CHEMICAL COMPOSITION OF THE ESSENTIAL AND FIXED OIL OF PISTACIA LENTISCUS L. GROWN IN COLLO EAST OF ALGERIA

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Abstract

Essential oil and fixed oil isolated from the aerial parts and the ripe berries of Pistacia lentiscus l .growing in Algeria, was evaluated for its chemical composition, this species is used in Algerian folk medicine. The essential oil obtained by hydro distillation was analyzed by GC/MS; the results indicated that the EO of pistacia lentiscus L contained the β-Linalool is the major compound with a content of 52.8%, followed by β-Pinene with a content of 6.85%, followed by three compounds with very low levels are Terpene-4-ol, D-Limonene and 4-Carene with percentages that are respectively: 1.08%, 1.05% and 1.02%. While, the fixed oil was obtained by extraction with Soxhlet extractor (solid liquid extraction) with hexane contained three predominant compounds; the trilinolenin with an HRf of 12%, the trilinolein with an HRf of 16%, the triolein with an HRf of 20%, and the waxes with an HRf of 66%,

Keywords: pistacia lentiscus L, Extraction, Essential oil, Fixed oil, Fatty acids, CG/MS

Introduction

The mastic tree (Pistacia lentiscus L.), also called lentiscus pistachio, mastic tree, “Defoe” or “Tadist”, is generally a shrub 1 to 8 m in height [1]. It belongs to the Anacardiaceae family. It differs from other pistachio trees by its evergreen foliage; the compound type leaves are paripinnate, ending in a pair of leaflets, while those of other pistachio trees end in a single leaflet. They are deciduous in winter, pale green and generally larger [2]. In Algeria it is finding in the Mediterranean basin of the soummam this species occupies stages bioclimatic wet, it is very popular in traditional medicine. The Essential oils are complex mixtures of lipophilic and highly volatile secondary metabolites formed by aromatic plant, characterized by a strong odour [3], and is used for the following indications heavy legs syndrome, varicose veins, haemorrhoids, sinusitis, resorption of oedemas and bedsores, antispasmodic, expectorant action in dentistry and rheumatism[4, 5]. The study of its essential oil reveals the presence of mono terpenes (45 - 68.3%) followed by oxygenated mono terpenes (13.3-23.1%) and sesquiterpene hydrocarbons (9.2 - 28.1%), however that of fixed oil reveals the presence of oleic, palmitic and linoleic acids [6]. So, it is a source of essential fatty acids and contains 5.6% unsaponifiable matter, it is extracted from the fruit and it is used for the treatment of burns, rheumatism and coughs.

Figure.1: *Pistacia lentiscus* were collected from plants in the locality of Collo (East of Algeria)

Materials and Methods

Plant material

The plant material was collected from the region of Collo (wilaya of Skikda) on May 2018 during the flowering period, and the ripe berries of Pistacia lentiscus L. was collected in September 2018. The aerial parts of the harvested plant were washed, cut into small pieces, and then dried in the dark at room temperature and then ground into a fine powder using a grinder.

Extraction of oil

The essential oil (EO) was obtained by hydro distillation [7], 100 g of powdered plant was subjected to distillation using an extraction apparatus of Likens Nickerson type for 3h. At the end of this period, the EO was measured at the end of the process and the results were expressed in % (w/w). The OE is collected and stored at (+4°C) until analysis. The fixed oil (FO) of the harvest of ripe berries (black colour) of Pistacia Lentiscus L was extracted by Soxhlet extractor (solid liquid extraction) with hexane.

Identification of the chemical components of the essential oil

The chemical compounds of the essential oil of Pistacia lentiscus L was obtained by Gas chromatography coupled with spectrometry (GCMS-QP 2010SHIMDZU) was used for the quantitative and qualitative analysis of the essential oil with a carrier gas (helium) as the mobile phase, the injected volume of the sample was

0. 3µl or the temperature of the column (OV-17, 25m, 0,25mm) is maintained isothermally at 60°C for 2min then increase of 1°C/munite in order to reach 240°C in isotherm during 4min [8]. The identification of the compounds was made by the comparison of the retention times of the standard solutions and mass

spectra with those contained in the library of NIST. The percentage of each compound is calculated by the method of internal normalization [9]

Identification of the chemical compounds of the fixed oil

The chemical compounds of fixed oil was identified by thin layer chromatography

The revelation is done by UV lamp at 254 nm and vanil-sulphuric acid, the theoretical Rf for each compounds is calculated and compared with the experimental Rf on a GF254 plate, the mobile phase is composed of n-hexane - diethyl ether - glacial acetic acid. The solution to be analysed was prepared with 1% chloroform.

Results and discussion

The extraction yield

The EO of Pistacia Lentiscus L. was extracted by hydrodistillation, and the obtained distillate gave yellow oil with a characteristic pungent odour, the extraction yield was 0.0027 ml/100g.

The FO of Pistacia lentiscus L was extracted by extracted by Soxhlet extractor (solid liquid extraction) with hexane and the obtained distillate gave brown oil, and the extraction yield was 43.25 ml/100g. It was found that this yield is much higher than that obtained by: Adjimi R. and Aouchria [10] following an extraction from a sample of lentisk, harvested from the Annaba region, with a yield of 27.25 ml/100 g of berries.

The comparison of our results with the work carried out on an Algerian sample from the Annaba region, reveals the effects of the geographical climatic conditions, the harvesting period and the stage of development.

The chemical compounds of the fixed oil of Pistacia Lentiscus L.

The FO of the harvest of ripe berries of Pistacia lentiscus L was extracted by Soxhlet extractor (solid liquid extraction) with hexane and the obtained distillate gave brown oil, the extraction yield was 43.25 ml/100g. The FO was analyzed by thin layer chromatography and Revelation by UV Lamp and the results are reported in Table 1 and Table II.

Table I : Frontal ratios and HRf of FO from Pistacia lentiscus L. reveled by the Wood's lamp.

	Frontal Reports		
Stains	RF	HRF	compounds
A	0.04	4	Not identified
B	0.12	12	Trilinolénine
C	0.16	16	Trilinoléine
D	0.20	20	Trioléine
E	0.25	25	Not identified
F	0.66	66	Waxes

Table II : Frontal ratios and HRf from Pistacia lentiscus L revealed by vanil-sulphuric acid.

	Frontal Reports		
Stains	**RF**	**HRF**	**compounds**
A	**0.04**	**4**	**Not identified**
B	**0.12**	**12**	**Trilinolénine**
C	**0.16**	**16**	**Trilinoléine**
D	**0.20**	**20**	**Trioléine**
E	**0.25**	**25**	**Not identified**
F	**0.66**	**66**	**Cires**
G	**0.86**	**86**	**Not identified**

The Revelation By Wood Lamp allowed the presence of 6 Staines, the calculation of frontal ratios and their heights allowed us to obtain the compounds mentioned in **Table 1** comparing them with the bibliographic data [11], the compounds were identified as: The trilinolenin with an HRf of 12%, the trilinolein with an HRf of 16%, the triolein with an HRf of 20%, and the waxes with an HRf of 66%.

The Revelation with Vanil-Sulphuric Acid allows a more precise identification of the spots, because it gives a characteristic coloration, which differentiates the compounds with identical frontal ratios, and allows the identification of the spots invisible under Wood's lamp.

The recalculation of the Rf and the HRf and the comparison with the theoretical data of [12], allowed us to observe a new spot not identified with an HRF 86%,

In our study, the number of compounds obtained is lower than in the literature [13, 14], **Table III,** the difference is probably due to the operating conditions and the reliability of the separation itself.

Compounds	Percentage %
Palmitic acid	24,5
Palmitoleic acid	1,2
Stearic acid	1,8
Oleic acid	54,8

Linoleic acid	13,9
Linolenic acid	2
Arachidic acid	0,3
Unsaponifiable	5,6

The chemical compounds of essential oil of Pistacia lentiscus L

The EO of the aerial parts of Pistacia lentiscus L. was extracted by hydrodistillation, and the obtained distillate gave yellow oil with a characteristic pungent odour, the extraction yield was 0.0027 % (w/w). The EO was analyzed by thin layer chromatography and Revelation by CG/MS and Wood Lamp and the results are reported in Table IV. Comparing them with the bibliographic data [12], the compounds were identified as the linalyl acetate with an HRf of 36%, the anethol with an HRf of 55%.

Table IV: Frontal ratios and HRf of the essential oil from Pistacia lentiscus L. revealed by the Wood's lamp.

		Frontal Reports		
		RF	HRF	Compounds
Stains	A	0.36	36	Linalyl acetate
	B	0.5	50	Not identified
	C	0.55	55	Anéthol
	D	0.8	80	Not identified

This developer allows for more accurate identification of stains, as it gives a characteristic coloring, which differentiates compounds with identical frontal ratios, and allows for the identification of stains invisible under Wood's lump.

The recalculation of Rf and HRf and the comparison with theoretical data from [13], allowed us to identify one new unidentified compound with an HRf of 85%.

Table V: Frontal ratios and HRf of the essential oil from Pistacia lentiscus L. revealed by vanil-sulphuric acid

	Frontal Reports		
Stains	RF	HRF	compounds
A	0.36	36	Linalyl acetate
B	0.50	50	Not identified
C	0.55	55	Anéthol
D	0.80	80	Not identified
E	0.85	85	Not identified

Gas chromatography/mass spectrometry

The compounds of the EO were determined on the basis of retention index (RI) implemented by the injection of the samples and the injection of the reference of a homogeneous series of n-alkanes (C_8-C_{30}), in the same experimental conditions. Supplementary identifications were made by comparing the mass spectra obtained with those of NIST 05 and the Wiley 8th version and a home-made MS library constructed from pure materials and known components of essential oils, and also comparing their retention index with the values of literature. The results were reported in Table IV.

Table IV: Chromatographic profile of the analysed essential from *Pistacia lentiscus L*

Compound	N°CAS (British Pharmacopoeia, 2007)	IR (min)	(%)
4-Carene	5208-49-1	3,48	1,02
β-Pinene	127-91-3	4,20	6,85
D-Limonene	5989-27-5	5,02	1,05
P-Cymene	527-84-4	5,30	37,92
β-Linalool	78-70-6	8,46	52,08
Terpene-4-ol	7299-41-4	8,89	1,08

From the TLC and GC/MS results of the essential oils, we can conclude that our sample is composed of: Anethol, 4 - carene, β - pinene, D – limonene, P - cymene, β-Linalool, Terpene - 4 - ol. The number of compounds detected is lower than that mentioned in the bibliography [14], which indicates the presence of 9 representative and characteristic constituents listed in the table: By comparing the results obtained with those mentioned in the bibliography [14], we found common components but with different contents: Limonene, Terpinen-4-ol, ß – pinene, *P* – cymene

Conclusion

Essential and fixed oils are compounds of medicinal plants with high biological potency used in several fields. Therefore, and in view of the results obtained in our previous carried out on the medicinal plant ***Pistacia lentiscus L.*** We decided on this work to study the chemical composition of essential and fixed oils, the vegetable oil yield showed an interesting profitability of 43.25 ml / 100 g of berries. The results of the analysis of vegetable oil by thin layer chromatography indicate that the vegetable oil of ***Pistacia lentiscus L.*** is composed of of triolein, trilinoleine, trilinolenine and waxes, and the yield of essential oils showed a low profitability of 0.027 ± 0.003 ml / 100 of DM., The results of the analysis of the essential oil by thin layer chromatography and gas chromatography coupled with a mass spectrophotometer indicate that the essential oil of *Pistacia lentiscus L*. is constituted of β-Linalool ,β-Pinene , Terpene-4-ol, D-Limonene and 4-Carene, when the chemotype of EO is the β- Linalool.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

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