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New Components in the Volatile Oil of Sage

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Abstract

Background: The volatile oil of dried leaves of "Sage" Salvia Officinalis was obtained by hydrodistillation (1.2% v/w).

Aim of Study: This study was designed to analyze the volatile oil by (GC-MS).

Material and Methods: Crushed dried Leaves (100g), were subjected to hydrodistillation E.P. (1984) GC-MS analysis was performed on Hewlett Packard 5850 GC connected to an HP 5970 quadruple nano spectrometer (70cw) and an HP 9000 work station with helium as the carrier gas.

Results: 26 components representing 95% of the total oil were identified. Four of these components Linolool, Borneol, a-Terpinol and Thujone were most abundant constituents of the oil about (51%). In addition significant amounts of unreported constituents were found to be present such as peaks No. 12, 16, 17, 18 whose Mwt and preliminary chemical structure were suggested and called Kuwaitene 1,2,3,4 by author.

Conclusion: GC-MS analysis of the volatile oil revealed at least 35 components, most of which could be identified, 4 of which were not reported in the literature before and reported here for the first time. (Peak No 12, 16, 17, 18 whose M. wts: 136 (1,4-Cyclohexanone, 1-Methyl 4, J-Methylethyl) 152 (Chrysanthone), 154 (3-Cyclohexen, 4-Methyl (I-Methyelthyl), 154 (Isomer) respectively).

Key Words: *Sage – Salvia officinalis leaves – Volatile oil GC-MS – Kuwaitene 1, 2,3,4.*

Introduction

SAGE Officially Known as Salvia Officinalis L. The name sage comes from the latin “Salvere” or salvation meaning “to be in good health, to cure or to save”. Sage was a sacred ceremonial herb of the Romans. It was associated with immortality, and was thought to increase mental capacity. The Chinese valued the use of in teas, and the American Indians used it for medicinal purposes. In Kuwait, it is used as a stringent, to improve digestion, blood circulation in debility and convalescence. It is used to reduce night sweats, treatment of excessive salivation, as a gargle against throat and mouth infections **[1-4]**.

In a study on the essential oil of the common sage. It was found to contain about 23.7% of α-thujone and β-thujone which were responsible for the characteristic odor and flavor **[5]**.

Pitarevic & Raic et al., reported that the yield and composition of essential oil changed from month to month and the maximum in essential oil in the leaves appeared during July. Correlations between geographic origin and composition indicated that the quantity and composition could vary with regard to the main component α-thujone, β-thujone, camphor and cineole **[6,7]**.

In another study by Pascaglia, et al., it was found that constituents, β-thujone, camphor, P-Cymene, β caryophylene, α-humulene and cargophylene oxide of Salvia Officinalis oil were effected significantly by various concentrations of fertilizers **[8]**.

Tekelova and Felkolva reported in a different study that contents of essential oil, hydroxycinamic and derivatives in separate leaf insertions were found to be highest in middle part of the herb and top of the herb respectively **[9]**.

Gomez et al., reported that other components, such as 1, 8-Cineole (15.71%), manool (1.94%)

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Abbreviations:

PAAET : Public Authority for Applied Education and Training.
GC-MS : Gas chromatography-mass spectrometry.
IR : Infrared.
Mwt : Molecular weight.
EO : Essential oil.

and viridiflorol were found in the essential oil of salvia officinalis using GC, IR and GC/MS techniques [10].

The hypoglycenic effect of volatile oils of sage and other plants were reported by Essaway et al., [11] to be significant in rats at 1 and 3 hours. In the same study the LD 50 was found to be 1950mg/kg.

The effects of Salvia Officinalis essential oils main constituents were studied by Carta et al., on Bocrytis Ginerea fungus and compared with the action of two synthetic plant fungicides prodione and benomyl and it was found that in the essential oil, its oxygenated fraction and the camphor showed fungicidal activity in dosses of 2.2, 1.85 and 1.75g/L respectively. While 1, 8-Cineole had no significant effects on the test organism [12].

Karawya et al., reported the presence of Campor and thujone in levels reaching up to 45.7% of the total make up of the essential oil of S. Officinalis [13].

Further studies on other species such as S. glutinosa L, growing in southern Italy and S. aurea L and other wild species grown in spain showed similar constituents [14-17].

Material and Methods

Experimental:

Plant material:

The dried leaves were imported from Hamdard laboratories, Haider Ahad, Pakistan who provide most of the plant materials used at the Islamic medicine Centre here in Kuwait with authenticated documents.

Oil preparation and analysis:

Crushed dried Leaves (100g), were subjected to hydrodistillation E.P. (1984). The composition of the volatile constituents was established by GC-MS analyses on Hewlett Packard 5850 GC CONNECTED TO AN HP 5970 quadruple nano spectrometer (70cw) and an HP 9000 work station with helium as the carrier gas.

J & W Scientific operated in split mode 50: 1 Conditions; Inhector Temp, 285º, deccript temp, 295º, initial Oven temp, 80º held for 1min, increased 80º/min to 145º and held for 6sec. Then increased 50º/min to 275º and held for 5min. Qualitative identification of the components was achieved by the automated data bank library attached to the GCMS and the data obtained are listed in (Tables 1,2).

Table (1): Identified components of the volatile oil of salvia officinalis (reported).

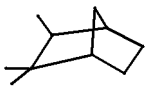
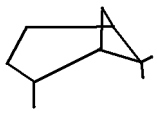
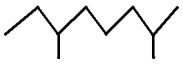
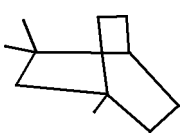
Peak No.	R.Time	M.Wt	Chemical Name	Structure
1	7.272-7.314	136	1,3,6 Octatriene 3,7-dimethyl	
2	7.725-7.767	136	Camphene	
3	8.667-8.708	136	Beta-pinene	
4	9.292-9.33	136	Beta-myrcene	
5	10.133	136	1,3-Cychlohexadiene	
6	10.383-10.450	134	Benzene 1-methyl 4-methylethyl	
7	10.625-10.700	154	Eycalyptol	

Table (1): Cont.

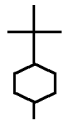
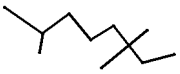
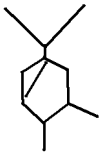
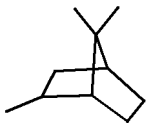
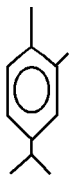
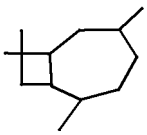
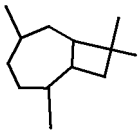
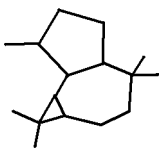
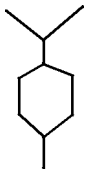
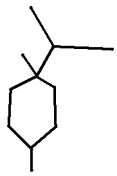
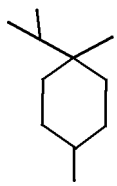
Peak No.	R.Time	M.Wt	Chemical Name	Structure
9	12.742-12.775	136	Terpincilen	
10	13.217-13.250	154	Linollool	
11	13.308-13.350	152	Thujone	
13	14.675-14.742	152	Camphor	
14	15.367-15.408	172	Bornyl chloride or turpentine camphor	
15	15.517-15.67	154	Borneol 1-2 camphanol	
18	16.449-16.525	154	Alpha-terpineol	
21	20.208	150	Phenol, 2-methyl-5 (I-methylethyl)	
24	24.475-24.533	204	Isocaryophyliene	
25	25.113-25.158	204	Caryophyllene	
34	29.939-29.982	222	Ledol	

Table (2): Unidentified components of the volatile oil of salvia officinalis (unreported).

Peak No.	R.Time	M.Wt	Chemical Name	Structure
8	11.683	136	1,4-Cyclohexanone 1-Methyl 4 (J-Methylethyl) (Kuwaitene 1)	
12	13.717-13.758	152	Chrysanthone (Kuwaitene 2)	
16	15.608	154	3-Cyclohexen 4-Methyl (I-Methyelthyl) (Kuwaitene 3)	
17	15.958-16.00	154	Isomer of 16 (above) (Kuwaitene 4)	

Results

The leaves of Salvia Officinalis afforded on hydrodistillation a pale yellow volatile oil (Yield in 25% v/w). It has a characteristic sage like odour and is soluble in chlorofoam, benzene, ether and alcohol.

GC-MS analysis of the volatile oil (Table 1) revealed at least 35 components, most of which could be identified, 4 of which were not reported in the literature before (Peak No 8, 12, 16, 17, M.wts: 136 (1,4-Cyclohexanone, 1-Methyl 4, J-Methylethyl) 152 (Chrysanthone), 154 (3-Cyclohexen, 4-Methyl (I-Methyelthyl), 154 (Isomer) respectively). The Chemical names and library matches are listed in Table (2).

Discussion

Salvia officinalis L. and Salvia sclarea L. have an important place in world trade as they have important economic value for the perfume and cosmetic industry **[18]**.

The medical sage (Salvia officinalis L.) has extensive uses. It is widely used in medicine, food, drink, perfume and cosmetic industries **[19,20]**.

Germacrene-D (32.9%), 0-caryophyllene (31.8%) and caryophylleneoxide (23.2%) were determined in a study as the main components among the 43 compounds identified by GC/MS. analysis of the volatile oil composition of Salvia officinalis L. grown in Cuba **[21]**.

The essential oil (EO) composition of Salvia officinalis L. grown in North India was investigated using gas chromatography (GC/FID) and GC-mass spectrometry (GC/MS). The required oil yield varied between 0.22-0.43% and 0.15-0.60%, respectively, depending on harvest season and processed plant parts. Sixty components were determined corresponding to 95.5-99.2% of the fat compositions. Cis-thujone (19.8-42.5%), (E)-caryophyllene (1.2-16.1%), manool (3.6-15.1%), viridifluorol (%3.1-12.8), 1.8-cineole (2.8-13.8%), camphor (1.4-22.1%), borneol (0.9-4.8%), a-humulene (1.5-4.5%), 3-pinene (0.7-4.1%), and trans-thujone (1.4-3.7%) were the main identified components of the essential oil **[22]**.

Karayel and Akcura, 2019 reported that as a-thujone, Camphor, 1,8-cineole were the main components of the volatile oil from Medical sage Salvia officinalis L. (hybrid) growing in three different locations **[23]**.

The results of the present study was consistent with the findings of these investigators.

GC-MS analysis of the volatile oil revealed at least 35 components, most of which could be identified, 4 of which were not reported in the literature before.

The reasons for these differences can be attributed to many different factors such as the variability in volatile oil composition due to the flowering time of the salvia plant, geographic and climatic factors in addition to the variety and amount of bioactive substances found in medicinal and aromatic plants may also vary according to the part of the plant used, post-harvest processes and the way of obtaining the essential oil as well as the analysis methods **[24]**.

Conclusion:

In Conclusion, four new products were reported by GC-MS analysis of the volatile oil. Further investigation in the nature of these unreported components is recommended.

Conflicts of interest: There are no conflicts of interest.

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المكونات الجديدة فى الزيت المتطاير من المرامية

الهدف من الدراسة: تحليل الزيت المتطاير من المرامية.

خطة البحث: فى هذه الدراسة تم الحصول على الزيت المتطاير للأوراق المجففة من المرامية عن طريق التكسير المائى ثم تعرضت الأوراقالمجففة المسحوبة ١٠٠ جم للتحليل المائى.

نتائج البحث: بمقارنة نتائج البحث بالنسبة للنتائج التى تم الحصول عليها فى الأبحاث السابقة، وجدت النتائج كالآتى:

تحديد ٢٦ مكون معروف من قبل تمثل ٩٥٪ من إجمالى الزيت.

وأخيراً هذه الدراسة تؤكد أنه تم اكتشاف أربعة مكونات جديدة لم يتم ذكرها من قبل فى الأبحاث السابقة.