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Chemical constituents and antioxidants of *Lycium barbarum L.*

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***Abstract*— The antioxidant activity of the contents of alkaloid and hexane extracts of *lycium barbarum* was determined and the percentage of free radical inhibition was calculated using DPPH at concentrations (5,10,25,50,75,100) µg/ml using free radical scavenging activity (DPPH) by adding concentrations Various of extracts to DPPH. The inhibitory activity of DPPH free radicals was determined using six different concentrations (5,10,25,50,75,100) µg /ml of *lycium barbarum* extracts. The results indicated that the concentration of 100 µg /ml showed stronger radical scavenging activity than the lower concentrations. The results of the percentage of free radical inhibition by calculating the IC50 value of the hexane extract of the *lycium barbarum* plant showed the strongest with a value of (84.5 mcg/ml) compared with the control agent ascorbic acid (4.29 mcg/ml) followed by the alkaloid extract of the bramble plant (5.74 mcg/ml). The total antioxidant capacity of the test samples was calculated using the standard curve as equivalents of ascorbic acid per gram of extracts, for ascorbic acid ($y = 0.04245x + 48.177$, $R^2 = 0.3224$). The results were for *lycium barbarum* hexane ($y = 0.6118x + 46.425$, $R^2 = 0.4849$) and alkaloid for bramble ($y = 0.6337x + 46.361$, $R^2 = 0.5284$), respectively.**

The analysis of the diagnosis of the active compounds of the *lycium barbarum* of the hexane and alkaloid extract using the GC-mass spectrometry technique - also the chemical analysis of the plant showed that the active compounds in the extract of the hexane of the bramble were (22) chemical compounds, and the compound Pentacosane occupied the highest percentages of 17.74%, followed by the compound Nonacos With a percentage of 16.09%, the number of compounds diagnosed in the alkaloid extract of the bramble plant was (14) chemical compounds, and the percentage of Bis (2-ethylhexl) isophthalate was recorded as 58.53%, followed by Pentacosane 8.96% and Tricosane 7.49%, respectively, and others, which appeared in different proportions.

Keywords— antioxidant activity, GC-MS, *Lycium barbarum*, chemical compounds

I. INTRODUCTION

The Solanaceae family is one of the largest families of angiosperms, also known as (nightshades), and it is a very widespread family in the world and includes about (83-90) genera and (2671) species spread in the tropics, semi-tropics, and sub-tropics Tropical and also found in America (Gürbüz *et a.l*, 2018). In Iraq, the family is represented by five wild genera and 14 species whose plants are annual or perennial herbs, shrubs or climbers, and rarely trees (Al-Mousawi, 1987; Al-Mayah 2001). Solanaceae is considered one of the economically important families, as some of its genera have food uses such as potatoes (*Solanum tuberosum*), tomatoes (*Lycopersicum esculentum*), eggplant (*Solanum melongena*) and pepper (*capsicum grossum*), including ornamental plants such as *Cestrum nocturnum*, including wild plants. Sugar (*Hyoscyamus*) and some of its types are of medical and narcotic importance, such as tobacco (*Nicotiana*) (Ahmed *et al* .,2019).

The plant *L. barbarum* belongs to the Solanaceae family. In Iraq it is called Awsaj or Al-Sreem (Al-Mayah, 2013), while in the Arab regions it is called Awsaj, Sahnoun, Tree of the Jews, Qasr Al-Gharqad, while in America and some European countries it is called squawthorn, matrimonyvine, thorn desert and boxthorn while in China it is called wolfberries or "gouqizi" and other designations.

The *Lycium barbarum* plant is widespread in Asia, Europe and North America and also appears in Africa and South America, while in Iraq it is widespread in fields and orchards (Al-Mousawi, 1987). *L. barbarum* is a woody, deciduous, perennial, thorny dicotyledonous plant that reaches a height of 1-2 meters. As for the leaves, they are small and simple green, and there are two sharp thorns on the side of the leaf and these thorns are poisonous (25-50 mm long). The flower is in groups numbered (1-3 flowers) on the axils of the leaves, with a thorn (6-15 mm) long. The fruit is a berry of elliptical shape, bright orange in diameter (1-2 cm) and its seeds are kidney brown. The *lycium barbarum* plant also has a wide root system, as well as "tolerant of temperature (100 Fahrenheit) and grows on alkaline soils"(Shah and Kamal,2020) *L. barbarum* contains flavonoids, alkaloids, tannins, sterols, triterpenes, and sugars. It also contains manganese, nickel, copper, and chromium molybdenum. The fruits of this type are of high nutritional value, as (68%) and proteins (12%). 10% fat) It is also rich in vitamins A, C and E, and the fruits of the *L. barbarum* plant are reddish-orange because they contain a group of carotenoids, and this plant contains multiple sugars

such as arabinose, glucose, galactose, mannose, rhamnose, which represent about 8% 5- From the dry fruit (Peng *et al*., 2005 ; Pedro *et al*., 2018) . It was also found that the leaves of the *Lycium barbarum* plant contain flavonoids, such as Nicotiflorin, Rutin, soquercitrin, Quercetin, Kaempferol and. While the flowers of the *lycium barbarum* plant contain flavonoids, namely β-sitosterol and Ianosterol, the powder of the awsaj fruit is used in the treatment of liver diseases. The fruits of the bramble fruit have biological activities in preventing and treating many chronic diseases such as diabetes, hyperlipidemia, coagulation, cancer, hepatitis and infertility.(Havelek *et al*., 2017**;** Gao *et al*.,2017).

The *Lycium barbarum* plant is important as an antioxidant, as it contains multiple phenols responsible for inhibiting lipid peroxidation and reducing the level of fat in the blood to normal levels, as well as being used as an anti-tumor and in improving eyesight (Halliwell and Gutteridge., 2015). The *lycium barbarum* plant has been used as a traditional Chinese medicine in addition to its use as food in East Asia, and the fruits of the *L.barbarum* are used in the treatment of aging and neurodegenerative diseases, hypoglycemia and cancer diseases as well. It has protective, immune and anti-inflammatory effects **(**Erick *et al*.,2020) . The *Lycium barbarum* leaves are also used as antioxidants and diseases. Fungal and bacterial, as it was found that the leaves and fruits of the *Lycium barbarum* plant have medical importance in treating many skin infections (Zhao *et al*., 2020).

Several studies indicated that the extracts of the *Lycium barbarum* plant had anti-microbial activity, as it was found that the ethanol and methanol extracts of the leaves of the *Lycium barbarum* plant were effective against pathogenic bacteria *Klebsiella pneumonia*, *Escherichia coli* and *Shigella shinga*, and the methanol extract showed strong activity against bacterial infections.As (Donno*etal*.,2014**;** Bouhajeb *et al*.,2020 ; Al-Askary and Malih,2021).mentiond that in the fruits of the *lycium barbarum* it was advanced in healing wounds, especially skin ones. The *Lycium barbarum* plant contains many compounds such as anthraquinone, as it showed a bacteriostatic effect on the activity of some types of bacteria such as *Bacillus anthrasus* as well as its bactericidal activity against *Pseudomonas aeurogones*. In another study, Zhao *et al*. (2020) found that *Lycium barbarum* is used to treat various forms of inflammatory conditions (eczema, psoriasis) or to reduce water loss by improving the protective function of the skin's barrie. and that the root extract of the *Lycium barbarum* plant possesses a vital activity against many bacteria and fungi because it has alkaloids that are easy to absorb from the body. (Zhang, 2013 **;**Zeynep *et al*.,2020) stated in his study of *Lycium barbarum* that the glycosides of the fruits of this plant have the ability to increase the effectiveness of antioxidant enzymes, especially the two enzymes (catalase, superoxide dismutase), and therefore has the ability to protect cells and body tissues from damage caused by free radicals. Study of the nutritional value, minerals, fatty acid composition, and biologically active compounds of *L. barbarum* L having antioxidant properties of methanol extracts Methanol contains the highest Proportion of fat, dietary fibre, iron, total carotenoids, 2-O-β-d-glucopyranosyl-l-ascorbic acid (AA-2βG), iron, total carotenoids, and flavonoids included in the food and pharmaceutical industry, and their ability to scavenge free radicals (Sharma and Bhat **.,** 2009; Cao and Gan., 2020 **).** Inhibition of lipid peroxidation The antioxidants present in the fruits of the *Lycium barbarum* may confer many health protective benefits by reducing oxidative stress and have a high capacity as an antioxidant As for the polyphenols and alkaloids and their role in removing free radicals from the fruits of *L. barbarum*, leaves and bark contain components anti-oxidant, which provides anti-inflammatory activity, at least in part through the anti-oxidant activity with an anti-aging effect **(**Nzeuwa, 2019). The seeds also contain oils that do not have Not only an antioxidant but it restores the skin and reduces the epithelial layer water loss through its ability to interact with the lipid matrix in the stratum corneum, as is the case for other bioactive oils. The *Lycium barbarum* plant has the ability to stimulate the production of type I collagen and enhance cell vitality, chemical components of antioxidant and microbial activities in flowers, as an alternative source of natural antioxidant compounds and the radical scavenging activity of the ethanolic extract, phenolic compounds, such as chlorogenic, coumaric and ferulic acids, isoquersterin and has been tested (Nardini and Garaguso.,2020). . Rutin and Quercetron, and that eating the fruits of *lycium barbarum* because of their various health benefits of antioxidant supplementation in processes such as stress, aging, infection with pathogens, reducing the harmful effects of cells, programmed cell death, neurodegenerative diseases of free radicals and phenolic compounds in which it is most important in the fight against heart disease It is very beneficial for human health as it has been shown to contain adequate amounts of essential phytochemicals (Min *etal*., 2020) .There are also studies as antioxidants on other plants, including the study of Al-Saad and Al-Saadi(2021**)** on two plants that are *Lepidium sativum* and *L. aucheri* of the Cruciferae family.

In recent years, GC-MS analysis has proven to be a valuable method for identifying components (Hussein *et al*., 2017). GC-MS analysis Phytochemical studies showed the presence of alkaloids, flavonoids, fatty acids, coumarins, flavonols, and glycosylates. This study aimed to Quantitative and qualitative analysis of *L.barbarum* hexane and alkaloid extract composition using GC-MS analysis and antioxidant properties of alkaloid and hexane extracts of *Lycium barbarum* (López *et al.*, 2017 **;** Ma *et al.*, 2019) .

II. MATERIALS AND METHODS

A. plants collection

The *L. barbarum* plant was collected from Nasiriyah city - Iraq in 2020 (from October to January) and then the plant samples were taken to the laboratory and diagnosed, cleaned and dried in the air, after grinded with an electric grinder and stored until used.

B. Preparation of plant extracts

Extraction of hexane and alkaloids followed the method (Bobby *et al*., 2012), where 20 g of the ground plant part was placed in a thimble and then placed in a Soxhlet extractor using 200 ml of hexane for 24 hours, and then filtered the extract using filter papers- 13 Whatman - No and left to dry in a Petri dish at room temperature. To extract the alkaloids, the extraction process was repeated using a

Soxhelt extractor by adding 10% acetic acid in 95% methyl alcohol at a rate of 250 ml for 24 hours and the solution was concentrated to 10 ml by a condenser Rotary evaporator at a temperature of 50 °C˚ Then concentrated ammonium hydroxide solution was added In the form of drops to the acid solution until the pH is equal to 9 using pH measuring paper and a pH meter device, then The solution was filtered and the filtrate was placed in a separatory funnel, and 100 ml of chloroform was added to it, and it was shaken several times, then left to settle and separate into two layers. The lower layer is taken and dried in the air and then kept at a temperature of 4°C, and the process was repeated several times to obtain a sufficient amount of the plant extract.

C. Determination of antioxidant activity by DPPH assays:

The antioxidant activity of each was determined by a DPPH assay using (Hasan,2009 ; Hassanand and Mujtaba.,2019)with some modifications. The extract was prepared at different concentrations (5, 10, 25, 50, 75 and 100) µg/ml. 0.004 mg of DPPH was dissolved in 100 mL of methanol. The absorbance at 517 nm versus the control was determined after incubation for 30 Min at room temperature using a spectrophotometer. DPPH µg/ml) was used as a control, and ascorbic acid standard in triplicate for the standard. The antioxidant activity as IC_{50} of DPPH scavenging activity was detected by observing an inhibitory concentration of 50% of the extract using a titration curve .

The displacement property of DPPH (2,2-Diphenyl-1-Picrlhydrazine) and its conversion to DPPH-H during the demise of the violet color of the DPPH root marked with yellow color was determined as a result of returning it to a stable compound to be used only to study the displacement property, and the ability to Extracting free radicals from the following relationship:

Antioxidant activity (Inhibition) % = $[(A_{control} - A_{sample}) /A_{control}] \times 100$

Where: $A_{control}$ is the absorbance of the control (DPPH)reaction

A_{sample} is the absorbance in the presence of extract.

D. GC-MS analysis of plant extracts :

GC-MS analysis was performed using a Shimadzu GC-QP 2010 ultra-gas chromatograph. The temperature of the GC oven was programmed from 40 °C to 280 °C at 10 °C/min. Helium was used in the air as a carrier gas. The pressure was 7.0699 psi. The column flow was 1 mL/min, the purge flow was 3 mL/min and the injector temperature was 290 °C with the fractionated injection mode. MS scan conditions include: source temperature, 200 °C; interface temperature (MSD transmission line), 290 °C; Solvent cutting time 4 minutes, scanning speed, 1562 (N2); Range 35 m/z to, 650 m/z. The active chemical compound was determined by comparing the spectra with the known compounds stored in a library (NIST., 2005; Adebo *etal.*, 2021) .

II. RESULTS AND DISCUSSION

A. Antioxidant assays using DPPH radical scavenging:

The antioxidant activity of the alkaloid and hexane extract was determined using free radical scavenging activity (DPPH) by adding different concentrations of the extracts to DPPH. The inhibitory activity was determined using six different concentrations of each *L.barbarum* extract (Figure 1). It is clear from the results that there are differences between the values of the antioxidant activity of the studied plant and ascorbic acid, as it was found that the *L.barbarum* plant had the lowest antioxidant activity in hexane extract at concentration 5 µg/ml and it was 57.6%, while the highest antioxidant activity was recorded at concentration 100. micrograms/ml and it was 95.42%, and its antioxidant activity was higher than the standard ascorbic acid lion at concentration 100 micrograms/ml it was 80.71%, while the effectiveness of the extract was less than the value of ascorbic acid lion at concentration 5 micrograms/ml it amounted to 67.85% as in (Figure 1) .

An explanation of the results was made by drawing the relationship between the antioxidant activity and the content of the active compounds in the hexane extract of the *L.barbarum* plant and ascorbic acid, as shown in (Figure 3) and it was found from the results that the compounds in ascorbic acid (Y=0.4245×+48.177, R2=0.3224)) thus, the displacement value of the free radical DPPH was estimated at IC_{50} in ascorbic acid 4.29 µg/ml, , in the intentions of *L.barbarum* , the value of Y=(0.6118×+46.425, R2= 0.4849), and when calculating the value of IC_{50}, we find that it amounted to 5.84 µg/ml, as shown in (Figure 5). The results in (Figure 6) show that there are differences between the values of the antioxidant activity between the alkaloid extract of the *L.barbarum* plant and ascorbic acid, as it was found that the alkaloid extract of the *L.barbarum* plant had the lowest antioxidant activity at a concentration of 5 µg/ml. It was 60.43%, while the highest oxidative activity was recorded at the concentration 100 µg / ml and it was 97.42%, and the antioxidant activity was higher than ascorbic acid at the concentration 100 µg / ml was 80.71%, while it was less than the value of ascorbic acid at the concentration 5 µg / ml as it reached 67.85% (Figure 2) . The results were also clarified by drawing the relationship between the antioxidant activity and the content of the active compounds in the alkaloid extract of the L.barbarum plant and ascorbic acid, as shown in (Figure 4). R^2 = 0.5248 and through its value it was possible to calculate IC50, and it was found that it has a displacement value of the free radical DPPH estimated at the value of IC50, as it reached 5.74 µg/ml, as in (Figure 6).

Approximately 1-3% of carbon dioxide is consumed by the human body as it turns into free radicals and leads to damage to the structure of compounds, proteins and fats, thus causing damage to tissues and cells to be responsible for the development of diseases such as cardiovascular disease and cancer (Liu *etal* ., 2017).

B. Effectiveness of plant extracts as antioxidants and determination of IC_{50} value

It was found that the higher the IC50 value, the lower the antioxidant activity. When comparing the IC50 value of ascorbic acid, it was estimated at 29. 4 mg / ml With the values of the studied extracts as antioxidants, we find that the activity of the hexane extract of the *L.barbarum* plant was higher than that of ascorbic acid, as its activity was estimated at 84.5 mg / ml, and the effectiveness of this extract was considered optimal compared to the rest of the

extracts. To counteract free radicals and protect cells from oxidative damage (Lavery *et al*., 2016; Ali *et al*.,2017) .

Approximately 1-3% of carbon dioxide is consumed by the human body as it turns into free radicals and leads to damage to the structure of compounds, proteins and lipids, thus causing a series of enzymatic and non-enzymatic systems in plants to counteract free radicals and protect cells from oxidative damage (Andrei *et al*., 2015; Andoni**,** *et al*., 2020).

The *L.barbarum* plant is one of the plants that contains compounds that have the ability to inhibit free radicals, and this is consistent with (Ganaie *et al*., 2018 ; Truong *et al*., 2019). These compounds play an important role in inhibiting free radicals, and these compounds can be considered as an alternative to industrial antioxidants (Zhou *et al*., 2016; Tijana *et al*.,2020).

The antioxidant activity was evaluated in Solanaceae family plants by determining the antioxidant activity from the total contents of alkaloids in the extract using free radical scavenging and inhibiting activity (DPPH) by adding different concentrations of alkaloid and hexane extract to (DPPH) and the inhibitory activity was determined using Six different concentrations of extracts as in hexane and alkaloid extract of bramble and eggplant and the mixture of both .

The results showed that a concentration of 100 mg/ml showed strong radical scavenging activity in contrast to low concentrations (5 mg/ml). The *L.barbarum* plant had the greatest abundance of antioxidants, it reached 5.84% in hexane extract and compared to 5.74% in alkaloids extract.

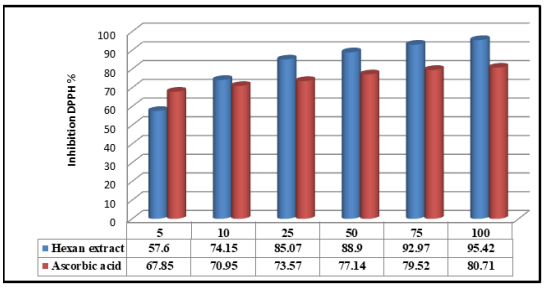
The current study agreed with many researchers, including **(**Zhou *et al*., 2017), who confirmed that the *L.barbarum* plant is a rich source of phytochemical compounds that have strong potential as antioxidants that make it a candidate. Which were recorded in our study to have medical importance: (Yao *et al*., 2018 : Waheed**,** *et al*., 2020).

Antioxidants are a defense system against stress caused by stray oxygen atoms, thus protecting the body by fighting free radicals resulting from oxidative stress, thus creating a state of balance between oxidants on the one hand and antioxidants on the other hand, and antioxidants primarily act as hydrogen donors or receptors. for free radicals (Rim *et al*., 2020).

One of the results of the antioxidants of *L.barbarum* plants is that these plants are strong antioxidants because they are non-toxic, non-radioactive, colorless and tasteless, and that they are effective at low concentrations, effective and stable in a wide range of pH, and this is in agreement with (Shang**,** *et al*. 2020**;** Ginwala *et al*., 2019).

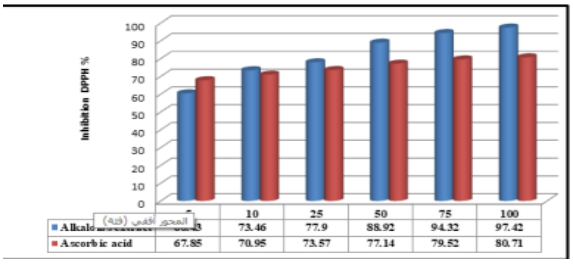
It should be noted that alkaloids are secondary plant compounds that possess strong antioxidants, and anti-proliferative and anti-bacterial activity is known to increase with plant stress. (Ginwala *et al*., 2019**;** Yen *et al*., 2017).

The *L. barbarum* L. plant is well-known in traditional Chinese medicines and has been widely used to reduce glucose and lipids in the blood, anti-aging, fatigue, anti-cancer, facilitating male fertility and regulating immunity. The fruits of the plant are rich in phenolic compounds, flavonoids, ascorbic acid and Tocopherol, it also contains flavonoids, tannins and ste Rools and triterpenes contain manganese, nickel, copper, chromium and molybdenum. It also contains alkaloids, sugars and hydrocyanic acid (which is a toxic acid). It was found in the hexane extract of *Lycium barbarum* that the compounds that characterize the plant differed in their molecular weights, most of which were fatty acids consistent with saturated fatty acids. (Min *et al*., 2020**;** Chiu *et al*., 2018)



	5	10	25	50	75	100
Hexan extract	57.6	74.15	85.07	88.9	92.97	95.42
Ascorbic acid	67.85	70.95	73.57	77.14	79.52	80.71

Figure (1) The percentage inhibition of Hexan extracts from *L. barbarum* and ascorbic acid of free radical DPPH.



		10	25	50	75	100
Alkaloids extract		73.46	77.9	88.92	94.32	97.42
Ascorbic acid	67.85	70.95	73.57	77.14	79.52	80.71

Figure (2) The percentage inhibition of Alkaloids extracts from *L. barbarum* and ascorbic acid of free radical DPPH

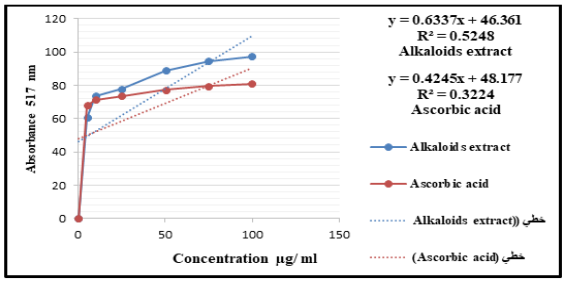


Figure (3) Calibration curve of percentage inhibition of the free radical DPPH by *L.barbarum* of Hexan extract and ascorbic acid.

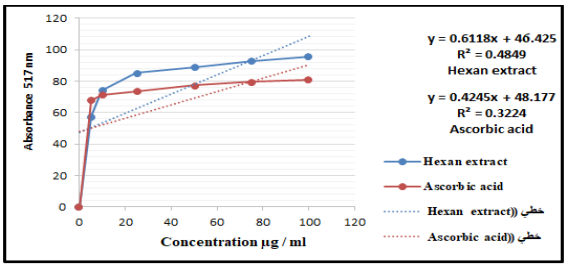


Figure (4) Calibration curve of percentage inhibition of the free radical DPPH by *L.barbarum* of Alkaloids extract and ascorbic acid

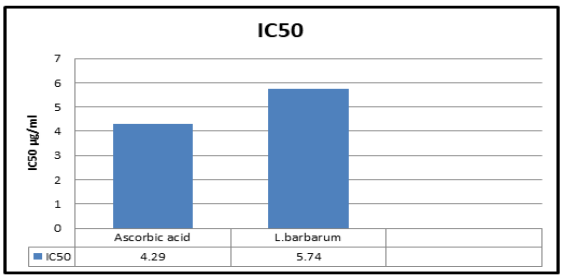


Figure (5): IC_{50} values of the different Hexan extracts in DPPH scavenging assay.

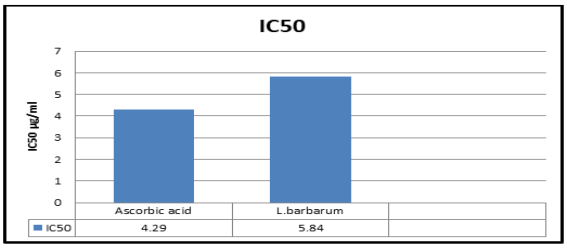


Figure (6): IC_{50} values of the different Alkaloids extracts in DPPH scavenging assay

C. *Chemical composition of Lycium barbarum*

After extracting the *L.barbarum* using hexane and alkaloids, the chemical analysis with the GC-MS device showed the following results, according to the type of extract:

1) Hexane extract of the L.barbarum plant:

The chemical analysis showed the presence of 22 chemical compounds, as shown in Table (1), Figure (7). The active compounds varied in number and percentages. The highest percentage of Pentacosane was recorded, which amounted to 17.74%, as shown in the Figure (8), then comes after it in the concentration sequence of the compound Nonacosane with a percentage of 16.09%, as shown in Figure (9), then the compound Triacontane, which appeared at 14.00%.Figure(10).

Table (1): Active Chemical Compounds of Hexane Extract of *L.barbarum* Plant Using Gas Connected Mass Spectrometry (GC-MS) Technique.

Peak	Retention time (min)	Area %	chemical formula	Chemical constituents
1	26.136	1.34	C16H22O4	Phthalic acid, butyl isobutyl ester
2	28.829	2.79	C20H40O	Phytol
3	30.271	0.51	C22H46	Docosane
4	31.682	2.35	C23H48	Tricosane
5	33.031	2.12	C2 H50	Tetracosane
6	34.36	6.63	C22H46	Docosane
7	35.605	6.00	C26H54	Hexacosane
8	36.482	0.40	C26H54	Hexacosane
9	36.845	16.09	C29H60	Nonacosane
10	37.971	4.61	C28H58	Octacosane
11	38.334	0.95	C27H55Cl	Heptacosane, 1-chloro-
12	39.097	8.00	C24H50	Tetracosane
13	40.524	0.80	C13H16FN3O6	Celidoniol, deoxy-
14	41.333	17.74	C25H52	Pentacosane
15	42.205	0.42	C30H61Br	Triacontane, 1-bromo-
16	42.656	0.47	C27H46O	5-Cholestene-3-ol, 24-methyl-
17	43.092	2.61	C11H22BrI	1-Bromo-11-iodoundecane
18	43.466	0.46	C27H56	Heptacosane
19	44.057	14.00	C30H62	Triacontane
20	45.131	0.61	C28H58	Octacosane
21	45.79	6.70	C20H42	Eicosane
22	46.221	1.05	C8H120	Bicyclo[5.1.0]octan-2-one, (1R)- (CAS)

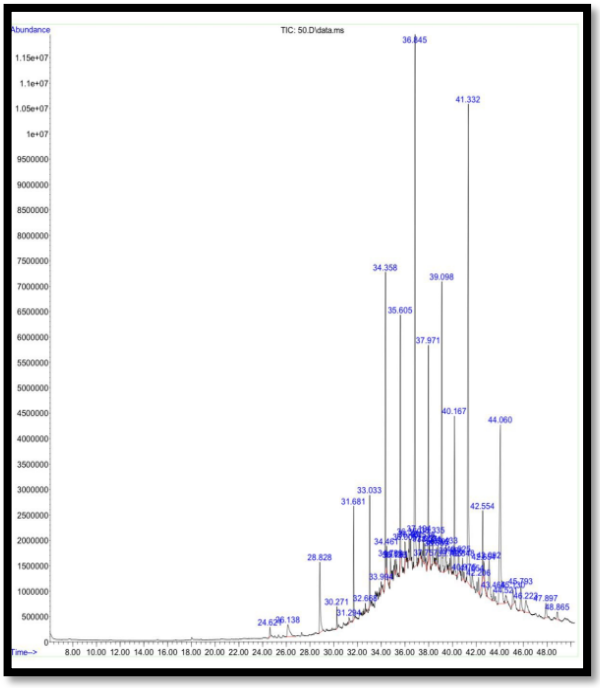


Figure (7): The active compounds in the *L.barbarum* plant for hexane extract using the technologyGC-MS

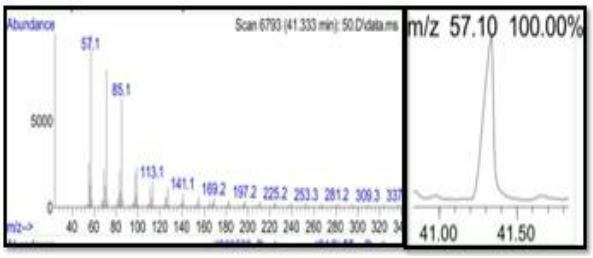


Figure (8): The chemical compound Pentacosane 17.73% of the hexane extract of the *L.barbarum* plant using the GC-MS technology

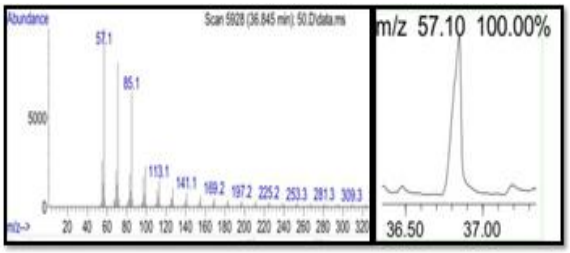


Figure (9): The chemical compound Nonacosane 16.09% of the hexane extract of the *L.barbarum* plant using the GC-MS technology

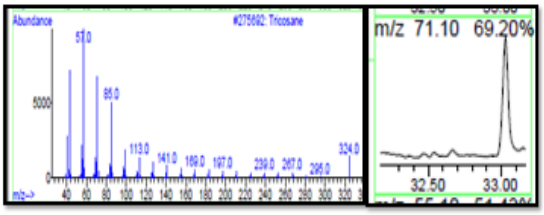


Figure (10): The chemical compound Triacontane 14.00% of the hexane extract of the *L.barbarum* plant using the GC-MS technology

2) Alkaloid extract of L.barbarum:

demonstrated by chemical analysis using the technique of The presence of (14) chemical compounds, as shown in Table (2) and Figure (11), and the active compounds varied in number and percentages. The highest percentage of Bis (2-ethylhexl) isophthalate was recorded, 58.53%, Figure (12). which is characterized as being the highest The percentages among all the studied plant extracts, as shown in Figure (13), then come after it in the concentration sequence, the compound Pentacosane, which amounted to 8.96% and as shown in Figure (14), then the compound Tricosane with a percentage of 7.49 and as shown in the Figure (12).

Table (2): Active compounds of the alkaloid extract of *lycium barbarum* using GC-MS technique.

Peak	Retention time (min)	Area %	for formula chemical	Chemical constituents
1	14.996	0.21	C7H12O3	3-Hexenoic acid, 5-hydroxy-2-methyl-, [R,R-(E)]-
2	22.39	0.20	C9H19O	5-Hepten-2-amine, N,6-dimethyl-
3	25.689	0.40	C19H40	Nonadecane
4	28.808	1.33	C21H44	Heneicosane
5	29.872	0.19	C21H32O2	14B-PREGNANE
6	30.266	2.41	C22H46	Docosane
7	32.865	0.96	C21H36	14-.BETA.-H-PREGNA
8	33.026	6.65	C24H50	Tetracosane
9	34.339	8.96	C25H52	Pentacosane
10	35.584	7.49	C23H48	Tricosane
11	36.342	1.32	C20H42	Eicosane
12	36.788	4.16	C25H52	Pentacosane
13	37.104	58.53	C24H38O4	Bis(2-ethylhexl) isophthalate
14	37.94	3.00	C28H58	Octacosane

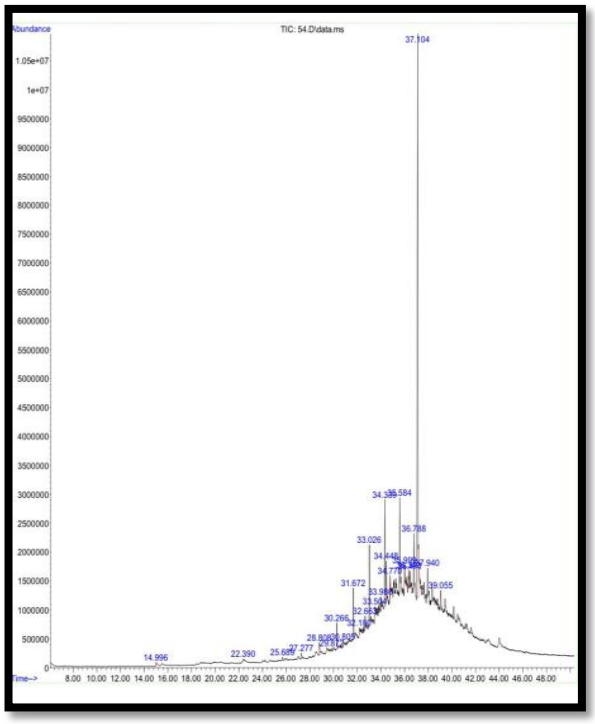


Figure (11): Active compounds of the alkaloid extract of *lycium barbarum* using GC-MS technique using GC-MS

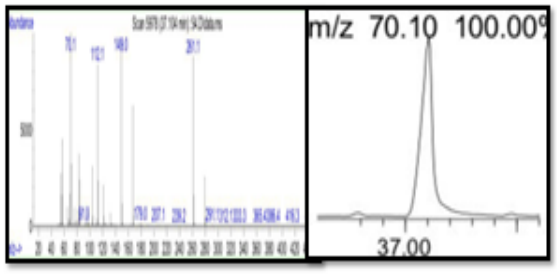


Figure (12):The chemical compound Bis(2-ethylhexl)isophthalate 58.45%of the alkaloid extract of the *L.barbarum* plant using GC-MS technology

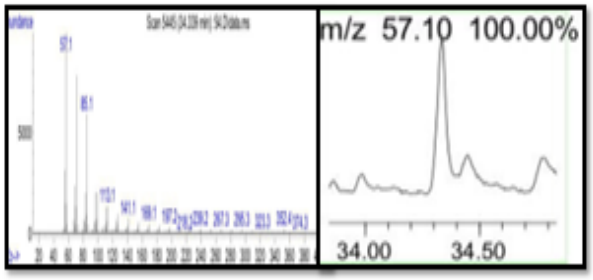


Figure (13) : The chemical compound Pentacosane 8.96% of the alkaloid extract of the *L.barbarum* plant using GC-MS technology

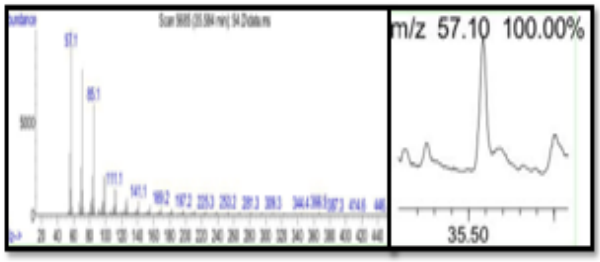


Figure (14): The chemical compound Tricosane 7.49 % of the alkaloid extract of the *L.barbarum* plant using GC-MS technology.

III. CONCLUSION

In this study, the active plant compounds of the hexane and alkaloid extract of *Lycium barbarum* were identified. Therefore, GC-MS analysis is the first step towards understanding the active compounds in *Lyciumbarbarum*, as this study is added to the sources for the production and development of modern medicines .Both extracts contain Biologically active chemicals and some plant chemical components are responsible for controlling diseases and adopting it as a natural source for treatment of various diseases with its antioxidant properties .

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