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Analysis of the Aqueous Extract of *Cordia myxa L.* Leaves Using (GC-MS) Technology

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Abstract

The current aim was to use the Gas Chromatography – Mass Spectrum (GC-MS) technique to examine the aqueous extract of *Cordia myxa L.* leaves. Molecular weight, retention duration, peak area, chemical structure, and molecular formula all play a role in the method utilized to determine active chemical compounds. By this technique, 30 peaks of the active chemicals were releaved in the analysis of the aqueous extract of *Cordia myxa L.* leaves. Of the most compounds shown there were ten have been identified, they are 9-Octadecenoic acid (Z)-(fatty acid), methyl ester, 1,1,1,5,7,7,7-Heptamethyl-3,3-bis(trimethylsiloxy)tetrasiloxane, Heptadecanoic acid, Hexadecamethylheptasiloxane, Hexasiloxane, tetradecamethyl, Triacontanoic acid, Cyclohexanecarboxylic acid, 3-Isopropoxy-1,1,1,7,7,7-hexamethyl-3, 5,5-tris(trimethylsiloxy)tetrasiloxane, 13-11-Octadecenoic acid methyl ester, 1,1,1,3,5,7,9,11,11,11–Decamethyl-5-(trimethylsiloxy) hexasiloxane. The study concluded that this plant has bioactive materials which are potential medical compounds that need further investigation. Therefore, this study represents a compilation of information related to the genus of *Cordia*, particularly Iraqi species and its phytochemistry in order to promote clear directions for future research.

Keywords: *Cordia myxa L.*, Chemical analysis, GC-MS, Aqueous Extract.

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تحليل المستخلص المائي لأوراق نبات *Cordia myxa L.* بأستخدام تقنية (GC-MS)

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الخلاصة

كان الهدف الحالي هو استخدام تقنية GC-MS لفحص المستخلص المائي لأوراق *Cordia myxa L.* يلعب الوزن الجزيئي، ومدة الاحتفاظ، ومنطقة الذروة، والتركيب الكيميائي، والصيغة الجزيئية دورًا في الطريقة المستخدمة لتحديد المركبات الكيميائية النشطة. بهذه التقنية تم استخراج 30 قمة من المواد الكيميائية الفعالة في تحليل المستخلص المائي لأوراق نبات Cordia myxa L. ومن أكثر المركبات الموضحة تم التعرف على عشرة وهي Octadecenoic acid (Z)-(fatty -9 acid), methyl ester, 1,1,1,5,7,7,7-Heptamethyl-3,3-bis(trimethylsiloxy)tetrasiloxane, Heptadecanoic acid, Hexadecamethylheptasiloxane, Hexasiloxane, tetradecamethyl, Triacontanoic acid, Cyclohexanecarboxylic acid, 3-Isopropoxy-1,1,1,7,7,7-hexamethyl-3, 5,5-tris(trimethylsiloxy)tetrasiloxane, 13-11-Octadecenoic acid methyl ester, 1,1,1,3,5,7,9,11,11,11–Decamethyl-5-(trimethylsiloxy) hexasiloxane. وخلصت الدراسة إلى أن هذا النبات يحتوي على مواد نشطة بيولوجيا وهي مركبات طبية محتملة وتحتاج إلى مزيد من البحث. لذلك فإن هذه الدراسة تمثل تجميعاً للمعلومات المتعلقة بجنس الكورديا، وخاصة الأنواع العراقية وكيمياءها النباتية من أجل تعزيز التوجهات الواضحة للبحث المستقبلي.

الكلمات المفتاحية: كورديا ميكسا ، التحليل الكيميائي، GC-MS، المستخلص المائي

Introduction

According to Ahmad et al. [1], medicinal plants are a gift from nature to humanity, they are significant economiclly and health components of biodiversity, as a result of the collected and accumulated knowledge from earlier generations to the recent, they have been utilized as medicines for thousands of years, every year, new compounds are discovered that are derived in large part from plants. Almost 75 % of the population in the world utilizes plants for treatment and prevention of disease [2]. A range of secondary metabolites are mostly sourced from plants, used as food additives, biocides, agricultural chemicals, medications, tastes, perfumes, and colors [3–6]. *Cordia myxa L.* plant contains some effective chemical compounds such as

flavonoids, glycosides, oil, sterols, terpenoids, saponins, phenolic acids, alkaloids, tannins, coumarins, gums, resins and mucilage [4]. According to pharmaceutical research, *Cordia myxa L.* has analgesic, anti-inflammatory properties and anti-immunosuppressive, that has a toxic effect against microbes, parasites and insects, in addition to its protective effect on cardiovascular, respiratory, and digestive systems [2]. The current study's objective was to investigate the bioactive compounds that found in the aqueous extract of *Cordia myxa L.* leaves.

Materials and Method

Method for preparing the powder of the leaves of the *Cordia myxa L.* plant

The leaves of the "Bumber" plant (*Cordia myxa L.*) which belongs to the family (*Boraginaceae*) were collected from Al-Khalis city - Diyala Governorate – Iraq, in July. The leaves were washed from dust and dirt by steril distilled water, then dried by air at room temperature, and left in the shade to dry at room temperature [7]. After that, the dry leaves were ground by using an electric grinder to obtain powdered "Bumber" leaves, as shown in Figure (1).

Figure 1: The steps of preparing powdered leaves of *Cordia myxa.*

Method of preparing the aqueous extract of the leaves of the *Cordia myxa L.* plant

The aqueous extract was prepared using a cold soaking technique by adding 10 gm of Cordia myxa L. plant powder to 100 ml of distilled water in a glass vial that is covered with tin foil, followed by shaking periodically for ten days to obtain the largest possible amount of the chemical components of the plant leaves [7]. The mixture was first filtered using a piece of

gauze cloth and then the filter was passed through sterile filter paper (CB60-11-102: Filter Paper, Qualitative) (CTechGlass, Singapore) to obtain the plant extract. The extraction was carried out at room temperature. Lastly the obtained extract was transferred to a well-sealed laboratory glass vial and covered with tin foil to prevent light.

The chemical analysis of plant extract using GC-MS

Chemical analysis of the aqueous extract of *Cordia myxa L.* was carried out in the laboratories of the Ministry of Industry and Minerals - Ibn Al-Bitar laboratories in Baghdad using a device Agilent 7820A, of American origin. The premier temperature of the column was 60 °C with a period of a three minutes, then raise to 180 °C at 7 °C/min and raise to 280 °C at 8 °C/min, with a period of retention 3 minutes. Injection temperature was 250 °C. The scanning range was (25-1000 amu) m/z. The ion source for the mass spectrometer was set at 250°C. 1µL of plant extract was injected, and the carrier gas was helium gas, at a flux rate of 1.0 ml/min. Peaks were identified by the National Institute Standard and Technology (NIST) database and device memory list [8].

Results

The chemical compounds of the plant extract were characterized using GC-MS technology; it is an effective technique with high specificity and sensitivity that is utilized in various applications. GC-MS analysis for the compounds in the aqueous extract of *Cordia myxa L.* leaves was performed, and is shown in Table 1. The mechanism that was used to identify the active chemical compounds in Table 1 depends on molecular weight, retention duration, peak area, chemical structure, and molecular formula.

Table 1: Phytocomponents identified in the aqueous extract of the leaves of the *Cordia myxa L.* plant

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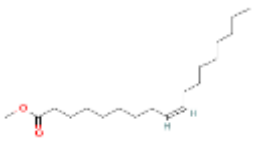
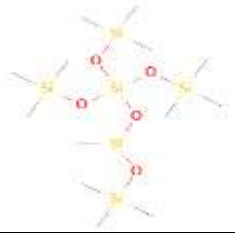
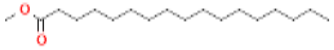
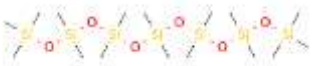
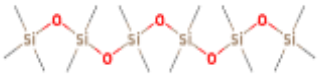
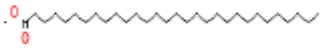
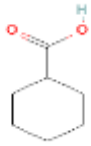
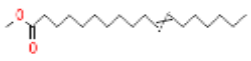
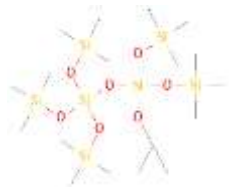
S. No.	RT	Name of the compond	Molecular formla	Molecular weight ($g.mol^{-1}$)	Chemical structure	Peak area %
1	20.719	methyl ester, 9-Octadecenoic acid (Z)-	$C_{19}H_{36}O_2$	296.4879		13.64
2	16.598	1,1,1,5,7,7,7-Heptamethyl-3,3-bis(trimethylsiloxy)tetrasiloxane	$C_{13}H_{39}O_5Si_6$	443.96		9.35
3	18.540	Heptadecanoic acid, methyl ester	$C_{18}H_{36}O_2$	284.5		6.05
4	25.909	Hexadecamethyl heptasiloxane	$C_{16}H_{48}O_6Si_7$	533.1		5.35
5	27.171	Hexasiloxane, tetradecamethyl-	$C_{14}H_{42}O_5Si_6$	458.9933		4.74
6	20.256	Triacontanoic acid, methyl ester	$C_{31}H_{62}O_2$	466.8228		4.16
7	6.489	Cyclohexanecarboxylic acid	$C_7H_{12}O_2$	128.171		3.81
8	23.028	1,1,1,3,5,7,9,11,11,11-Decamethyl-5-(trimethylsiloxy) hexasiloxane	$C_{13}H_{42}O_6Si_7$	491.07		3.48
9	19.846	13- 11-Octadecenoic acid methyl ester	$C_{19}H_{36}O_2$	296.5		3.24
10	11.991	3-Isopropoxy-1,1,1,7,7,7-hexamethyl-3,5,5-tris(trimethylsiloxy)tetrasiloxane	$C_{18}H_{52}O_7Si_7$	577.2		3.22

Academic Science Journal

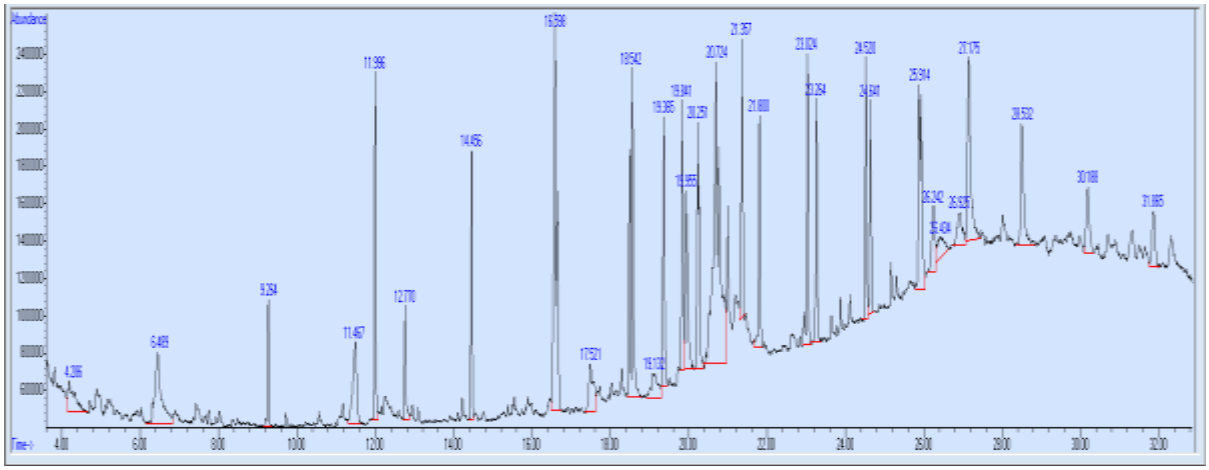


Figure 2: GC-MS chromatogram of aqueous extract of *Cordia myxa L*.

The most effective chemical compounds have been identified, namely methyl ester, 9-Octadecenoic acid(Z)-, Heptadecanoic acid, 1,1,1,5,7,7,7-Heptamethyl-3,3–bis (trimethylsiloxy)tetrasiloxane, Hexadecamethylheptasiloxane, tetradecamethyl-, Hexasiloxane, Triacontanoic acid, Cyclohexanecarboxylic acid, 3–Isopropoxy-1,1,1,7,7,7–hexamethyl-3,5,5– tris(trimethylsiloxy)tetrasiloxane, 13-11-Octadecenoic acid methyl ester, 1,1,1,3,5,7,9,11,11,11–Decamethyl-5-(trimethylsiloxy)hexasiloxane. 30 peaks were obtained for the used chemical compounds, which were displayed in the GC-MS scheme, which is shown in Figure 2.

Discussion

The method and technique of extraction and materials used in this process has an impact on the extracted materials [9]. In the current study, GC-MS technique and aqueous (cold soaking technique using a cold distilled water) was carried out. The peaks of the ten most effective compounds, which were previously mentioned in Table 1, were identified. Through the results obtained from the aqueous extract of the leaves of the *Cordia myxa L*. plant, and when compared with the alcoholic extract of the leaves of the *Cordia myxa L*. plant that applied by Hussein *et al*. (2016) using the same technique (GC-MS) [10]. It was found that the aqueous extract prepared in the current study contains fewer chemical compounds than the alcoholic extract in previous study, this may be due to the ability of some of them to dissolve in alcohol and not

dissolve in water or because of some details of extraction process such soaking period and temperature. Quantitative examination of the chemical analyses of the aqueous extract of *Cordia myxa L.* leaves shown the subsistence of disorderly high levels of flavonoids, glycosides, citrullines, spinoids, saponins, phenolic acids, alkaloids, and gum, which are important chemical compounds, which are bound to the leaves of the *Cordia myxa L.* plant regardless of the solvent used to prepare the extract, as they can be seen in both aqueous and alcoholic extracts [11], where pharmacists are solicitous in these components because of their therapeutic performance and low toxicity [10, 12].

The most effective chemical compounds have been identified, namely methyl ester, 9-Octadecenoic acid(Z)-, Hexadecamethylheptasiloxane, Heptadecanoic acid, 1,1,1,5,7,7,7-Heptamethyl-3, 3–bis(trimethylsiloxy)tetrasiloxane, tetradecamethyl-, Hexasiloxane, Triacontanoic acid, Cyclohexanecarboxylic acid, 3–Isopropoxy -1,1,1,7,7,7–hexamethyl-3,5, 5–tris(trimethylsiloxy)tetrasiloxane, 13- 11-Octadecenoic acid methyl ester, 1,1,1,3,5,7,9,11,11,11–Decamethyl-5-(trimethylsiloxy) hexasiloxane. 30 peaks were obtained for the used chemical compounds, which were displayed in the GC-MS scheme, which is shown in Figure 2. Those compounds have biological and medical properties [13, 14].

Conclusions

Ten chemical compounds were identified from the aqueous extract of Cordia myxa L., which are among the most effective components in the plant extract by GC-MS technique. It was found that the aqueous extract prepared in the current study contains fewer chemical compounds than the alcoholic extract. Quantitative examination of the chemical analyses of the aqueous extract of *Cordia myxa L.* leaves shown the subsistence of disorderly high levels of flavonoids, glycosides, citrullines, spinoids, saponins, phenolic acids, alkaloids, and gum. The current study concluded that this plant has bioactive materials which are a potential medical compound and need further investigation.

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