan province. In order to study the complex chemical composition of volatile compound from plants, advanced analytical GC-MS techniques must be used, these allowing the identification of compounds even in minute quantities (Rădulescu and Oprea, 2008; Pavel *et al*., 2009).

2. Materials and methods

E. angustifolia and *E. orientalis* flowers were collected from Zahedan in Sistan and Baluchestan province. In first step, the flower samples were dried away from sunlight and then powdered. Hydrodistillation using a Clevenger- type apparatus was used for essential oil extraction. For the extraction, 100 g of the *E. angustifolia* flower powder was hydrodistilled with 300 mL water in a Clevenger-type apparatus for 5h. Moreover, 40 g of the *E. orientalis* flower samples were hydrodistilled with 200 mL water in a Clevenger-type apparatus for 5h. The essential oils were dried over anhydrous Na_2SO_4 (Merk), stored in a dark glass bottle and kept at 4°C until analysis.

The essential oils were analyzed by GC-MS electron impact ionization (EI) method on GC-17A gas chromatograph (Shimadzu) coupled to a GC/MS QP 5050A Mass Spectrometer (Shimadzu). Compounds were separated on a 50m × 0.25mm fused-silica capillary column coated with a 0.32µm film tickness of DB-1 (Shimadzu). The data were acquired under the following conditions: the initial temperature and final temperature were 50 °C and 225 °C, respectively. The carrier gas was helium and the split ratio was 30 ml/min. For GC–MS detection, an electron ionization system with ionization energy of 70 eV was used. The components of the oils were identified by comparison of their mass spectra with those of a computer library (Wiley-v.7 database) or with authentic compounds.

3. Results and discussion

The oils from flowers of *E. angustifolia* and *E. orientalis* were examined by GC-MS. The chemical composition of the essential oils and their amount were shown in Table 1. In the essential oil of *E. angustifolia*, 12 constituents representing %100, were identified in which Ethyl cinnamate (73.24 %), Cyclohexanecarboxylic acid, ethenyl ester (6.94 %), Isobutyl cinnamate (4.74%), Palmitic acid (4.39%), Buthyl cinnamate (2.38%), Ethanol (2.24%) and Methyl 9, 9- Dideutero- Octadecanoate (2.05 %) were the major constituents (Table 1).

In total, 12 constituents in the *E. orientalis* flower oils representing %100, were identified in which Ethyl cinnamate (84.80 %), Ethanol (7.86%), Tetra hydrogeranyl acetone (2.18%) and Phenantrenol (1.26%) were the major ones (Table 1). The results showed that there are some differences and similarities between the oil compositions of *Elaeagnus* species growing in the same weather conditions.

There are no adequate literature data concerning chemical composition of the volatile oil of *E. orientalis* and *E. angustifolia* flower. Twenty six compounds were identified in the essential oil of *E. angustifolia* flower and ethyl cinnamate was the most dominant followed by

(E)-9-octadecenoic acid ethyl ester and n-hexadecanoic acid. In addition, relatively high amounts of n-propyl acetate, 2-pentadecyn-1-ol and 9-octadecenal (Z) were also found in the extract. Apart from ethyl cinnamate, aromatic alcohols and ketones appeared to contribute to the aroma of the essential oil (Hu and Guo-qiang, 2013). The presence of 4-hydroxybenzoic acid, phenolic acid, and acid caffeic also was reported in the *E. angustifolia* fruit (Ayaz *et al.*, 1999) and the significant amounts of flavonoid, terpenoid, and cytosterol compounds were derived from the *E. angustifolia* leaves (Dembinska-Migas and Gill, 1973). Total phenolic and flavonoid content of leaves and flowers were also determined in two *E. angustifolia* variants and reported that the amount of phenolic and flavonoids compounds in leaves were higher than flowers (Saboonchian *et al.*, 2014). Flavonoids have been considered one of the most important constituents in *E. angustifolia*. Antinociceptive and anti-inflammatory activities of some flavonoids have been reported previously (Ramezani *et al*., 2001; Ahmadiani, 2000; Küpeli and Yesilada, 2007; Erdemoglu *et al*., 2008). In another study Elaeagnoside, a new steroidal glucoside, has been isolated from the chloroform fraction of *E. orientalis.* The identified components showed significant inhibitory activity against the enzyme chymotrypsin (Ayaz *et al*., 2009). The type and amount of the components are different in *Elaeagnus* species. These variations may be attributed mainly to variation in their agroclimatic and geographical conditions.

Table 1. Composition of the volatile oil of the *E. angustifolia* and *E. orientalis* flowers.

Compounds of *E. angustifolia*	%	Compounds of *E. orientalis*	%
Ethanol	2.24	Ethanol	7.86
2-propenoic,3-phenyl, ethyl ester	0.81	Cinnamic acid, isopropyl ester	0.35
Ethyl cinnamate	**73.24**	Ethyl cinnamate	**84.80**
Cyclohexanecarboxylic acid, ethenyl ester	6.94	Cyclohexanecarboxylic acid, ethenyl ester	0.94
Buthyl cinnamate (Cis or Trans)	0.66	1- Phenanthrenol	1.26
Pheylethyl tiglate 2	0.97	Megastigmatrinone 4	0.21
Isobuthyl cinnamate	4.74	Cycloheptan,1,3,5-tris(methylene)	0.51
Buthyl cinnamate (Cis or Trans)	2.38	Palmitic acid	0.94
2- phenylnitroethane	0.74	2-methyl-5-phenylpent-4-en-3-one	0.42
2-Phentadecanone	0.84	Hexahydropseudoionone (Tetra hydrogeranyl acetone)	2.18
Palmitic acid	4.39	Di-N-buthyl phthalate	0.32
Methyl 9,9-Dideutero-Octadecanoate	2.05	Octadecane	0.21

4. Conclusions

Here in, we reported the essential oil composition of *E. angustifolia* and *E. orientalis* flowers. The results of the present study showed that the *E. angustifolia* and *E. orientalis* flower oils can be utilized as cheap sources for the commercial isolation of Ethyl cinnamate. In addition, extraction of the identified components can be useful for medicinal uses. This study is a preliminary research for investigating the nutritional values and potential use of *E. angustifolia* and *E. orientalis.* Hopefully, it paves the way for further research projects.

5. Acknowledgement

We appreciate the university of Sistan and Baluchestan Research Council for its partial support.

6. References

Ahmadiani, A., Hosseiny, J., Semnanian, S., Javan, M., Saeedi, F., Kamalinejad, M. and Saremi, S. 2000. Antinociceptive and anti- inflammatory effects of *Elaeagnus angustifolia* fruit extract. *Journal of Ethnopharmacology*, 72: 287-92.

Aksoy, A. and Sahin, U. 1999. *Elaeagnus angustifolia* L. as a biomonitor of heavy metal pollution. *Turkish Journal of Botany*, 23: 83-87.

Ayaz, F. A., Kadioğlu, A. and Doğru A. 1999. Soluble sugar composition of *Elaeagnus angostiholio* L. var.

orientalis (L.) Kuntze (Russian olive) fruits. *Botany*, 23: 349-354.

Ayaz, M., Riaz, A., Malik, A., Ahmad, E., Fatima, I., Arif Lodhi, M. and Iqbal Chaudhary, M. 2009. Elaeagnoside, chymotrypsin inhibiting steroidal glucoside from *Elaeagnus orientalis*. *Natural Product Research*, 23: 409-414.

Dembinska-Migas, W. and Gill, S. 1973. Flavonoids in leaves of *Elaeagnus angustifolia* L. *Polish Journal of Pharmacology and Pharmacy*, 25: 599-606.

Erdemoglu, N., Akkol, E.K., Yesilada, E. and Calls, I. 2008. Bioassay-guided isolation of anti-inflammatory and antinociceptive principles from a folk remedy, *Rhododendron ponticum* L. leaves. *Journal of Ethnopharmacology*, 119:172-78.

Ghahraman, A. 1986. *Flora of Iran*. Vol. 5. The Research Institute of Forests and Rangelands press.

Hu, Y. and Guo-qiang, G. 2013. Gas Chromatographic-Mass Spectrometric Analysis of Essential Oil Extracted by Supercritical CO2 from Flowers of *Elaeagnus angustifolia* L. *Food Science*, 34: 152-156.

Klich, M.G. 2000. Leaf variations in Elaeagnus *angustifolia* related to environmental heterogeneity. *Enviromental and Experimental Botany*, 44:171-183.

Küpeli, E. and Yesilada, E. 2007. Flavonoids with anti-inflammatory and antinociceptive activity from *Cistus laurifolius* L. leaves through bioassay-guided procedures. *Journal of Ethnopharmacology*, 112:524-30.

Lev, E. and Amar, Z. 2002. Ethnopharmacologicl survey of traditional drugs sold in the Kingdom of Jordan. *Journal of Ethnopharmacology*, 82:131-145.

Matthews, V. 1994. *The new plantsman*. Vol. 1. Royal Horticultural Society.

Pavel, M., Rădulescu, V., Ilieş, D.C. 2009. GC-MS analysis of essential oil obtained from the

species *Thymus comosus* Heuff.ex Griseb (Lamiaceae). *Farmacia*, 57: 479-484.

Rădulescu, V. and Oprea, E. 2008. Analysis of volatile compounds of officinal *Tiliae flos* by gas chromatography coupled with mass spectrometry. *Farmacia*, 4: 129-138.

Ramezani, M., Hosseinzadeh, H. and Daneshmand, N. 2001. Antinociceptive effect of *Elaeagnus angustifolia* fruit seeds in mice. Fitoter, 72:255-62.

Saboonchian, F., Jamei, R. and Hosseini Sarghein, S. 2014. Phenolic and flavonoid content of *Elaeagnus angustifolia L*. (leaf and flower). *Avicenna journal of phytomedicine*, 4: 231-238.

Sastre, J., Lluch-Bernal, M., Bustillo, A.M.G., Carnes, J., Maranon, F., Casanovas M. and Fernandez-Caldas, E. 2004. Allergenicity and cross- reactivity of Russian olive pollen (*Elaeagnus angustifolia*), *Allergy*, 59: 1181-1186.

Zargari, A. 1990. *Medicinal plants*, vol.4. Tehran, Tehran Univercity Press, pp. 275-277.