African Journal of Advanced Pure and Applied Sciences (AJAPAS)

Online ISSN: 2957-644X

Volume 2, Issue 3, July-September 2023, Page No: 160-166

Website: *https://aaasjournals.com/index.php/ajapas/index*

||Arab Impact factor 2022: 0.87|| SJIFactor 2023: 5.689|| ISI 2022-2023: 0.557

The Gas Chromatography-Mass Spectrometry (GC-MS) Analysis of Seed Oil of Retama Raetam

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Received: June 11, 2023	Accepted: July 27, 2023	Published: July 29, 2023

Abstract:

One of the most accurate techniques for identifying the various secondary metabolites present in plant oils is gas chromatography-mass spectrometry (GC-MS). The seed oil of Retama raetam was analyzed by GC-MS to detect various compounds present in it. The GC-MS analysis revealed 47 chemical compounds. (4-Bromophenyl) bis (2, 4-dibromophenyl) amine (54.78 min) is the highest retention time chemical compound, followed by 2, 7, 12, 17-tetrabrom (allàs) cyclotetrathiophen (5.17 min) as the lowest retention time chemical compound. The most abundant phytocompounds identified in seed oil of Retama raetam are 9,12-octadecadienoicacid (Z,Z), methyl ester (42.86%), dodecanoic acid, 3,7,11 trimethyl, methyl ester (19.42%), and 9-octadecenoic acid (Z,Z), methyl ester (13.77%), respectively. In vitro antimicrobial screening of the seed oil of Retama raetam against Gram-positive (St. aureus ATCC 25923) and Gram-negative (E. coli ATCC 25922) and Ps. aureginosa ATCC 25850) bacteria was evaluated in this study, and the obtained results revealed activity only against St. aureusas, with no activity recorded against E. coli or Ps. aureginosaas. Fungi (Candida albicans ATCC 10213) was also evaluated, with no activity recorded for different concentrations of the seed oil of Retama raetam (100%, 50%, and 25%). Thus, it indicates that the seed oil of Retama raetam has activity only against St. aureus. The resultant antibacterial activity exhibited by the seed oil of Retama raetam is related to the presence of phytocompounds identified in the seed oil of Retama raetam, which were identified by using GC-MS and reported to have antimicrobial and antibacterial activity.

Keywords: Chromatography-Mass Spectrometry (GC-MS), Seed Oil, Retama Raetam

Cite this article as: A. Alwasia, A. Alhamrouni, O. A. Aburas, E. Boras, A. Abukhdir, S. M. Eljamay, "The Gas Chromatography-Mass Spectrometry (GC-MS) Analysis of Seed Oil of Retama Raetam," *African Journal of Advanced Pure and Applied Sciences (AJAPAS)*, vol. 2, no. 3, pp. 160–166, July-September 2023.

تحليل كروماتوغرافيا الغاز ـ مطياف الكتلة (GC-MS) لزيت بذور ريتاما رايتام

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الملخص

واحدة من أكثر التقنيات دقة لتحديد مختلف المستقلبات الثانوية الموجودة في الزيوت النباتية هي قياس طيف كتلة كروماتوغرافيا الغاز (GC-MS).تم تحليل زيت بذور ريتاما رايتام بواسطة GC-MS للكشف عن المركبات المختلفة الموجودة فيه. كشف تحليل-GC MSعن 47 مركبًا كيميائيًا) .4 (Bromophenyl-مكررا (2، 4-ثنائي بروموفينيل) أمين (54.78 دقيقة) هو المركب الكيميائي الأعلى وقت الاحتفاظ، يليه المركب الكيميائي 2، 7، 12، 17-رباعي بروم (ألاس) cyclotetrathiophen (5.17 دقيقة) باعتباره أقل مركب كيميائي وقت الاحتفاظ. والمركبات النباتية الأكثر وفرة التي تم تحديدها في زيت بذور ريتاما رايتام هي 9 و12-ثماني الكيادينويكيد (Z, Z) واستر الميثيل (42,86%) وحمض الدوديكانويك 3,7,11 وثلاثي ميثيل واستر الميثيل (19,42%) وحمض 9-ثمانينيك (Z, Z) على التوالي وميثيل 13,77%. في المختبر، فحص زيت بذور ريتاما ضد إيجابي الغرام) سانت أوريوس ATCC (25923وسلبي الغرام (E. Coli ATCC 25922) و (P. aureginosa ATCC 25850 تم تقييم البكتيريا مع عدم وجود نشاط فقط في هذه الدراسة، و كما تم تقييم الفطريات (المبيضات البيضاء(ATCC 10213 ، مع عدم تسجيل أي نشاط لتركيزات مختلفة من زيت بذور ريتاما (100٪، 50٪، 25٪). وبالتالي، فإنه يشير إلى أن زيت بذور ريتاما رايتام له نشاط فقط ضد القديس أوريوس. يرتبط النشاط المضاد للبكتيريا الناتج عن زيت بذور ريتاما رايتام بوجود مركبات نباتية تم تحديدها في زيت بذور ريتاما رايتام، والتي تم تحديدها باستخدام GC-MS وأفيد عن وجود نشاط مضاد للميكروبات ومضاد للبكتيريا.

الكلمات المفتاحية: طيف الكتلة الكروماتوغرافية (GC-MS) , زيت البذور، ريتاما رايتام.

Introduction

Medicinal plants are considered as a rich resource of ingredients which can be used in drug development either pharmacopoeial, non- pharmacopoeial or synthetic drugs. A part from that, these plants play a critical role in the development of human cultures around the whole world. Moreover, some plants are considered as important source of nutrition and as a result of that they are recommended for their therapeutic values [1]. The importance of medicinal Plant species was attributed to the presence of huge number of active ingredients such as alkaloids, phenols, tannins, cryogenics, glycosides, terpeniods. These ingredients have been used and found effective as sweeteners, anti-infective and anti-bacterial. For instance, the bark of Alstonia boonei contains alkaloids and achistamine, which are useful in the treatment of fever, dizziness and high blood pressure. Ginger (Zingiber officinale) and Garlic (Alliumsativum) are spicy additions to food that has long been used to maintain human health. It is not an exaggeration to say that medicinal plants have a great role to play in sustainable human health [2]. The stage of identification of biomedical compounds of medical importance from the old was began, and gradually developed. These biomedical compounds classified as primary and secondary metabolites. Primary metabolites include chlorophyll, cane sugar, starch, camphor and benzoic acid had long been known, as their preparation was extremely simple, also complex mixtures such as fats, fixed oils, volatile oils, tars and resins had been prepared and used. Secondary metabolites like alkaloids, sterols, terpenes, flavonoids, saponins, glycosides,cyanogenics,tannins,resins, lactones, quinines, volatile oils where synthesized and stored inside plants, which lead to the progress occurred more rapid in 19th century [3]. There are various examples of development of new drugs from the plant sources. Morphine was isolated from opium produced from cut seed pods of the poppy plant (Papaver somniferum) approximately 200 years ago. Pharmaceutical research expanded after the Second World War to include massive screening of microorganisms for new antibiotics, inspired by the discovery of penicillin. Few drugs developed from natural sources have undoubtedly revolutionized medicine, like antibiotics (e.g. penicillin, tetracycline, and erythromycin). Antiparasitic (e.g. avermectin), antimalarials (e.g. quinine, artemisinin), lipid control agents (e.g. lovastatin and analogs), immunosuppressants for organ transplants (e.g. cyclosporine, rapamycins), and anticancer drugs (e.g. paclitaxel, irinotecan) [4]. Since the beginning of natural herbal medicine, oils are one of the most ancient forms of folk medicine. Herbal oils have been used since ancient times for their preservative and medicinal properties, and to impart aroma and flavor to food. Hippocrates, sometimes referred to as the “father of medicine,” prescribed perfume fumigations. The pharmaceutical properties of aromatic plants are partially attributed to essential oils. The term “essential oil” was used for the first time in the sixteenth century by Paracelsus von Hohenheim. The historical Persian medical and pharmacological manuscripts are the first to describe the importance of using oils for therapeutic purpose and their forms of administrations (i.e. systemic or topical). Massage by herbal oils was the culture of traditional Chinese, Indian and Egyptian medicine. As frequent application of herbal oils to the newborn skin thought improve skin condition, protect skin from injury and infections, and also keep the moisture content in the skin. It has been observed the massaging with Sesame oil for newborn baby, improves sleep pattern and growth of limbs [5],[6],[7]. The medicinal values of essential oils have been recognized for many plants, like: Thymus schimperi leaves oil has anthelmintic, antibacterial, and antifungal activity ,leaves oil of Eucalyptus globulus can boost the immune system and is helpful in cases of chicken pox, colds, flu, measles, and infectious diseases ,Matricaria chamomilla flower oil is good for skin care, acne, allergies, boils, burns, eczema, inflamed skin conditions, and wounds and used for infection , and Rosmarinus officinalis leaves oil possesses antitumor and anti-inflammatory

actions and antimicrobial activity [8]. In recent years, essential oils have received increasing attention as they exhibit significant antibacterial, antifungal, and antioxidant activities [9]. In the earlier time, the process of isolation and identification the chemical identity of these bioactive constituents was time wasting. Recently, availability of new techniques such Gas Chromatography or gas chromatography-mass spectroscopy (GS-MS) are most exclusively for the qualitative analysis of the volatiles [10]. Based on importance and extent of medicinal and toxic effects of secondary constituents, we have done a research on seed oil of Retama Raetam, medicinal plant with biologically active constituents which will be presented later. The aim of this study to investigate the chemical composition of the R. Raetam seed oil and to evaluate the antimicrobial activity of R. Raetam seed oil. Retama raetam frossk. webb'' is a spontaneous desert shrub, belongs to the fabaceae family with four species include (Retama monosperma, Retama raetam, Retama sphaerocarpa and Retama dasycarpa) mostly distributed in east Mediterranean regions and north Africa. In Libya, commonly found in Fezzan, Tripoli, Ain Zara, Khoms, Tarhuna and Tobruk [11],[12],[13],[14]. The stems, leaves, roots, and flowers were traditionally used. It can be taken by mouth or used externally as compress [15],[16],[17]. However, each part of the plant has a specific medicinal property and thus dedicated its use to treat particular illness. In Libya, some people who practice traditional medicine, recommend using of plant shoots in treatment of diabetes mellitus, sinusitis and antitumor [18]. Also, according to information available from shops that sell aromatic herbs in Tripoli and Zeileten, seeds taken by mouth to treat worms, while vapor inhalation of shoots used in treatment of Brucellosis. On the other hand, some regions in Libya used it as veterinary drug to heal wounds of sheep mow (personal communication). Generally, Broom brush in North Africa used for treatment of several diseases such as diabetes, hepatitis, jaundice, sore throat, eczema, skin disease, joint pain, rheumatism, inflammation, fever and microbial infection. It is considered as an anthelmintic, emetic, laxative and sedative [19],[20],[21]. In Morocco, crushed leaves and stems mixed with honey and given as an emetic. However, powdered leaves and flowers or their decoction utilized to heal skin diseases. A decoction of leaves given as purgative and anthelmintic [22], [23]. Traditional healers in Saudi Arabia utilized the fruits in treatment of hypertension, diabetes mellitus and hyperlipidemia [24],[25]. In occupied Palestine, plant tea extract was used in treatment of neonatal jaundice, upper branches prepared as vapor bath to treat limb paralysis and boiling of plant roots in water and applying the extract locally on affected area in cases of local paralysis [26], [27]. Furthermore, Tunisian folk medicine, applied its shoots as antidote for snake bites, roots where utilized as antidiarrheal remedy, leaves to reduce arthralgia, back pain and eye infections and curing of renal disease [28], [29]. R. raetam rich with bioactive constituents like flavonoids, terpenoids, quinolizidine alkaloids and fixed oils which are retained biological activities whether toxic or pharmacological actions. Earlier experiments suggested that anti-inflammatory, analgesic and antimicrobial effects were attributed to the presence of valuable secondary products like flavonoids and essential oils that relatively distributed between different plant parts. Previously, flavonoids like daidzein, vicenin-2, naringenin, apigenin, kaempferol, quercetin and kaempferol-7-O-glucoside were detected in the seeds of R. raetam [26], [29].

Material and methods

Plant materials: The Seeds of Retama raetam (forssk.) webb and Berthel were collected from Sobratah area, west region of Libya, in April, 2020. The plant was identified at Herbarium of Department of Botany, Faculty of Science, University of Tripoli, Libya, by two taxonomists: Prof. Mohammed Abuhadra and Dr. Fathi Al-Retib. A voucher specimen for this collection was recorded and kept under code: D-688691.

Chemicals: n-hexane, tween20, tween80, ciprofloxacin disc, phenol.

Instruments and other Materials: Gas chromatography-Mass spectroscopy, sensitive balance, incubator, autoclave, vortex mixer, micropipette, water bath

Culture Media: Muller Hinton agar and sabarouds dextrose agar media

Microbial strains used: Escherichia coli (ATCC 25922), Pseudomonas auergenosa (ATCC 25850), Staphylococcus aureus (ATCC 25923) and Candida albicans (ATCC 10213).

Preparation of plant extract: After the collection of plant seeds. Cleaned, shade-dried and powdered by mechanical grind. 500gm of powdered seeds were extracted by Soxhlet apparatus at 60 ºC with 1 liter n-hexane for 12 hours. The final net volume of the oil is 35ml (percentage of yield 7%), then the resultant oil stored in amber glass bottle in a cold place [25].

The method of Gas chromatography-mass spectrometry (GC-MS) analysis: The analysis of 1ml of retama raetam seed oil extract was performed using a Thermo Scientific, Trace GC Ultra / ISQ Single Quadrupole MS, TG-5MS fused silica capillary column (30m, 0.251mm, 0.1 mm film thickness).For GC/MS detection, an electron ionization system with ionization energy of 70 eV was used, Helium gas was used as the carrier gas at a constant flow rate of 1mL/min. The injector and MS transfer line temperature was set at 280 °C. The oven temperature was

programmed at an initial temperature 40 °C (hold 3 min) to 280 °C as a final temperature at an increasing rate of 5 °C /min (hold 5 min). The quantification of all the identified components was investigated using a percent relative peak area. A tentative identification of the compounds was performed based on the comparison of their relative retention time and mass spectra with those of the NIST, WILLY library data of the GC/MS system.

Evaluation of antimicrobial activity of retama raetamseed oil against defined pathogens by Agar well diffusion method: The well diffusion method was employed to determine the antimicrobial activities for the R.R seed oil. Different concentrations of extracts, 100%, 50% and 25% were prepared; this is to know the least of the level of concentration that will be required for the culture to grow [28]. About 0.1ml of the standardized 24hour old culture of the tested organisms in Nutrient broth was spread unto sterile prepared Nutrient agar plates and allowed to set. With the aid of a sterile corn borer, hole of 6mm in diameter were bored on the plates, about 0.5ml of each concentrations of the extracts was dispensed into the hole and then allowed to stand for about 15minutes [28]. Also 0.1ml of the prepared ciprofloxacin (standard) and phenol (standard) discs were put into the media. These were then incubated at 37 0C for 24hours. At the end of the period, the zones of inhibition were measured using scientific ruler and the diameters were recorded [28].

Results and discussion

Gas chromatography-mass spectrometry analysis of the seed oil of Retama Raetam.. The GC - MS chromatogram of the seed oil of Retama Raetam showed 47 major peaks indicating the presence of fourty seven compounds (Figure1.). The active principles with their peak, retention time (RT), and molecular weight are presented in the (Table 1.) and Reported biological activities of the some identified bioactive compounds in seed oil of Retama Raetam with different research as in (Table 2).

Table 1: Chemical constituents identified in seed oil of Retama Raetam by GC-MS

S.N	RT(min)	Compound Name	Molecular Formula	MW	Peak area
1	5.17	2,7,12,17-tetrabrom-(all-às) cyclotetrathiophen (2,7,12,17-tetrabromcycloocta[1,2-b:4,3-b':5,6- b":8,7-b"']tetrathiophen	C16H4Br4S4	640	0.47
2	9.99	2-Methylhexadecane	C17H36	240	0.14
3	18.88	2[3,4Bis(dodecyloxy)phenyl]4,4,5,5tetramethyl1,3,2dioxaborolane	$C_{36}H65BO4$	572	0.26
4	19.42	2,4 - Decadienal	$C_{10}H_{16}O$	152	0.45
5	20.28	3-Methoxy-1-pentene	C6H12O	100	0.25
6	20.83	Propanoic acid,2methyl,3hydroxy2,4,4trimethylpentyl ester	C12H24O3	216	0.37
7	24.43	Phenol,2,4bis(1,1dimethylethyl)	C14H22O	206	0.12
8	28.54	Pentadecane	C15H32	212	0.12
9	28.96	Decanoic acid, methylester	C11H22O2	186	0.15
10	31.02	2-Naphthalenol,- 8-amino	C10H9NO	159	0.20
11	31.97	1,2Benzenedicarboxylicacid, bis(2methylpropyl)ester	C16H22O4	278	0.47
12	32.12	1,1,1,2tetrafluoro2tridecene	C13H22F4	254	0.11
13	33.03	Dodecanoic acid,3,7,11trimethyl, methylester	C16H32O2	256	19.42
14	33.68	1Octanol	C8H18O	130	0.13
15	33.81	3(5'Formyl2furyl)2propenal	C8H6O3	150	0.55
16	34.28	Octadecane, 1chloro	C18H37Cl	288	0.18
17	34.44	9- Octadecenoicacid (Z)	C18H34O2	282	0.28
18	34.87	3Undecanol,3ethyl	C13H28O	200	0.32
19	35.26	NORESERINE	C14H19N3O2	261	5.556
20	36	Phosphonic acid,dioctadecyl ester	C36H75O3P	586	0.11
21	36.23	9,12Octadecadienoicacid (Z,Z),methyl ester	C19H34O2	294	42.86
22	36.30	9Octadecenoicacid (Z), methyl ester (CAS)	C19H36O2	13.77	296
23	36.48	2Hexadecen1ol,3,7,11,15tetramethyl, [R[R*,R*(E)]](CAS)	C20H40O	296	0.13
24	37.30	Linoleic acid ethyl ester	C20H36O2	308	0.12
25	38.40	N(2Acetylcyclohexylidene)cyclohexylamine	C14H23NO	221	0.21
26	37.84	Docosane	C22H46	310	0.14
27	37.91	transFarnesol	C15H26O	222	0.18
28	38.83	4,5dihydro [1,2,4] triazolo[3,4d][1,5]benzoxazepin1(2H)one	C10H9N3O	203	0.21
29	39.30	17Octadecynoicacid	C18H32O2	280	0.36
30	39.63	cis11Eicosenoicacid, methyl ester	C21H40O2	324	0.26
31	39.88	3Pinanemethylisothiocyanate	C12H19NS	209	0.49
32	36.22	Eicosanoic acid, methylester (CAS)	C21H42O2	326	0.41
33	40.52	9-Octadecenoicacid (Z)(CAS)	C18H34O2	282	0.14

34	41.64	2,4bis(áchloroethyl)6,7bis[ámethoxycarbonylethyl]1,3,5trimethylporphyrin	C35H38Cl2N4O4	648	0.17
35	42.09	3(Benzylthio)acrylicacid, methyl ester	C11H12O2S	208	0.19
36	42.39	17-Octadecynoicacid	C18H32O2	280	0.12
37	43.18	Hexadecanoic acid,methyl ester (CAS)	C17H34O2	270	0.15
38	43.56	ethyl3amino2,5dimethyl1,4,6trioxo1,2,5,6tetrahydro4Hpyrrolo[3,4c] pyridine7caeboxylate	C12H13N3O5	279	0.27
39	44.19	17-Pentatriacontene	C35H70	490	0.15
40	46.67	,12- Octadecadienoicacid(Z,Z),2,3dihydroxypropylester	C21H38O4	354	0.13
41	47.45	Squalene	C30H50	410	0.72
42	50.49	çTocopherol	C28H48O2	416	0.68
43	51.54	CHLOROCADMIUM(1R,19R)1,2,2,7,7,12,12HEPTAMETHYL15CYANO19METHOXYCARBONYLCARRINATE	C29H36CdClN5O2	635	0.11
44	52.91	5,10secoCholestan1(10)en3,5dione	C27H44O2	400	0.58
45	53.42	Stigma sterol	C29H48O	412	0.40
46	54.43	1,5Dimethyl6(1,5dimethylhexyl)15,16epoxy18oxatetracyclo [9.6.1.0(2,10).0(5,9)] octdecane13one	C28H46O2	414	1.74
47	54.78	(4Bromophenyl)bis(2,4dibromophenyl)amine	C18H10Br5N	635	0.16

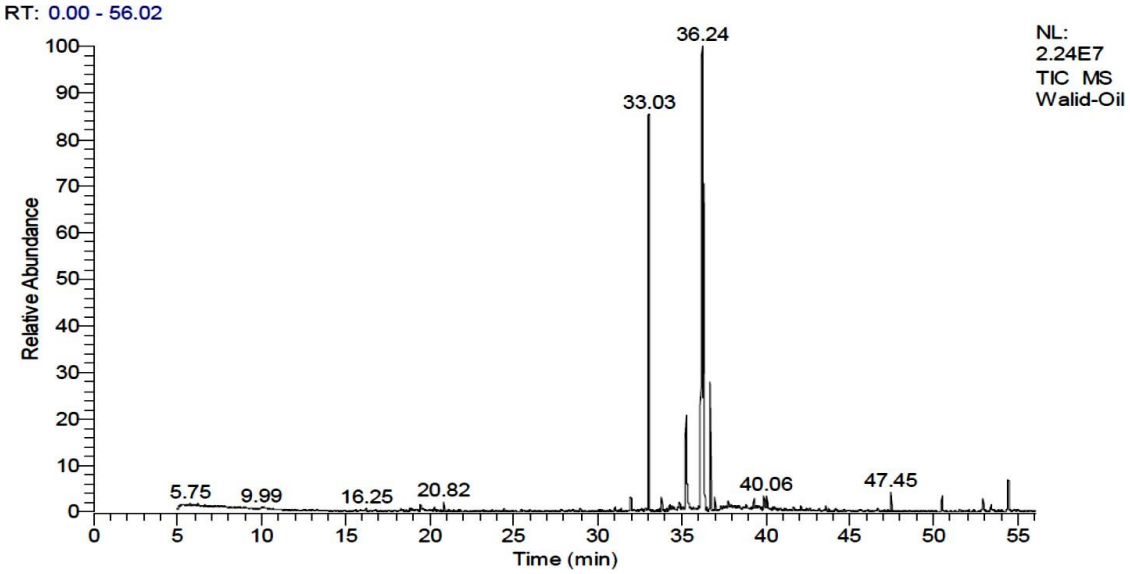

Figure 1: GC-MS spectra of Retama raetam seed oil

Table 2: Reported biological activities of the some identified bioactive compounds in seed oil of Retama Raetam.

Compound	Biological activity
Phenol, 2,4-bis(1,1-dimethylethyl)	Antimicrobial, antioxidant (Salini T.S. et al. 2014).
9-Octadecenoic acid (Z) methyl ester	Antioxidant, anti-cancer (Saada, M et al. 2018).
Squalene	Antioxidant activity (Salini T.S. et al. 2014).
Docosane	Antibacterial (Hamedi, A. et al. 2013).
Stigmasterol	Anti-hypercholesterolemia activity (Rahman, M.M. et al. 2014)
Hexadecanoic acid methyl ester	Anti-oxidant, decrease blood cholesterol, anti-inflammatory (Rahman, M.M. et al. 2014).
9,12-Octadecadienoic acid (Z,Z),methyl ester	Antioxidant and antimicrobial activities (Salini T.S. et al. 2014).

Antimicrobial screening of R.R seed oil: The in vitro antimicrobial screening of the seed oil of Retama raetam against Gram-positive (St.aureus ATCC 25923), and Gram-negative (E.coli ATCC 25922), (Ps.aureginosa ATCC25850) bacteria was evaluated in this study and the obtained results revealed activity only against St.aureusas shown in (table 3) and no activity recorded against

E.coliand Ps.aureginosaas shown in (table 3), and its activity against fungi (Candida albicans ATCC 10213) also was evaluated and no activity recorded for different concentrations of the seed oil of Retama raetam (100%, 50%, 25%) as shown in (table 4). Thus indicates that the seed oil of Retama raetamhas activity only against St.aureus.

Table 3: Antibacterial Activity of seed oil of Retama raetam and comparison with standard antibiotic (Ciprofloxacin).

		Zone of inhibition (mm)				
SN	organisms	25mg/ml	50mg/ml	100mg/ml	*RR* extract	Ciprofloxacin (+CTL)
1	*Staphylococcus .aureus*	-	5 mm	-	-	30 mm
2	*Pseudomonas aeruginsa*	-	-	-	-	30 mm
3	*Escherichia .coli*	-	-	-	-	30 mm

Table 4: Antifungal activity of seed oil of Retama raetam and comparison with control (phenol).

	Candida albicans			
100mg/ml	50mg/ml	25mg	phenol(+CTL)	RR extract
-	-	-	7.5 mm	-

Discussion

GC-MS is the one of the most precise methods to identify various secondary metabolites present in the plant oils. The seed oil of Retama raetam was analyzed by GC-MS to detect various compounds present in it. The GC-MS analysis revealed the 47chemical compounds. (4-Bromophenyl) bis (2,4dibromophenyl) amine (54.78min) is the highest retention time chemical compound and 2, 7, 12, 17-tetrabrom (allàs) cyclotetrathiophen (5.17 min) as the lowest retention time chemical compound. The most abundant phytocompounds identified in seed oil of Retama raetam are 9,12-Octadecadienoicacid(Z,Z),methyl ester (42.86%), Dodecanoic acid, 3,7,11trimethyl, methyl ester (19.42%) and 9-Octadecenoic acid (Z), methyl ester (13.77%) respectively. The identified compounds were reported in previous studies to have antioxidant, antimicrobial, antioxidant, anticancer and anti-inflammatory activities [26], [29]. The in vitro antimicrobial screening of the seed oil of Retama raetam against Gram-positive (St.aureus ATCC 25923), and Gram-negative (E.coli ATCC 25922), (Ps.aureginosa ATCC25850) bacteria was evaluated in this study and the obtained results revealedactivity only against St.aureusas shown in (table 4.3) and no activity recorded against E.coliand Ps.aureginosaas shown in (table 4.3), and its activity against fungi (Candida albicans ATCC 10213) also was evaluated and no activity recorded for different concentrations of the seed oil of Retama raetam (100%, 50%, 25%) as shown in(table 4.4). Thus indicates that the seed oil of Retama raetamhas activity only against St.aureus. The resultant antibacterial exhibited by the seed oil of Retama raetam are related to the presence of phytocompounds identified in seed oil of Retama raetam which were identified by using GC-MS and reported to have antimicrobial and antibacterial activity in previous studies [26], [29].

Conclusion

The Gas Chromatography-Mass Spectroscopic analysis concluded the presence of bioactive phytochemical compounds in the seed oil of R. reteam. It justifies the use of R. reteam seeds as an anti-oxidant, anti-inflammatory and antimicrobial agent in herbal medicine.

References

[1]. Trease, E.C. and Evans, W.C. (2009) Pharmacognosy. 16th Edition, W.B. Saunders, Philadelphia, 365-650.

[2]. Akinyemi, O., Oyewole, S. O., & Jimoh, K. A. (2018). Medicinal plants and sustainable human health: a review. Horticult Int J, 2(4), 194-195.

[3]. Butnariu, M., & Sarac, I. (2018). Essential oils from plants. Journal of Biotechnology and biomedical science, 1(4), 35.

[4]. Katiyar, C., Gupta, A., Kanjilal, S., & Katiyar, S. (2012). Drug discovery from plant sources: An integrated approach. Ayu, 33(1), 10.

[5]. León-González, A. J., Navarro, I., Acero, N., Mingarro, D. M., & Martín-Cordero, C. (2018). Genus Retama: a review on traditional uses, phytochemistry, and pharmacological activities. Phytochemistry Reviews, 17(4), 701-731.

[6]. Hamedi, A., Zarshenas, M. M., Sohrabpour, M., & Zargaran, A. (2013). Herbal medicinal oils in traditional Persian medicine. Pharmaceutical biology, 51(9), 1208-1218.

[7]. Robins, J. L. W. (1999). The science and art of aromatherapy. Journal of Holistic Nursing, 17(1), 5-17.

[8]. Benhouhou, S. (2005) Retama raetam(Frossk.)Leguminosae (fabaceae).A guide to medicinal plants in North Africa. IUCN center for Mediterranean cooperation, Malaga, Spain. ISBN 2-8317-0893-1.

[9]. Mekonnen, A., Yitayew, B., Tesema, A., & Taddese, S. (2016). In vitro antimicrobial activity of essential oil of Thymus schimperi, Matricaria chamomilla, Eucalyptus globulus, and Rosmarinus officinalis. International journal of microbiology.

[10]. Bezerra, J. W. A., Rodrigues, F. C., Costa, A. R., Rocha, M. I., Duarte, A. E., & Barros, L. M. (2016). Potencial Medicinal De Lantana camara L.(Verbenaceae): Uma Revisão. Cadernos de Cultura e Ciência, 15(1), 82-92.
[11]. Baharum, S. N., Bunawan, H., Ghani, M. A. A., Mustapha, W. A. W., & Noor, N. M. (2010). Analysis of the chemical composition of the essential oil of Polygonum minus Huds. Using two-dimensional gas chromatography-time-of-flight mass spectrometry (GC-TOF MS). Molecules, 15(10), 7006-7015.
[12]. Jafri S. Fabaeace. In: Jafri S. and EL-Gadi A. (Ed.). (1980). Flora of Libya. University of Tripoli press, Tripoli, Libya, pp. 1 - 304.
[13]. Kotb, F. T. (1985). Medicinal plants in Libya. Arab Encyclopedia House.
[14]. Agiel, N. and Mericli, F. (2017) A survey on aromatic plants of Libya. Indian Journal of Pharmaceutical Education and Research. 51(3): 304 -308.
[15]. Algandaby, M.M. (2015) Assessment of acute and subacute toxic effects of the Saudi folk herb Retama raetam in rats. Journal of the Chinese Medical Association. 78(12): 691 -701.
[16]. El Hamdani, N. and Fdil, R. (2015) Evaluation of fatty acids profile and mineral content of Retama monosperma (L.) Boiss. of Morocco. Journal of Materials and Environmental Science. 6(2): 538 - 545.
[17]. Saada, M.; Falleh, H.; Catarino, M.D.; Cardoso, S.M. and Ksouri,R. (2018) Plant growth modulates metabolites and biological activities in Retama Raetam (Forssk.)Webb. Molecules. 23(9):1-17.
[18]. Miguel, M.; Bouchmaaa, N.; Aazza, S.; Gaamoussi, F. and Lyoussi, B. (2014) Antioxidant, anti-inflammatory, and anti-acetylcholinestrase activities of eleven extracts of Moroccan plants. Fresenius Environmental Bulletin. 23(6):1-14.
[19]. Schmid, T.; Turner, D.; Oberbaum, M.; Finkelstein, Y.; Bass. R. and klied, D. (2006) Respiratory failure in a neonate after folk treatment with Broom bush (Retama raetam) extract. Pediatric Emergency Care. 22(2):124-126.
[20]. Abu-Rabia, A. (2012) Ethno-Botanic Treatments for Paralysis (Falij) in the Middle East. Chinese Medicine 3(4):157-166.
[21]. Mechergui, K.; Mahmoudi, H.; Khouja, M.L. and Jaouadi, W. (2017) Factors influencing seed germination of the pastoral plant Retama raetam subsp. bovei (Fabaceae): interactive effects of fruit morphology, salinity, and osmotic stress. Biologija. 63(2): 134 - 151.
[22]. Hayet,E.; Samia,A.; Patrick,G.;Ali,M.M.; Maha,M.; Laurent,G.; Mighri,Z. and Mahjoub,A.(2007) Antimicrobial and cytotoxic activity of marrubium alysson and Retama raetam grown in Tunisia. Pakistan Journal of Biological Sciences. 10(10):1759-1762.
[23]. Awen, B.Z.; Unnithan, C.R.; Ravi, S.; Kermagy, A.; Sasikumar, J.M.; Khrbash, A.S. and Ekreem, W.L. (2011) Essential oils of Retama raetam from Libya: chemical composition and antimicrobial activity. Natural Product Research. 25(9):927-933.
[24]. Djeddi, S.; Karioti, A.; Yannakopoulou, E.; Papadopoulos, K.; Chatter, R. and Skaltsa, H. (2013). Analgesic and antioxidant activities of Algerian Retama raetam (Forssk.) Webb & Berthel Extracts. Records of Natural Products. 7(3):169-176.
[25]. Tesfaye, B., & Tefera, T. (2017). Extraction of essential oil from neem seed by using Soxhlet extraction methods. International Journal of Advanced Engineering, Management and Science, 3(6), 239870.
[26[. Salini T.S, Divakaran D., Shabanamol S., Sharrel R., Jisha M.S. (2014).World J. Pharm. Res. 3, 879.
[27]. Wink M. (2015). Modes of Action of Herbal Medicines and Plant Secondary Metabolites. Medicines (Basel, Switzerland), 2(3), 251–286.
[28]. Cheesbrough, M. (2006). District Laboratory practice in tropical countries. Cambridge, United Kingdom: Press Syndicate of the University of Cambridge; pp.194-201.
[29] Rahman, M.M.; Ahmad, S.H.; Mohamed, M.T.M.; Ab Rahman, M.Z. (2014). Antimicrobial compounds from leaf extracts of Jatropha curcas, Psidium guajava, and Andrographis paniculata. TheScientificWorldJournal,635240-635240.
[30]. S. M. Eljamay, J. E. Elhassadi, N. R. Ben Haleim, F. M. Eljamay, “Endometriosis and its Relationship to Marital Status,” North African Journal of Scientific Publishing (NAJSP), vol. 1, no. 2, pp. 7–12, April-June 2023
[32]. Eljamay SM, Boras E, Almzaini MS, Jebreil MM. Practices and Behaviors Regarding the Use of Analgesics. Indonesian Journal of Innovation and Applied Sciences (IJIAS). 2023 Feb 28;3(1):67-73.