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Further New Components in the Volatile Oil of Sage

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Abstract

Background: As mentioned in the first part of this study, sage leaves and their essential oils are very important and most commonly used in the food, drug and perfumery industries. The volatile oil of dried leaves of "Sage" Salvia Officinalis was obtained by hydrodistillation method (1.2% v/w).

Aim of Study: The present study was a continuation of the previous one where four new constituents Kuwaitine 1, 2, 3, 4 were unveiled further analysis was carried out along the same procedure to determine and evaluate the essential components of the volatile oil of sage by (GC-MS) provided further data exposing further constituents.

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

Results: As mentioned in part one of the study 26 components representing 95% of the total oil were identified. Four of these components were not reported before. Thujone, Camphor Camphene, Pinene, Myrecene, Eucalyptol, Terpinlen, Linolool, Borneol, a-Terpinol and most abundant constituents of the oil about (51%). In addition significant amounts of unreported constituents were found to be present such as Peak No. 19, 20, 23, 40 whose Mwt and suggested stu preliminary chemical structure were elucidated and called Kuwaitene 5, 6, 7, 8 by the Author.

Conclusion: GC-MS analysis of the volatile oil revealed at least 35 components, most of which could be identified, four of which were not reported in the literature before (peak no. 19, 20, 23 and 40. M. Wts 136 (Bicyclo 4. 1.0 HEPTANE, 7 (I-methylethylidene) 196 (2-Nor bornanol), 196 Isomer (Terpinyl acetate), 332 (Sandaracopimar-15, en-8, beta-yl acetate) respectively) named by the author as "Kuwaitene 5, 6, 7, 8".

Key Words: *Sage – Salvia officinalis leaves – Volatile oil GC-MS.*

Introduction

MANY salvia species with their varieties are known and belonging to the mint family (Labiatae). Dalmatian (common) sage (Salvia officinalis L.) is the most important of them. S. officinalis L. is an odorous small perennial shrub native to the Mediterranean region (Dalmatia, Albania, Turkey, Italy) and is cultivated in many different regions in the world **[1]**.

Essential oil of sage and their preparations can be externally used for treatment of the mucous membranes of throat and mouth inflammations and infections such as (stomatitis, gingivitis, and pharyngitis). Also, it can be used internally the essential oil can be used for dyspeptic symptoms and excessive perspiration treatment **[2]**.

α and B-thujone are the main constituents of the essential oil (35-50%, mainly α thujone) **[3]**. The maximum percentage of α and B-thujone contents are up to 63 and l3% respectively. Although, α-thujone which is found by a higher proportion in the essential oil, it is considered more toxic than B-thujone **[4]**.

α and B-thujone, camphor and 1, 8-cineole are mainly responsible for the main biological properties of essential oil of S. officinalis. The drug has antimicrobial and antiviral effect because of the thujone rich essential oil **[5]**.

Common sage is reported to have and possess an antimicrobial effect in Palestinian traditional medicine **[6]**.

The main traditional uses of S. officinalis were confirmed by a survey studied the taxonomical and pharmacological of therapeutic plants in Jordan in 2008 by reporting that it can be used frequently in management of skin and eye diseases and also in pleurisy through their antiseptic, antiscabies, antisyphilitic, and anti-inflammatory effects **[7,8]**.

In Jordan and the Middle East, also it was reported that common sage can be frequently used

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for treatment of fever, digestive disorders and also stomach ache [9].

Sage oils were reported to have antibacterial effects due to the presence of 1, 8-cineole, thujone, and camphor [10].

Pinto et al., [11] reported that 1, 8-cineole and camphor were essentially the main responsible for the antifungal effect in the tested strains while, thujones did not play an important role against yeasts and filamentous fungi.

The essential oil composition of S. officinalis is reported to be highly affected by many factors such as genetic, environmental factors, organ age, climate conditions, and seasonality [12].

Sage leaves and essential oils are reported to have carminative, antispasmodic, antiseptic, astringent and anhidrotic effects [3].

External uses of the drug, essential oil and their preparations are inflammations and infections of the mucous membranes of throat and mouth such as stomatitis, gingivitis and pharyngitis. While, intenral uses are excessive perspiration and also dyspeptic symptoms. Also, the essential oil is reported to be considered as a moderate skin irritant [5].

Material and Methods

Experimental:

Plant material: The dried leaves were imported from Hamdard laboratories, Haider Abad, 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) GC-MS analysis was performed on Hewlett Packard 5850GC 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).

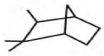
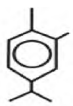
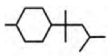
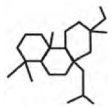
Peak no.	R.time	M.Wt	Chemical name	Structure
1	7.272-7.314	136	• 1, 3, 6 Octatriene 3, 7-dimethyl	
2	7.725-7.767	136	• Camphene	
3	8.667-8.708	136	• Beta-pinene	
4	9.292-9.33	136	• Beta-Myrcene	
5	10.133	136	• 1, 3-Cyclohexadiene	
6	10.383-10.450	134	• Benzene 1-Methyl 4 - Methylethyl)	
7	10.625-10.700	154	• Eycalyptol	
9	12.742-12.77.5	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	15.517-15.567	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
19	16.675	136	Bicyclo 4.1.0 HEPTANE 7 (I-methylethylidene) (Kuwaitine 5)	
20	19.900-19.942	196	2-Nor bornanol (Kuwaitine 6)	
23	22.125-22.175	196 Isomer	Terpinyl acetate. (Kuwaitine 7)	
40	42.650-42.708	332	Sandaracopimar-15 en-8, beta-yl acetate (Kuwaitine 8)	

Results

As in part one of the study, 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, four of which were not reported in the literature before (peak no. 19, 20, 23 and 40. M.Wts 136 (Bicyclo 4.1.0 HEPTANE, 7 (I-methylethylidene) 196 (2-Nor bornanol), 196 Isomer (Terpinyl acetate.), 332 (Sandaracopimar-15, en-8, beta-yl acetate) respectively). The Chemical names and library matches are listed in (Table 2). Further investigation in the nature of these unreported components would be favourable.

Discussion

People have used plants in diseases management for centuries and the use of plants for treatment has continued until today. Another development is the understanding of the flavor, smell, taste and appetizing properties of these plants in terms of nourishment and the spread of their use. Natural remedies constitute a significant part of drugs used for the treatment of different diseases. The developed and developing countries use the natural drugs by rate of 60% and 4% respectively **[13]**.

The sage plant is helpful by using the parts of herb, leaves and volatile oil. The chemical composition of the essential oils obtained from these plants varies greatly according to the geographical characteristics of the area where they grow in **[14]**.

The active substances derived from the Salvia species are considered the main raw material for various drugs used for the treatment of certain diseases **[15]**.

The salvia species in general are the plants which have antibacterial, antiseptic, analgesic, antioxidant properties as well as biological activities such as insecticide **[16,17]**.

However, the chemical composition of the essential oils obtained from these plants exhibits great variability in relation to the geographic properties of the area they grow in. It is known that the biological activity of the essential oil is directly attributed to the major constituents present in the composition of the essential oil **[16,17]**.

A study was conducted simultaneously in three different locations in Çanakkale, Balıkesir and Kütahya aimed to identify the effect of location on the components of volatile oil, volatile oil rate and volatile oil quality of Medical sage (Salvia officinalis L). Different components from Salvia officinalis L. (hybrid) were analyzed and these numbers constituted 97.31%-97.83% and 97.61% of all the total fat in all locations. The main component values for the volatile oils were determined, respectively, as follows: Salvia officinalis L., α-thujone 46.00%, 44.53%, 35.78%, β-thujone 5.05%, 6.31%, 8.61%, camphor 10.73%, 19.15%, 18.68%, 1.8-cineole 8.99%, 7.23%, 5.06%, viridiflorol 1.85%, 2.28%, 4.23%. The rates of these main components constitute 72.62%, 79.5% and 72.36% of the total fat amount in the 3 locations (Çanakkale, Balıkesir-Edremit and Kütahya), respectively **[18]**.

The essential oil was obtained by the researchers from S. officinalis L. collections grown in the temperate climate of India through GC/MS. It was reported that the essential oil content of S. officinalis L. ranged from 1.11% to 2.76% on a dry weight basis and its major components were as follows: α-thujone (21.43% to 40.10%), β-thujone (2.06% to 7.41 %), camphor (11.31 % to 37.67%), 1.8-cineole (9.17% to 4.47%), α-humulene (4.58% to 9.51 %), camphene (1.89% to 7.04%), viridiflorol (2.14% to 5.56%), α-pinene (1.55% to 6.17%), β-pinene (1.68% to 3.49%) and β-caryophyllene (1.06% to 5.59%) **[18]**.

a-thujone (22, 8-41, 7%), Camphor (10, 7-19,8%), 1,8-cineole (4,7-15,6%) and 0-thujone (6, 1-15, 6%) were the main components reported through GC/MS analysis of four essential oils from Salvia officinalis L. grown in Spain to identify their relative and absolute compounds **[19]**.

Conclusion:

In conclusion, GC-MS analysis of the volatile oil revealed at least 35 components, most of which could be identified, four of which were not reported in the literature before (peak no. 19, 20, 23 and 40. M. Wts 136 (Bicyclo 4.1.0 HEPTANE, 7 (I-methylethylidene) 196 (2-Nor bornanol), 196 Isomer (Terpinyl acetate.), 332 (Sandaracopimar-15, en-8, beta-yl acetate) respectively) named by the author as "Kuwaitene 5, 6, 7, 8". The chemical names and library matches were listed however four new components that were not reported before were found along the same line of sciences. Further investigation in the nature of these unreported components would be favorable.

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المزيد من المكونات الجديدة فى الزيت المتطاير من المرامية

كان هدف الدراسة هو تحليل الزيت العطرى المتطاير من نبات المرامية حيث تم التكسير المائى للأوراق المجففة المسحوقة ١٠٠جم من المرامية من أجل الحصول على الزيت العطرى وتم تحديد ٢٦ مكون معروف من قبل ومثبت علمياً بالأبحاث السابقة تمثل ٩٥٪ من إجمالى الزيت وكما تم إكتشاف أربعة مكونات جديدة فى البحث السابق كشفت تحليل الزيت المتطاير لنبات المرامية عن أربعة مكونات جديدة غير مثبتة من قبل فى الأبحاث السابقة وهذا الإكتشاف يعد نعمة من نعم الله الكثيره علينا والتى لا تعد ولا تحصى ففى كل يوم يتم إكتشاف العديد من المكونات الجديدة حتى فى أبسط الكائنات حولنا وكما قال الله تعالى فى كتابة الحكيم "وَإِنْ تَعُدُّوا نعمة اللّه لا تحصوها" وما زال البحث جارياً فى إكتشاف مركبات جديدة فى نعمة واحدة من نعم اللّه الا وهى الزيت الطيار للمرامية.