

GC-MASS Analysis of The Essential Oil of Vitex Agnus Leaves Cultivated in Baghdad.

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ABSTRACT

Objective: the study was conducted to evaluate the qualitative and quantitative properties of Vitex agnus leaves cultivated in Baghdad-Iraq. **Methods:** leaves of the plant were collected from two famous spots at different sporadic regions in Baghdad where the plant famously grows. The essential oil obtained by hydrodistillation. Constituents of the volatile oil were determined by Gas Chromatography. **Results:** the chromatogram of essential oil from Baghdad specimen shows 16 peaks representing the molecular masses of volatile components. The main compounds of essential oil were (13.29) Eucalyptol, (13.17) beta-Pinene, (11.54) cis-.beta.-Farnesene, (10.87) Caryophyllene and (8.64) alpha-Pinene. **Conclusion:** The percentage of essential oil of vitex agnus leaves grown in Baghdad soil was found to be low which proves that the plant flourishes best in humid regions as opposed to semi-arid regions like Baghdad.

Keywords: GC-MASS, Essential Oil, Vitex Agnus Leaves

Introduction

Since the beginning of time plant has been used in the treatment of many diseases in every culture and all countries. From plant species present choosing the right plant, the time of collection of the right part beside the method of extraction is very important because the active constituents within the same species differ responding to different soil and weather⁽¹⁾. Iraqi soil is rich with medicinal plants and Iraqi people trust using herbal as treatments since ancient times as noticed by the Sumerian and Babylonian clay⁽²⁾. Vitex agnus-castus, also known Chaste Tree, Chasteberry and Monk's Pepper is a small tree or shrub that belongs to family Lamiaceae is one of the most important wild plants in Iraq. It's a deciduous plant native to European, Mediterranean and Central Asian countries^(3,4). It's commonly cultivated in warm temperate and sub-tropical regions for its delicate-textured aromatic-foilage and butterfly-attracting mid-summer strikes of lavender like flowers opening in late summer in cooler climates (5). Leaves are long-petiolate, at opposite sides, palmately-compound with approximately 3 to 9 stipulate leaflets; leaflet blade of a linear-lanceolate, apex, and base acuminate, 1.5 to 10.0 centimeters long, 0.5–2.0 centimeters in width (6). Flowers are perfect, symmetric, campanulate and white-tomentose, Fruits are drupe, globose to sub-globose, reddish in color, oval or almost globular, with a diameter of up to 5 millimeter(7). Kef merriem has been used locally for centuries to treat menstrual issues

including premenstrual syndrome, fertility, galactorrea and premenstrual related acne (8). Vitex Agnus leaves contain a great quantity of essential oil that have anti-fungal, anti-microbial and insect-repellent properties and that' due to its rich chemical components: hydrocarbon monoterpenes (e.g., camphor 2, Cis-B-Farnesene, E-B-farnesene eucalyptol, pinene, limonene, myrcene, gamma terpinene, globulol. Also, Sesquiterpenes like caryophyllene. This study is carried out to evaluate the chemical elements of the essential oil of the plant's leaves that's cultivated in Baghdad- Iraq (9).



Figure 1: Vietx agnus leaves before flowering stage

Materials and methods

Leaves of the plant were collected from two famous spots at different sporadic regions in Baghdad where the plant famously grows. The leaves were dusted off, cleaned properly and left to dry in room temperate for two full weeks before embarking on the process. Hydrodistillation of 200 g of air- dried vitex agnus leaves with 150ml of water was carried out for three hours by Clevenger-apparatus according to the procedure applied in the European pharmacopeia(10).The pale yellow oil was isolated then kept at low temperature in air-tight container until analysis by Gas chromatography/Mass spectrometry (GC/MS).

GC/MS analysis was carried out to identify the essential oil from leaves of Vitex agnus. The carrier gas for GC was helium and it was injected at volume 1 μ L, and splitting ratio was 2.0. Injection temperature was 250 C. Column temperature was increased from 80 C and rose up to 310 C at 10 $^{\circ}$ C / min. GC analysis for detection of essential oils was performed at Ibn AL-Betar center for research/ Ministry of Industry / Baghdad.

Results and discussion

The qualitative analysis of essential oil of Baghdad specimen was performed by GC/MS chromatogram as shown in Figure (3.2). Identification of the components of the oil was performed by comparing their mass spectra with database library of Ibn AL-Betar center for research/Ministry of Industry / Baghdad.

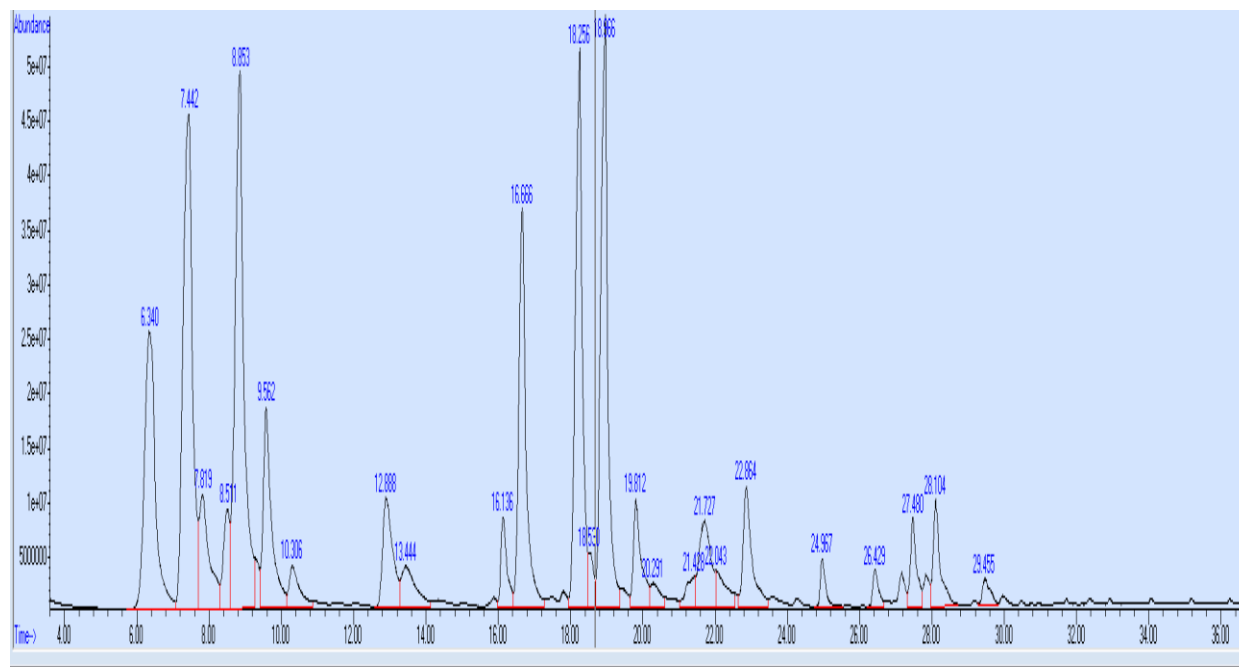


Figure 2 : GC/MS analysis of essential oil from leaves of *Vitex agnus* .

The chromatogram of essential oil from Baghdad specimen shows 16 peaks representing the molecular masses of volatile components. The identified compounds are shown in Table (1).

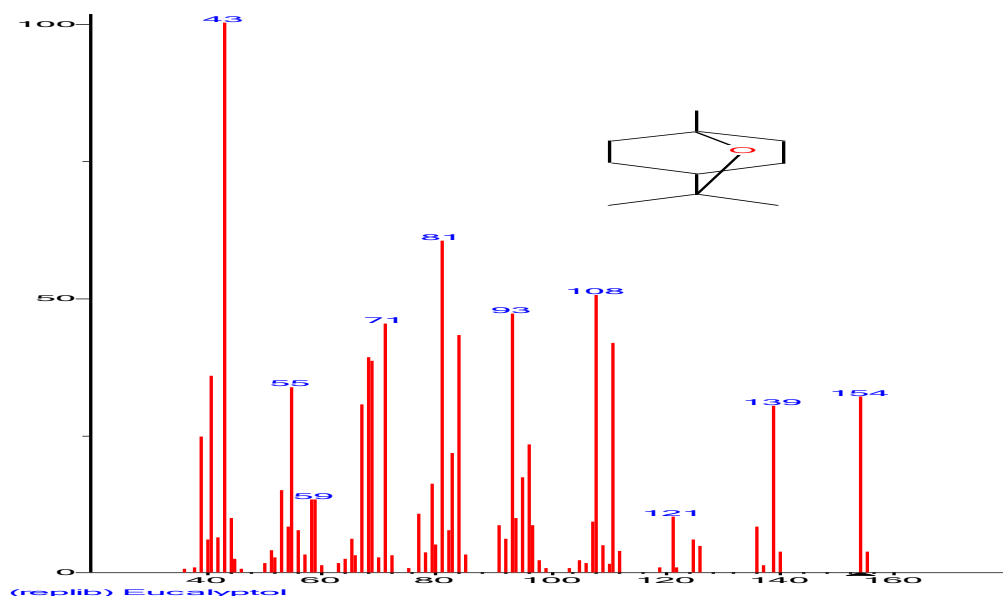
Table 1: The identified compounds , retention time, similarity index and area for GC/MS analysis of essential oil.

Peak no.	Compound	Retention time	Similarity index	Area%
1	alpha-Pinene	6.32	96%	8.64
2	beta-Pinene	7.44	93%	13.17
3	beta-Myrcene	7.81	89%	3.27
4	2-Carene	8.51	96%	1.81
5	Eucalyptol	8.85	91%	13.29
6	Gamma-terpinine	9.56	97%	4.77
7	4-Carene	10.30	96%	1.26
8	Terpinen-4-ol	12.88	88%	3.09
9	alpha.-Terpineol	13.44	90%	1.64
10	gamma-Elemene	16.13	97%	1.56
11	Caryophyllene	18.25	99%	10.87
12	(E)-.beta.-Famesene	18.25	93%	10.87

13	cis-.beta.-Farnesene	18.96	95%	11.54
14	gamma.-Muuroleone	20.29	94%	0.63
15	Ledol	29.45	96%	0.64
16	Caryophyllene oxide	21.72	87%	2.29
17	beta.-Humulene	22.04	92%	1.64

The results were obtained at table (1) refers to 16 components of volatile oil of chaste-berry leaves. The main compounds of volatile oil were (13.29) Eucalyptol, (13.17) beta-Pinene, (11.54) cis-.beta.-Farnesene, (10.87) Caryophyllene and (8.64) alpha-Pinene.

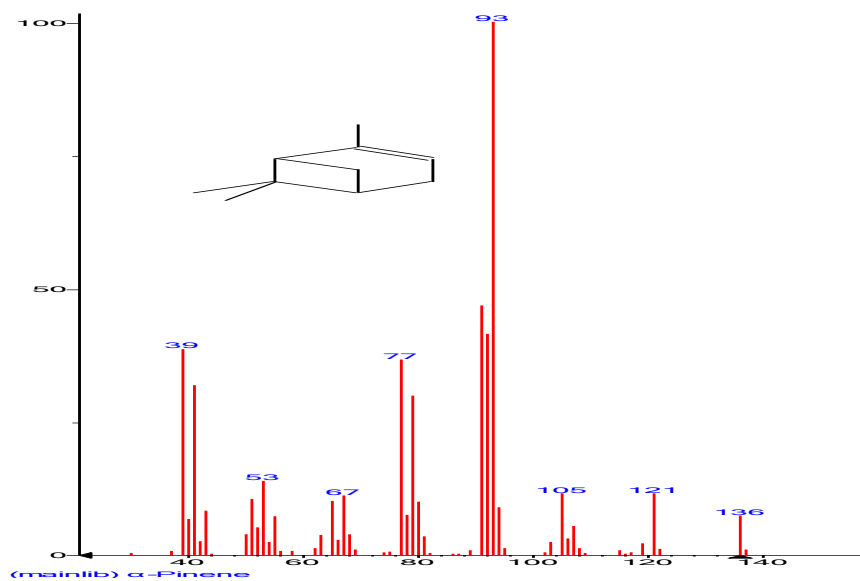
Although the leaves were collected before flowering stage for optimal essential oil concentration, the percentage of essential oil of vitex agnus leaves grown in Baghdad soil was found to be low which proves that the plant flourishes best in humid regions as opposed to semi-arid regions like Baghdad(11) .



(A)

Name: Eucalyptol, Formula: C₁₀H₁₈O.

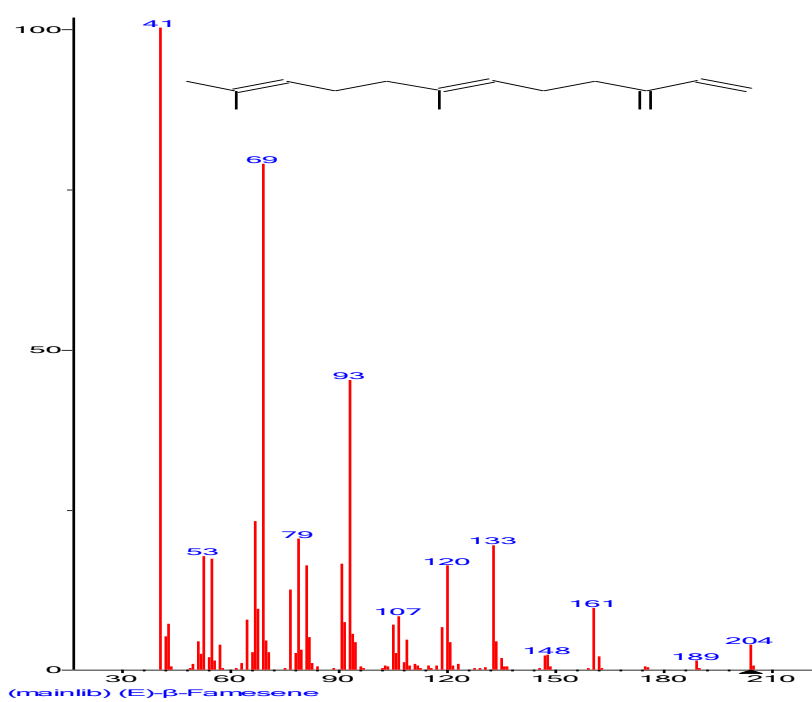
MW: 154 Exact Mass: 154.135765 CAS#: 470-82-6 NIST#: 379213 ID#: 2717.



(B)

Name: beta-Pinene, Formula: $C_{10}H_{16}$

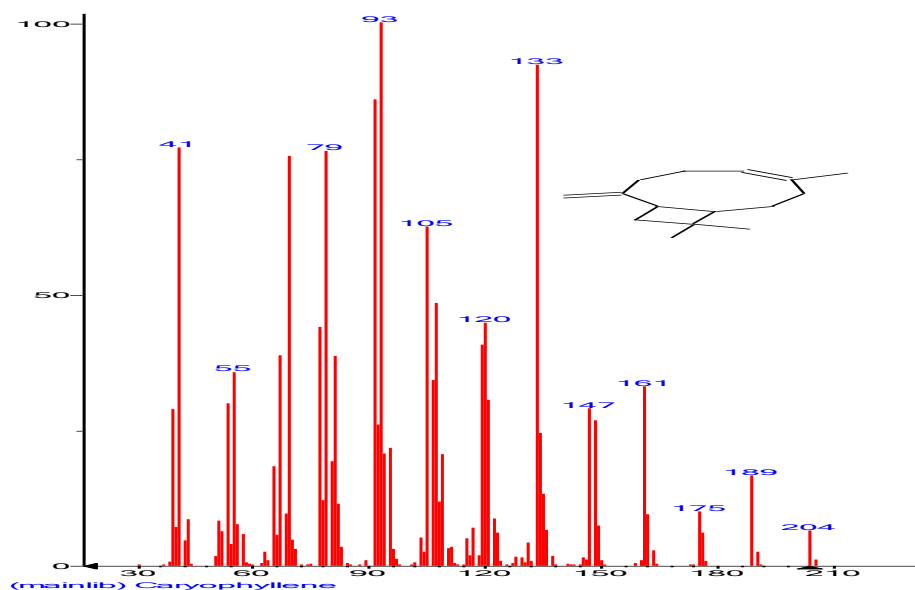
MW: 136 Exact Mass: 136.1252 CAS#: 80-56-8 NIST#: 134072 ID#: 60228.



(C)

Name: (cis)- β -Famesene, Formula: $C_{15}H_{24}$

MW: 204 Exact Mass: 204.1878 CAS#: 18794-84-8 NIST#: 141111 ID#: 3251.



(D)

Name: Caryophyllene, Formula: C₁₅H₂₄

MW: 204 Exact Mass: 204.1878 CAS#: 87-44-5 NIST#: 291486 ID#: 60555

Figure (3): Fragments of the extracted essential oil from leaves of Baghdad plant: (A) eucalyptol, (B) beta-Pinene, (C) (cis)-β-Famesene, (D) caryophyllene compared with fragments in the database.

In general, the diversity in quantity of oil contents, percentage of components and chemotypes of *R. officinalis* in different locations have been ascribed to many factors, including geographical environment, genetic heritage, population density of plant in addition to physical and chemical characteristics of soil, growing media and time of harvest⁽¹⁰⁻¹²⁾.

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