The GC-MS Analysis of Elaeagnus Angustifolia L. Flowers Essential Oil

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The quantity of essential oil obtained from the flowers of Elaeagnus angustifolia L. from the seaside area of Constanta, is of 0.05%. Two compounds, limonene and anethole in quantities of 1.068% (m/v) and 0.1855% (m/v) respectively were identified and determined quantitatively, by using reference substances through the GC-MS analysis of this species. With the help provided by our data base, using the defragmentation process, other six constituents were identified: ethyl cinnamate, 2-phenyl-ethyl benzoate, 2-phenyl-ethyl isovalerate, nerolidole, squalene and acetophenone. The antiseptic and anti-inflammatory properties of these constituents are well-known due to the literature of specialty, which would justify the external use of the essential oil in the treatment of dermatological diseases.

Key words: Elaeagnus angustifolia L., GC-MS analysis, flowers essential oil

The essential oil obtained from the flowers of *Elaeagnus angustifolia* L. is relatively less studied. A few Russian researchers have established a quantity of 0.1% volatile oil in the flowers of this species. The GC-MS analysis made evident 85 compounds; 47 of them were identified, representing 96.5% from the whole number of compounds. The main component is trans-ethylcinnamate, which represents 78.88% [1].

Starting from this study, our aim is to identify and to establish the content of essential oil in the flowers of *Elaeagnus angustifolia* L. from the seaside area of Constanta. Using the GC-MS analysis we will study the chemical compounds, on the basis of reference substances and the spectrum storage device.

Materials and methods

The flowers of *Elaeagnus angustifolia* L. represent the vegetal material harvested from Mamaia village area, Constanta county, in June, 2005.

To obtain the vegetal product, the shrub was shaken and the flowers were collected on tarpaulin; the impurities (leaves, branches, sand grains or insects) were removed and the flowers were dried at the temperature of the room, on special shelves.

The purity of the product was determined by monitoring the impurities in the same plant [2] and the impurities which did not belong to the producing plant [3].

To express the content in the essential oil of the dry product, we determined the humidity according to the Romanian Pharmacopoeia Xth edition; we used the method of drying the flowers in the drying chamber at 105°C until the constant mass was obtained [3].

The identification of the essential oil is based on the pleasant aromatic smell of the residue obtained when an etheric extract is run dry and then re-taken with ethanol [4].

For confirmation, we used the method of obtaining the essential oil by distillation with water vapours in closed circuit in Neo-Clevenger apparatus. This method is also used to obtain and determine quantities of volatile oil according to the Romanian Pharmacopoeia Xth edition [3, 4]. We used 100 g vegetal product and 750 mL water, with 6 h refluxing time. We determined the quantity of volatile oil on the graded tube of apparatus, by catching the essential oil in 1mL of xylene.

We performed the GC-MS analysis with gas chromatograph joined with mass spectrum (GC-MS) Agilent 6890NMS5973N.

Analysis conditions: Column HP-5MS 0.25mm x 30m . 0.25urn; carrier gas He, 1mL/min (constant flux); speed 36cm/sec; oven 40°C (0.40min), 12°C/s, 300°C (10min).

We identify the compounds in the essential oil on the basis of the reference substances (r.s.) and of the data base device. We used 9 reference substances of compounds frequently met in the essential oils: α and β-pinene, limonene, linalool, linalyl acetate, anisic aldehyde, cinnamic aldehyde, anethole, eugenol) (fig.1). The retention times of these compounds used as reference substances are given in table 1.

Results and discussion

The flowers of *Elaeagnus angustifolia* L. were sorted and the impurities on the same plant (leaves, branches) and the foreign impurities (sand grains, insects) were removed, so that the vegetal product was 99.9% pure.

The humidity varies between 10.22% and 10.52%, which gives good conservation to the product.

The residue we obtained from the evaporation of the etheric extract has got a slightly aromatic smell, which confirms the presence of the essential oil.

The essential oil obtained in xylene in Neo-Clevenger apparatus was in a very small quantity (0.05%) and had got a yellowish colour.

The sample of the essential oil in xylene which was analysed through the GC-Ms method made evident the presence of 42 chemical compounds, according to the chromatogram given in figure 2.

As a result of the qualitative analysis we identified 8 chemical constituents: 2 of them were determined with the help of the reference substances (limonene and

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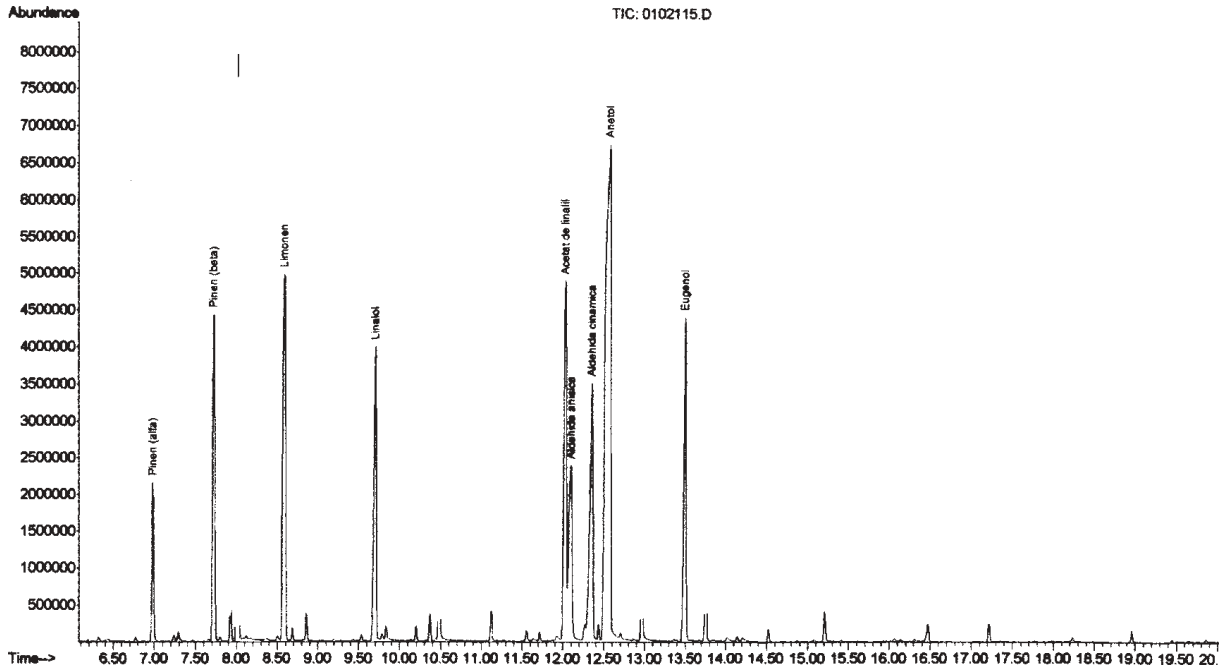

Fig. 1. CG - MS chromatogram of a mixture of compounds used as reference substances

Table 1
RETENTION TIMES FOR ALL REFERENCE SUBSTANCES

Reference substances	Retention time (min.)	Reference substances	Retention time (min.)
α-pinene	6.98	anisic aldehyde	12.10
β-pinene	7.73	cinnamic aldehyde	12.36
limonene	8.56	anethole	12.48
linalool	9.70	eugenol	13.50
linalyl acetate	12.04		

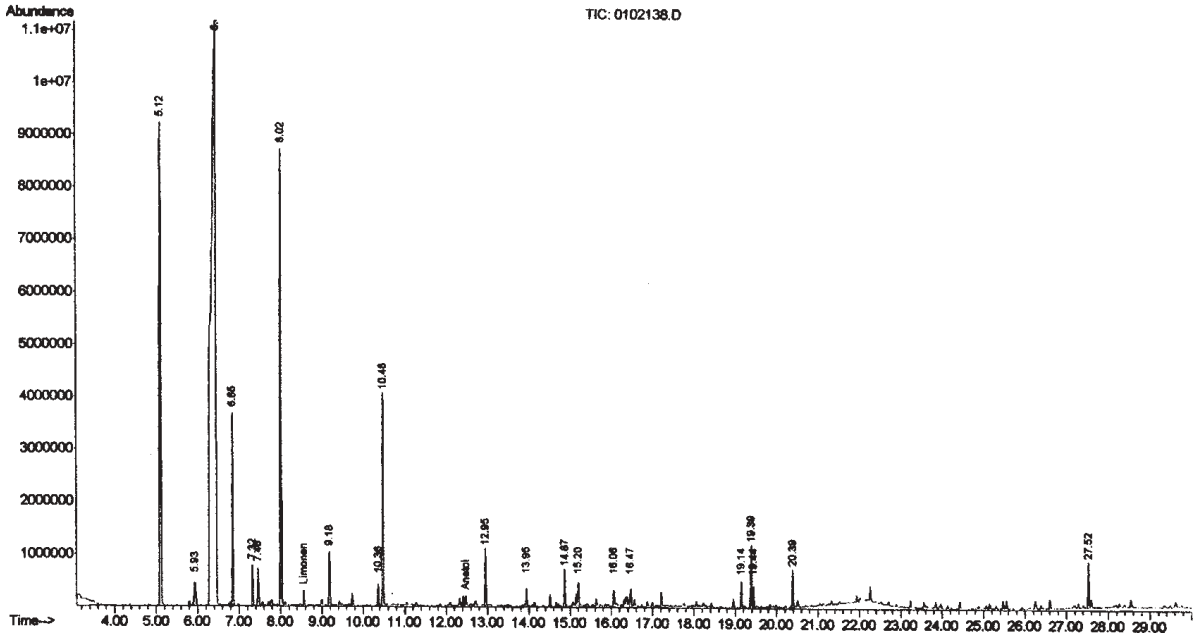

Fig. 2. GC - MS chromatogram of the flowers essential oil in the Elaeagnus angustifolia L. flowers

Table 2
COMPOUNDS IDENTIFIED IN ESSENTIAL OIL OF ELAEAGNUS ANGUSTIFOLIA L. FLOWERS AND THEIR RETENTION TIMES

Reference substances	Retention time (min.)	Reference substances	Retention time (min.)
p-xylene	6.46	2-phenyl-ethyl isovalerate	15.15
limonene	8.56	nerolidole	16.06
acetophenone	9.18	2-phenyl-ethyl benzoate	19.39
anethole	12.48	squalene	27.52
ethyl cinnamate	14.87		

anethole), 6 constituents were identified on the basis of the spectrum storage (ethyl cinnamate, 2-phenyl-ethyl benzoate, 2-phenyl-ethyl isovalerate, squalene, nerolidole and acetophenone). Data are given in table 2.

We analysed the quantity of the identified compounds using the reference substances and found 1.068% (m/v) limonene and 0.185% (m/v) anethole in the essential oil. The structure of this compounds is showed in figure 3.

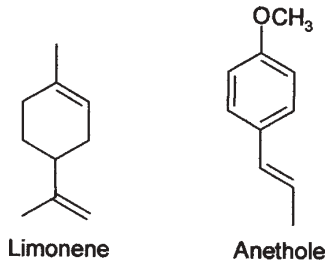

Fig. 3.The structure of componds quantitatively determined

Limonene and squalene are hydrocarbons (monoterpenic and triterpenic respectively) with anti-inflammatory and antiseptic properties [5].

Limonene can provide protection against other constituents of the essential oil, such as aldehydes, which can be dermo-caustic [5].

Among the oxygenated derivatives, we identified nerolidole (sesquiterpenic alcohol) and anethole (phenol methyl-ether) with antiseptic properties [5].

The esters we identified (ethyl cinnamate, 2-phenyl-ethyl benzoate, 2-phenyl-ethyl isovalerate) are derivatives of cinnamic and benzoic acids and can be found in balms with healing properties; they could justify the use of the essential oil in the treatment of skin diseases and wounds.

Acetophenone is probably a compound of degradation and xylene is the solvent used of catching the essential oil on the graded tube of Neo-Clevenger apparatus.

Conclusions

The essential oil in the flowers of *Elaeagnus angustifolia* harvested from the seaside area of Constanta, although in very small quantities (0.05%), contains 42 constituents, out of which we identified 8: limonene, anethole, ethyl cinnamate, 2-phenyl-ethyl benzoate, 2-phenyl-ethyl isovalerate, nerolidole, squalene and acetophenone. The quantities of limonen 1.068% (m/v) and anethole 0.184% (m/v) were determined.

The anti-inflammatory and antiseptic properties of these chemical compounds, already known in the literature of specialty, could justify the use of the essential oil in the treatment of dermatological diseases and wounds.

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