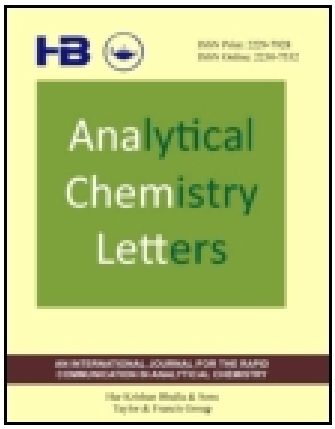

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Essential Oil Composition of *Pimpinella anisum* from Algeria

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Abstract: Water-distilled essential oil from seeds of *Pimpinella anisum* of Algerian origin was analysed by GC-MS. 9 components representing more then 98.8 % of the essential oil were identified among which *trans*-anethole (92.4 %), estragol (1.9%), o-isoeugenol (1.9%) and γ-himachalene (1.1%) were the major constituents. Essential oil yield evolution during water distillation has been investigated as a function of time and showed a relatively slow extraction kinetic.

Key word: *Pimpinella anisum*, Apiaceae, essential oil composition, anethole, extraction kinetic.

Introduction

Anise (*Pimpinella anisum* L.) is an aromatic plant in the Apiaceae family. It is an annual herb indigenous to Near East and widely cultivated in the Mediterranean rim (Turkey, Egypt, Syria, Spain, etc.). Its fruits are called aniseed and contain 1-4 % of essential oil. (E)-Anethole is the major component (75-95 %) or more of the essential oil and other components include anisaldehyde, estragol, isoeugenol, γ-himachalene, anisol, acetoanisol and p-anisic acid [1,2,3,4,5,6,7,8]. The yield and (E)-anethole content of aniseed are affected by the genotype, the ecological conditions and especially by agricultural practices, such as the sowing date, fertilizer and water application, and plant density[7,9,10,11,12,13].

Aniseeds are used to treat dyspeptic complaints and catarrh of the respiratory tract, and as mild expectorants. It was also reported that extracts from anise fruits have therapeutic effects on several conditions, such as gynaecological and neurological disorders [14,15,16]. It has mild estrogenic effects, which explains the use of this plant in folk medicine for increasing milk secretion [17].

Materials and methods

The water distillation of 1 Kg. of aniseeds was carried out, during 6 hours, according to the following experimental protocol: The vegetable material is mixed with boiling water in a two necks flask connected to a condenser. The steam produced with a relative flow (steam mass / mass of vegetable substrate / time) of 0.08 g/g.min drains the volatile components, which are collected after condensation and cooling at room

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temperature (25°C). Oil is then separated from the distillate by diethyl ether liquid-liquid extraction. The yield is defined as being the essential oil and the dry vegetable matter mass ratio.

$$Y(\%) = 100\frac{m_E}{m_V} \quad (1)$$

m_E : essential oil mass,
m_V : vegetable matter mass,
Y(%) : essential oil yield.

The experimental error on the essential oil yield estimated statistically, by determining the greatest variation compared to the average value of five repetitive tests, is lower than 5 %.

Analyses were performed on a Hewlett Packard 6890 gas chromatograph coupled to a Hewlett Packard 5973 mass spectrometer. A HP5 fused silica capillary column (30 m x 0.25 mm x 0.25 µm film thickness) was used. GC conditions were as follows: injector temperature 250°C, split less injection mode, oven temperature 80°C (5 min.) to 230°C (15 min.) at 4°C/min and carrier gas helium, flow rate 1 mL/min. MS conditions were: Ion source temperature 250°C and ionising voltage 70 eV.

The oil constituents were identified by comparison of their mass spectra to those of authentic samples and by comparison of their retention indices to those cotted in litterature.

Results and discussions

The chemical composition of Algerian *P. anisum* oil presented in table 1, is caracterised by a high content of *trans*-anethole (92.4 %). Also, we note the presence of estragol (1.9 %), o-isoeugenol (1.9 %), γ-himachalene (1.1 %) and *cis*-anethole (0.5 %). The content of o-isoeugenol is higher than those found in the oils of Turkey [18,7] and Portuga l[8] (Table 2).

Figure 1 shows the evolution of the extraction yield according to the extraction time. The overall essential oil yield obtained from aniseeds was more than 2.3 % after 6 hours of extraction. We note that after a period of 6 hours of extraction, the plant material was not completely exhausted from its oil. The slow kinetic could be due to the endogenous location (secreting ducts), hence the difficulty to reach and train the oil constituents.

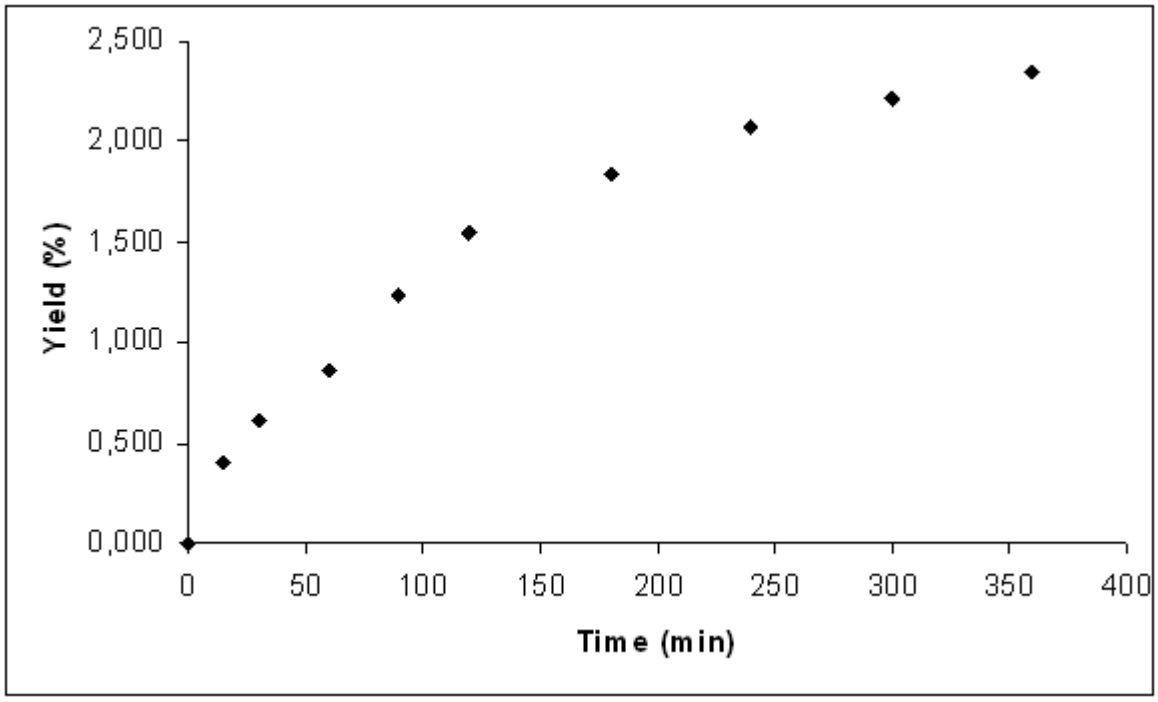

Figure 1. Yield evolution of aniseeds essential oil as function of the extraction time

Table 1. Composition of *Pimpinella anisum* essential oil

Components	RI	Relative Area (%)
linalool	1092	0.3
estragol	1203	1.9
cis-anethole	1268	0.5
trans-anethole	1338	92.4
γ-himachalene	1509	1.1
zingiberene	1526	0.3
anisylacetone	1536	0.3
o-isoeugenol	1867	1.9
butanoic acid, 2-methyl-, 4-methoxy-2-(3-methyloxiranyl)phenyl ester	1914	0.3
Total		98.8

Table 2. Composition of *Pimpinella anisum* essential oil (%) of various origins

Components	Algeria	Reported compositions		
		Turkey [18]	Turkey [7]	Portugal [8]
linalool	0.3	-	0.8	-
terpinene 4-ol	-	-	0.6	-
methyl chavicol	-	-	0.8	-
α-terpineol	-	-	1.0	-
estragol	1.9	0.6	-	2.2
anisaldehyde	-	0.9	0.5	1.9
cis-anethole	0.5	0.3	0.1	Tr
trans-anethole	92.4	95.4	89.5	92.5
methy eugenol	-	-	0.6	-
γ-himachalene	1.1	0.8	-	-
zingiberene	0.3	-	-	-
anesic acid	-	0.5	-	-
anisylacetone	0.3	-	0.2	-
anisyl alcohol	-	-	0.1	-
o-isoeugénol	1.9	-	0.2	-
trans-Pseudoisoeugenyl-2-methybutyrate	-	-	-	0.1
butanoic acid, 2-methyl-, 4-methoxy-2-(3-methyloxiranyl)phenyl ester	0.3	-	-	-

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