Plant Archives Vol. 19, Supplement 1, 2019 pp. 102-111 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

CHEMICAL STUDY IN LEAF AND FRUIT OF SOME SPECIES FOR *POPULUS* AND *SALIX* IN DIWANIYAH GOVERNORATE USING GAS CHROMATOGRAPHY-MASS SPECTROMETRY(GC-MS).

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Abstract

The present study examined the quantitative and qualitative characteristics of the two species of genus *Populus* and *Salix*, namely *P. euphratica* and *S. acmophylla*. Belong to the Salicaceae family plants. The samples were collected from the study area in Diwaniyah governorate and for the duration 2017\10\16 - 2018\4\25. The study included the chemical content of the leaves and fruits of the two species as above which were characterized by the abundance of chemical secondary compounds, it was analyzed using a technique GC-MS the latter showed the richness the compounds secondary metabolism in the two species, which varied in the studied plant parts such as leaves and fruits. Some found in the species genus *Populus* and her loss in species genus *Salix* in and on the inversion which contributed to isolating them clearly from each other. The recurrence of compounds others was observed, in addition, 17 chemical compounds were involved which were characterized by varying percentages and concentrations that helped separate between the two species the genus under study. This reinforces the taxonomic importance of this study, so this study is of great importance.

***Key words*:** *Salicaceae*, GC-MS Analysis, Chemotaxonomy, Biological efficiency, Secondary metabolism compounds.

Introduction

The species *S. acmophylla* and *P. euphratica* belong to the *Salicaceae* or Willow family and grow on shape Trees and Shrubs, a family of Dicotyledons flora with universal distribution found in different parts of the world, (Townsend & Guest, 1980; Kuzovkina, & Quigley, 2005). Chase *et al.* (2002) and Heywood *et al.* (2007) cite the family of 55 genus and about 200 species, coming second after the family of the daughter of the consul *Euphorbiaceae*. Sleumer (1980) states that the family includes seven tribes, position the genus under consideration are *Salix* and *Populus* within the Salicaea clan, Chase *et al*. (2002) agreed with him that the family had more than 100 clans, including the clans mentioned above. They Sleumer, (1980) and Mosaddik (2004) and Bretteler (2008) have pointed out that the *Salix* species genus has almost 200 species spread throughout Asia and Africa. While Jones & Luchsinger (1987) reported that it had about 300 species, whereas Rauder-roitzsch (1969), and Harrar & Harlow (1996) reported that *Populus* genus contains 55 species that are widely distributed the Earth's surface. As indicated by both Kruessmann (1962) and Rabbani *et al.* (2011) that the family has large plants spread in different regions such as China, Pakistan, India, Turkey, Iran, and the Arab world, such as Syria, Egypt and Iraq, and they have spread in America and Europe as plants Accessories. The classification of the family in Iraq has shown that the information in the flora of Iraqi plants is still insufficient and need to studies in order to reach the true picture of the species and spread in Qatar, especially in the province of Diwaniyah. As mentioned in Townsend & Guest, (1980) four species and two of them spread in Iraq are the genus *Salix* and *Populus* and between the species *P. euphratica* and *S. acmophylla* have been observed spread near the banks Tigris river and the Euphrates and their tributaries as well as their presence in the mountainous areas and is widespread in central and southern Iraq. According to Roitzsch (1969), the family under study included two genus broad, spread *Salix* and *Populus*, and the first three species spread in Iraq, is *S. acmophylla*, *S. alba* and *S. babyloni*, the first species are more prevalent compared to the latter two species, asit is found in most areas of our country, while the third species is considered an exotic species of Iraq. Al-Katib (2000) has referred to the family includes two genus *Salix* and *Populus*, and 340 species with worldwide prevalence, with the exception of Australia. Eight species are found in Iraq. The family name goes back *Salicaceae* relative to the genus of *Salix*, the ancient Greek name of this genus is sallows or osiers, meaning willow baskets or boughs baskets (Mabberley, 1997). While William (2000), Willis & McElwain (2002) reported that the traditional name of the *Salicaceae* family, Willow comes from two Greek words Sal means near Lis and means water, Any near water is a sign of plants habitat.

Both have been mentioned Farmer, (1964) so Guest & Townsend, (1980) and Al-Moussawi, (1987) Common names for gender *Salix* and *Populus* are under study in various languages including Arabic, English, Italian, Hindi, Turkish and French. The species was called *S. acmophylla L.* WILLOW SAFSAF and Common WILLOW, the researcher found that same This common name is also called in the province of Diwaniyah, but in the English language is called WILLOW ACMOPHYLLA And Turkish HALF The species is called *P. euphratica* L. in Arabic Multiple names GHARIB and HAWR, In English, it is called the EUPHRAT–PAPPELI. mention Guo, (1984) and Anon(1986) many common names for this species are in the Chinese language HUANG and in Hindi are called common names BAHAN and BHAN And in Asia is called COTTONWOOD.

It came in Mittion & Mittion (1976) that this family is one of the best families of plants for the large use in the indications as used in the treatments of Malaria. It contains a genus. *Salix* and *Populus* is an important chemical, especially in leaves, fruits, and found seven species of compounds such as Glucosides and the most important compound Salicin, which is used in the treatment of rheumatism for its high efficiency, as well as other compounds from the medical point of view Also used in the treatment of many diseases such as gum treatment, tonsillitis, stomach bleeding and skin diseases, and in the treatment of viral and fungal diseases also (AL-Katib, and Chrubasik, 2000, and EL-Shemy *et al*., 2003). Reported Bound (1995) and Singh *et al*. (2008) that genus *Salix* uses in medicine, especially *S. acmophylla*, which is used in the treatment of many diseases such as high blood pressure, hypothermia and tonic for kidney functions and in the treatment of itching, scabies, Arthritis, urinary tract, headaches and other diseases.. Karimi *et al*. (2011) reported that most of the world's population, including Iran, Egypt and Turkey, used boiled leaf *Salix* in several diseases such as depression, neuropathic pain. The plants of these species are of great economic importance as well they are found in many industries, including wood chips, matches, baskets, fibre, board and compressed wood, as well as the manufacture of cellulose paste and mats. It is also used in the manufacture of dyes and pesticides and its timber is used as roofing columns (IL'Yashevich and Sidorov 1978 and FAO, 1979). Harlow and Harrer (1969) referred to it as animal feed. AL-Katib (2000) states that it is an ornamental plant and is cultivated by roads, forests, parks and park landscaping, they act as wind, soil and Windbreakers as well as preserve the soil from erosion (Sharif *et al*., 2015). As for the studies in Iraq and according to available sources, he addressed Shahbaz, (2002) two species of *S. allba* and *S. amophylla* genus will spread in the province of Dohuk in northern Iraq anatomically and the importance of surface and medium tissue characteristics of the paper In isolating these two species from each other. Chemical studies of plants are one of the important steps that play an important role between Taxa. As for the family *Salicaceae* a number of studies have shown that the chemical composition and the economic and medical potential of the species around the world, which showed the richness of this family with chemical content, and possesses many vehicles as a major source in the pharmaceutical industry and the industries of dyes and medical supplies and others, and such compounds as and terpenes, flavonoids and alkaloids, Salicylic acid, which is produced in the preparation of Aspirin (Kotb, 1985 and Kuzovkina & Quigley, 2005). Also mentioned Krivoyat *et al.* (2011) the family plants are characterized by active compounds such as phenols and glucosides in addition to the substance Salicin which is an important source. agreed each of Moore *et al* (1998) this family is rich in important secondary compounds as studies have shown Karl *et al.* (1985) AL-Rawi & Chakravrty, (1988) and Shao *et al.* (1989) species *Salix* have many important chemical compounds, such as Tannins, Flavonoids, Kaloiaes and Glycosides Scattered in different parts of the plant. And agree each of Meire (1988) & Cowan (1999) and Evans (1992) to contain the species of this genus many vehicles including cumarin, steroids, volatile oils, gum and others.

Materials and Methods

The Markham (1982) method was used to prepare extracts chemical compounds from parts the plants using GC-MS with some modifications:

After washing the samples well to remove dust then leave for several days until dry at room temperature.

- Grind with an electric mill for 10 minutes to get a smooth mixture.
- One gram of plant extracts extracted from 10 mL of methanol was extracted with concentration. 99% with a continuous and vertical motion for 10-15 minutes then leave for 8 hours in a dark place and at room temperature.
- Then filtered by a filter with a capacity of 0.45 µm, which is associated with a medical injection.
- Add the hexane after 99% and the volume of 1 ml to separate the concentration of the extract and the discharge of water.
- The floating part of the leachate was withdrawn by the hexane from the water and the active chemical compounds were evaluated.

Results

The results of the current study of the chemical compounds of the studied species for the plant extracts separated and analyzed by GC-MS showed a high degree of quantitative and qualitative chemical content. 103 chemical compounds of both species were recorded, 54 species of *Populus* were recorded, and 48 compounds of *Salix* species. The phytochemicals in the leaves and fruits of the two species studied varied between phenols, terpenes, fatty acids, amino acids, alkanes, alkaloids, esters and carbohydrates Table (1 and 2). They were found 48 compounds in the leaves and fruits of the *P. ephratica* species Table (1) and 2, shape (1) and (2). The leaves and fruits of the *S. acmophylla* species contained 43 compounds, table (2) and 2 shape (3) and (4). Repeating the appearance of some chemical compounds at different times for the same type and the same extract was recorded. The two chemical compounds were repeated in the leaves of the species genus *Populus* it is Sucrose and Pentadecanal, whereas the species genus *Salix* included three replicated compounds it is 2,6-Pyridinediol, Vitamine E and P. Xylene.

In the table 1,(13) phenolic compounds were recorded in leaves and fruits of species *P. ephratica*, and distribution of which were in leaves and three in fruits. The highest purity of Salicin was recorded in leaves, with a concentration of 18.91% at 25.138\min and the lowest concentration of glycerine in the leaves at a concentration of 0.09% and at the time of emergence of 2.407\min. Also in table 2. *the Species S. acmophylla* were included 11 phenolic compounds in leaves and fruits (table 2), eight compounds were distributed in leaves and three in fruits, the highest concentration was the share for the Styrene in fruits, with a concentration of 76.49% at 4.532\ min, while the lowest concentration was coumarin in leaves, with a concentration of 0.5% at 10.083\ min.

The results of the present study showed the presence of both fruits of the two types of compounds, P. Xylene and Styrene. In addition, there was a difference in the distribution of chemical compounds in the leaves of the two species under study. Genus *Salix* was characterized by 6 compounds and its loss in the genus *Populus*, the latter was characterized by 7 compounds and their loss in genus *Salix*, two Tables (1 and 2).

The results of the present study also recorded the presence of terpenes compounds in the two species under study (Tables 1 and 2). Their presence was limited to leaves only, which were not observed in the fruits of both species. The species *P. uphratica* was characterized by containing 8 compounds that recorded the highest concentration in the compound Pentadecanoic acid the concentration was 3.64% at the time of the emergence of 9.400/ min and the lowest concentration of 0.32%, which was the share of the -2-Octylbenzoate at the time of the emergence of 21.422/min. While *S. acmophylla* was unique in the presence of 6 terpenic compounds Benzoic acid was the highest concentration, with a concentration of 4.07% at 9.372/min minute and the lowest concentration was found in the compound Benzoic acid, Hydrazide, whose concentration was 0.28% and at the time of emergence of 8.010/ min. The *S. acmophylla* was characterized by the presence of two compounds, Benzoic acid and Benzoic acid, Hydrazide, while not observed in the *P. euphratica*, which in turn was characterized by the presence of 4 compounds were not observed in the species *S. acmophylla*.

In the table (1 and 2), 14 compounds of fatty acids were recorded. Seven compounds were recorded in the species *P. euphratica*, which were divided into six compounds in leaves and one in fruits. The highest concentration was linolenic acid, with a concentration of 5.63% at 21.223\ min, and the lowest percentage of the compound Capric acid, Methyl ester which had a 0.25% concentration with an impressive time of 19.001 / min, While the *S. acmophylla* recorded 11 compounds, all were in leaves .table (2), has lost fruit of these acids. The highest concentration was in Decanal, with a concentration of 8.96% at the time of the emergence of 15.715/min, while the lowest concentration of 0.31% time the appearance of 8.995/ min of the chemical compound Hexadecanoic acid,15-methyl-, methyl, The results of the current study also separated the species *P. euphratica* by existence three chemical compounds of *S. acmophylla* the latter was characterized by the presence of 7 fatty compounds and their loss in the species *P. euphratica* characterized by the presence of compound 1,3-Dioxolane,4-ethyl- 2-pentadecyl in the fruit. The fruits of the species *S. acmophylla* were characterized by the absence of fatty compounds, Subscribe two species by four fatty compounds too. In addition, 4 amino acid compounds were recorded in *P. euphratica*. (Table 1), three of them were distributed in leaves and one in fruit. The purity of the compound was highest Methenamine, N-cyclohexadiene in the leaves Which had a 7.44% concentration by 10.889/ min the lowest concentration was for Isobutyl nitrite in fruit the same species while five compounds were recorded in species *S. acmophylla* all were in leaves and the fruits of the compounds were absent, and the highest concentration of the compound Armed E was recorded in the leaves, which was its concentration 1.81% at the time of 26.607\ min and the least purity of the compound6-Methoxy-2-phenacylo-3-(2H)- Pyridazinone with a

concentration of 0.32% and a time of 20.411/ min. The results shown in (Table 1) show that *P. euphratica* is characterized by three compounds in leaves and one compound in fruits, and her absence in species *S. acmophylla* the latter was characterized by its possession of four chemical compounds and their loss in the *P. euphratica* and the two species involved in the Armed E compound under study also included two tables (1 and 2).

From the observation of the results in tables (1 and 2), there are 11 alkanes compounds that differ in their distribution between the two species under study. Seven compounds were recorded in the species *P. uphratica*, which was divided into five compounds in leaves and two chemical compounds in fruits, With the highest concentration of fruits of 43.41% for the compound Acquired by the time of appearance 2.109/min, Followed by 1,2,4 Trimethylcyclo pentane, which is the second highest concentration in the leaves of the species mentioned above, with a concentration of 5.17% at the time of appearance 6.353 per minute, while the lowest concentration of the share of the 1-octane, 6-methyl in Papers with a concentration of 0.25% and an impression time of 12.566 per minute. While *S. acmophylla* is unique in that it contains five alkanes, which are confined to leaves they are not observed in the fruits. The highest concentration for the compounds 5-Phenyl-1-pentene was (5.63%) at the time of emergence was 21.223 / min followed compounds by 2Z-3-Methyl-2-undecane, which was his focus 4.32% at time 6.342/ min. Of these two tables, it is possible to isolate the species *P. euphratica* by possessing its leaves and fruits on (6) chemicals and their loss in species *S. acmophylla* and the latter characterized by the containment of (4) compounds also and loss in the opposite sex. The papers of the two species were also involved in the 2-Penitential, (E).

Eight ester compounds of plant extract in leaves and fruits of the two species under study were separated and analyzed in Tables 1 and 2, it recorded (5) chemical compounds in the species *P. euphratica*, which distributed four compounds in the leaves and one compound in the fruit The highest concentration for the toxin-4 (4ah) - one [1.3] [d] Tetrahydrocyclopenta was found in leaves, with a concentration of 11.11% the at time is 6.693/ min. While species of *S. acmophylla* was characterized by finding two compounds in leaves and one in fruit, (Table 2). The highest concentration was 11.71% at compound 6-Azabicyclo [3,2,1] octane in leaves at the time of emergence 13.24\ min followed by Oxalic acid, allylpentyl ester in the same species fruit with a concentration of 5.73% and at time 2.115/min..In from the two tables above, the *P. euphratica* separated from *S. acmophylla*, its first characterized by the possession of papers on five chemical compounds and their absence in the species second, which in turn marked by the presence of three chemical compounds in leaves and their absence in the leaves of the species *P. euphratica*, the fruits were characterized of *P. euphratica* containing the compound Butyphophonoic-phenylethyl ester acid, ethyl-2 and loss in the fruits *S. acmophylla* the latter species was characterized by containing fruits on the compound Oxalic acid, allylpentyl ester and absence in the first species.

For alkaloids compounds, four alkaloid compounds were separated and diagnosed in the current study of plant extracts of the two species. In the study topic Table (1 and 2), two alkaloids were identified in *P. euphratica*, one in leaves and one in fruits. The highest concentration for the citric acid, butyl ester, acetin the leaves was 3.53% at the time of the appearance of 2.265\ min, followed by Aziridine,1-(1,1-dimethyl ethyl)-2,3-dimethyl-, cisin fruits of the same species, with a concentration was 1.14% at the time of emergency at 27.983.While *S. acmophylla* was isolated by two compounds alkaloids, whose presence was limited to leaves, the highest concentration was 5.32% in the compound 1.5-Diphenyl-3- (2-phenylethyl) -2-pentene, it was observed 25.237/min. The presence a common in of plant leaf extracts for the above two species was observed in one compound, Citric acid, butyl ester, act. *S. acmophylla* has been isolated from the species *P. euphratica*, the first was characterized by containing its leaves on the chemical compound 1.5-Diphenyl-3- (2-phenylethyl) -2-pentene and its absence in the second species, tables (1 and 2).

From the observation of the results in Tables 1 and 2, six carbohydrates compounds were isolated and confined to leaves only, not observed in the fruits of both species under study. Four compounds were identified in the *P. euphratica* at leaves and the highest concentration was for the compounds 2,7-Anhydro-1-galactoheptulofuranose was 4.89% at time 22.867/min, while *S. acmophylla* had two compounds in leaves and the highest concentration was in Sucrose with a concentration of 4.70% at the time of appearance 13.527/ min, in the two tables above, *P. euphratica* is characterized by its two chemical components, for example, 2.7-Anhydro,1-galactic-heptulofuranoseand Beta-D-MannoFuranoside,-1-on, and their loss in *S. acmophylla*, and it was observed that there was a common between the two species by two chemical compounds the Sucrose and Heroes.

Discussion

The present study has led to the collection of two species genus *Populus* and *Salix* scattered in the Diwaniyah governorate, the analysis was performed

using the technique GC-MS of plant extracts of two species *P. euphratica* and *S. acmophylla* and isolate them by distinguishing them with different chemical compounds. In addition, their chemical content can be clarified in several areas, especially medical ones. Kotb (1985) remind this family as having many secondary compounds as a main source in the pharmaceutical industry, Phenols, terpenes, alkaloids, fatty acids and amino acids, as well as their compounds, esters and carbohydrates. This is confirmed by the current study. The two species under study differ in the presence of chemical compounds in general.

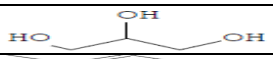
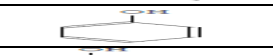
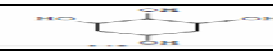
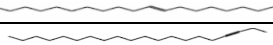
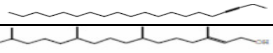
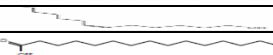
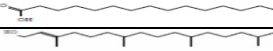
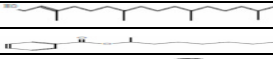
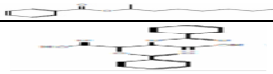
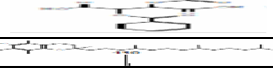
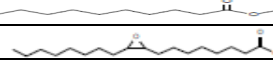
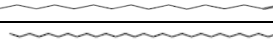
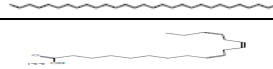
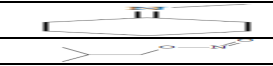
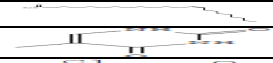
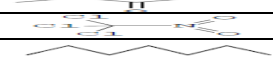
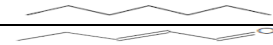
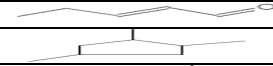
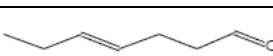
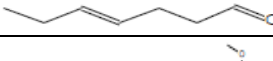
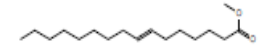
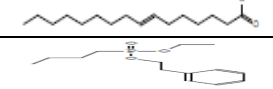
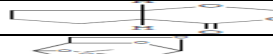
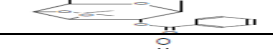
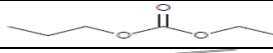
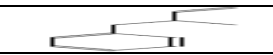
Each species is characterized by the presence of compounds lost by the other, as well as by their common compounds. Such as the presence of seven phenolic compounds in the *P. euphratica* and its absence in *S. acmophylla* species (Table 1 and 2). The latter also contained six other phenolic compounds and their loss in the *P. euphratica*, which helped to isolate between the two species under study. The current study was agreed with several researchers, Júnior *et al*. (2015), in their study of chemical and biological activity in the extracts of the leaves of some species of the *Salicaceae* family spread in the state of Sercia in Brazil in the presence of phenolic compounds, especially coumarin. The study came agreed with Srivastava *et al*. (2013) and Kong *et al*. (2014) the *Salicaceae* contains phenolic compounds, especially salicin, and It is a derivative a monohydroxbenzoic acid, which is medically important, as it is a powerful oxidative and therapeutic factors anti-cancer, especially lung cancer and colon, the study also agreed with Boeckler (2011) and Kilic (2012) in their study of some of the *Salicaceae* family species prevalent in China, including the two species under study in the richness of the plants of this family with effective phenolic compounds.

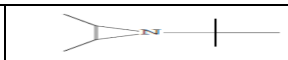
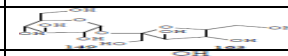
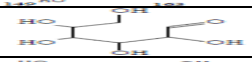
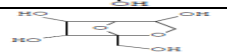
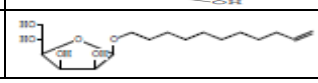
The present study has also shown an important threshold character in isolating and diagnosing the two species under study, through which it was possible to isolate the species *S. acmophylla* by two chemical compounds terpenes. is missing species *P. euphratica* which was isolated through its containment on four terpenes, not observed in the species *S. acmophylla*. Has been mentioned AL-Rawi & Chakrvarty, (1964) on the presence of terpenes vehicles of which Benzoic acid and others in one species genus *Populus* It is a species *P. alba* Distributed in the sections of Rawanduz in northern Iraq and this confirms the results of the current study in the presence of terpenes in species genus *Populus*. The study also agreed with Kilic (2012) in his study of the two genus *Populus* and *Salix* in turkey in the presence of terpenes compounds.

As for fatty and amino acids, of the species genus, *Salix* was observed to have seven fatty acids not observed in the species genus *Populus*, while the latter contains three fatty acids not found in the species genus *Salix*. The species genus *Salix* was isolated in possession of four amino acids not found in the species genus *Populus*, the latter was characterized by the presence of three amino acids missing in the species the second genus and this contributed to the isolation and diagnosis of the two species under study. As for alkanes, the species *P. uphartica* has six compounds alkanes not observed in species *S. acmophylla* and the latter is characterized by four compounds and their absence in the other species. This also helped in the isolation between the two species, table (1 and 2). The *P. euphratica* was isolated by five compounds ester not observed in species *S. acmophylla*, which in turn contained three compounds not observed in first species. As well as presenting one alkaloid compound in the species *P. euphratica* and its absence in *S.acmophyll* Which was characterized by the presence of a composite alkaloid also not observed in the other species. The study also agreed with Karl *et al*. (1985), involved the incorporation of secondary chemical compounds, including fatty acids, amino acids and alkaloids, in various parts of the plant body, as well as the study also agreed with Schmid (1998) in his study of two species of genus *Salix* in the city of Tubingen in Germany in that too. The results of the study have also been given a stenographic effect in isolating and diagnosing the two species under study. It was possible to isolate *P. euphratica* by the two basic carbohydrate compounds: 2.7-Anhydro, 1-galacto-heptulofuranoseand Beta-D-MannoFuranoside,-1-on, and their presence in *S. acmophylla* is not observed.

From the tables (1 and 2) we find that the two genera under study in leaves and fruits are mixed with 17 common compounds this confirms their belonging to the same family means a relationship between them, Which came by both AL-Khozaei (2016) and AL-Mayyahi (2017), They emphasized the fact that similar plants containing similar compounds that are, plant similarity in chemical content Proof of a link kinship between them and this are confirmed by the current study also.

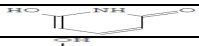
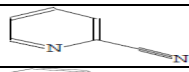
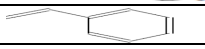
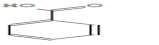
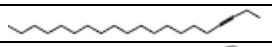
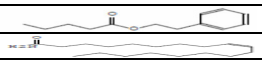
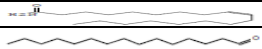
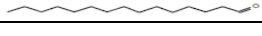
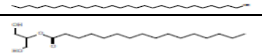
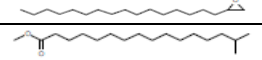
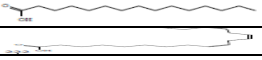
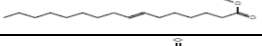
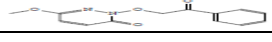
Table 1 : Analysis GC-MS of an extract of Leaves and Fruits of *P. euphrasia.*

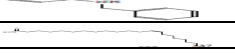
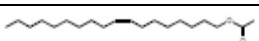
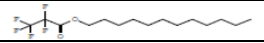
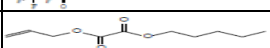
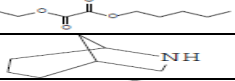
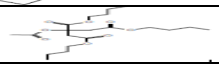
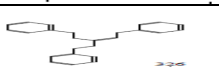
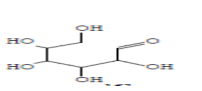
Nature of compounds	no	Compound Name	Plant part						Structure	Molecular Formula
			Fruits			Leaves				
			Peak Area %	Reten-tion time	N. Peak	Peak Area %	Reten-tion time	N. Peak		
Phenolic compounds	1	Glycerine	1.04	2.854	3	0.09	2.407	1		$C_3H_8O_3$
	2	P-Xylene	12.82	4.979	4	0.22	4.178	2		C_8H_{10}
	3	Styrene	34.24	5.366	5	1.94	4.521	3		C_8H_8
	4	Phenol	-	-	-	0.48	6.134	5		C_6H_6O
	5	Pyrocatechol	-	-	-	2.88	9.862	10		$C_6H_6O_2$
	6	62-Furacaboxaldehyde, 5-(hydroxymethyl)-	-	-	-	2.08	10.165	11		$C_6H_6O_3$
	7	1,2,3,5-cyclohexanete trol ,(1-alpha-,2-beta-, 3-alpha-,5-beta)-	-	-	-	4.90	15.667	18		$C_6H_{12}O_4$
	8	4-((1E))-3-Hydroxy-1-propenyl)-2-methoxyphenol	-	-	-	0.61	17.092	19		$C_{10}H_{12}O_3$
	9	Salicin	-	-	-	18.91	25.138	38		$C_{13}H_{18}O_7$
	10	Benzeneformic acid	-	-	-	5.07	9.431	9		$C_7H_6O_2$
Terpenes compound	11	9-Eicosene,(E)	-	-	-	0.21	15.210	17		$C_{20}H_{40}$
	12	3-Eicosyne	-	-	-	2.72	18.109	21		$C_{20}H_{38}$
	13	(2E)-3,7,11,15Tetra methyl-2hexadece-1-ol	-	-	-	0.45	18.374	22		$C_{20}H_{40}O$
	14	(6Z)-6-Pentadecen-1-lo	-	-	-	0.70	18.576	23		$C_{15}H_{30}O$
	15	Pentadecanoic acid	-	-	-	3.64	19.400	25		$C_{15}H_{30}O_2$
	16	Phytol	-	-	-	0.91	20.950	27		$C_{20}H_{40}O$
	17	2-Octylbenzoate	-	-	-	0.32	21.422	29		$C_{15}H_{22}O_2$
Terpenes	18	Butanedicoicacid,2,3- bis(benzoyloxy)-, [S-(R*,R*)]	-	-	-	0.45	21.720	30		$C_{18}H_4O_8$
	19	Vitamine E	-	-	-	0.74	30.465	43		$C_{29}H_{50}O_2$
Fatty acid	20	A capric acid methyl ester	-	-	-	0.25	19.001	24		$C_{11}H_{22}O_2$
	21	Oxrianeoctanoic acid, 3-octyl methyl ester, cis	-	-	-	0.27	22.599	32		$C_{19}H_{36}O_3$
	22	1,3-Dioxolane,4-ethyl- 2- pentadactyl-	0.41	20.707	8	-	-	-		$C_{20}H_{40}O_2$
	23	Plamitic acid-beta- monoglyceride	-	-	-	0.37	24.458	37		$C_{19}H_{38}O_4$
	24	Pentadecanal	-	-	-	0.61	27.022	40		$C_{15}H_{30}O$
	25	1-Octacosanol	-	-	-	0.27	27.575	41		$C_{28}H_{58}O$
	26	Linolenic acid	-	-	-	5.63	21.223	28		$C_{18}H_{30}O_2$
Aminoacid	27	Methenamine,N- cyclohexylidene	-	-	-	7.44	10.889	12		$C_7H_{13}N$
	28	Isobutyl nitrite	0.50	25.266	9	-	-	-		$C_4H_9NO_2$
	29	Armid E	-	-	-	1.40	26.609	39		$C_{22}H_{43}NO$
	30	Thymine	-	-	-	0.64	7.788	8		$C_5H_6N_2O_2$
Alkanes compound	31	Acquinite	43.41	2.109	1	-	-	-		$CC_{13}NO_2$
	32	Heptane	2.12	2.419	2	-	-	-		C_7H_{16}
	33	2-Pentenal,(E)	-	-	-	0.43	5.992	4		C_5H_8O
	34	1,2,4Trimethylcyclo pentane	-	-	-	5.17	6.353	6		C_8H_{16}
	35	1-Octene,6-methyl	-	-	-	0.25	12.566	14		C_9H_{18}
	36	(4E)-4-Heptenal	-	-	-	0.58	11.074	13		$C_7H_{12}O$
	37	7-Hexadecenoic acid methyl, ester,(Z)	-	-	-	0.30	23.867	35		$C_{17}H_{32}O_3$
Ester compound	38	Butyphosphonic acid , ethyl-2 phenyl ethyl ester	3.70	18.325	7	-	-	-		$C_{14}H_{23}O_3P$
	39	Tetrahydrocyclopenta[d][1,3]doxin-4(4ah)- one	-	-	-	11.11	6.693	7		$C_7H_{10}O_3$
	40	2-Benezoyl-3,4- aceton e-d-galactosan	-	-	-	0.31	20.413	26		$C_{16}H_{18}O_6$
	41	Carbonic acid, ethyl propyl ester	0.50	26.265	10	-	-	-		$C_6H_{12}O_3$
	42	Benzoen,(2-methyl-3-butenyl)-	-	-	-	0.22	24.173	36		$C_{11}H_{14}$

Alkaloids compounds	43	Aziridine,1-(1,1- dimethylethyl)-2,3- dimethyl-.,cis	1.14	27.983	10	-	-	-		$C_8H_{17}N$
	44	Citric acid,tribuytylester,acetate	-	-	-	3.53	2.265	31		$C_{20}H_{34}O_8$
Carbohydrate compound	45	Sucrose	-	-	-	2.40	13.531	15		$C_{12}H_{22}O_{11}$
	46	Hexose	-	-	-	3.60	13.995	16		$C_6H_{12}O_6$
	47	2.7-Anhydro-1- galacto- heptulofura nose	-	-	-	4.89	22.867	33		$C_7H_{12}O_6$
	48	Beta.-D-Manno Furanoside,1-o-	-	-	-	1.92	23.105	34		$C_{17}H_{32}O_6$

(-) :absence

Table (2): Analysis GC-MS of an extract of Leaves and Fruits of *S. acmophylla*

Nature of compounds	no	Compound Name	Plant part						Structure	Molecular Formula
			Fruits			Leaves				
			Peak Area %	Retention time	N. Peak	Peak Area %	Reten-tion time	N. Peak		
Phenolic compounds	1	2,6-Pyridinediol	-	-	-	11.41	6.682	5		$C_5H_5NO_2$
	2	1,2-Benzenediol	-	-	-	2.80	9.858	8		$C_6H_6O_2$
	3	Coumarin	-	-	-	0.51	10.083	9		C_8H_8O
	4	P-Xylene	12.68	4.185	2	2.58	25.035	35		C_8H_{10}
	5	Cyanopyridine	5.10	17.323	4	-	-	-		$C_6H_4N_2$
	6	7-Ethylcycloheptatriene	-	-	-	2.66	24.172	33		C_9H_{12}
	7	Salicin	-	-	-	2.43	25.584	37		$C_{13}H_{18}O_7$
	8	Trans-1,2-Diphenylcyclo butane	-	-	-	5.76	17.311	19		$C_{16}H_{16}$
	9	Styrene	76.49	4.532	3	2.68	4.507	2		C_8H_8
Terpenes compounds	10	9-Eicosene,(E)	-	-	-	1.35	12.562	12		$C_{20}H_{40}$
	11	Benzaicacid,hydrazide	-	-	-	0.28	8.010	6		$C_7H_2N_2O$
	12	Benzoic acid	-	-	-	4.07	9.372	7		$C_7H_6O_2$
	13	3-Eicosyne	-	-	-	2.48	18.106	20		$C_{20}H_{38}$
	14	Phytol	-	-	-	1.35	20.944	26		$C_{20}H_{40}O$
	15	Vitamin E	-	-	-	0.93	30.460	43		$C_{29}H_{50}O_2$
Fatty acid	16	Decanal	-	-	-	8.96	15.715	16		$C_{10}H_{20}O$
	17	Valeric acid,2-	-	-	-	0.75	16.687	17		$C_{13}H_{18}O_2$
	18	Oleic acid amide	-	-	-	0.41	23.232	31		$C_{18}H_{35}NO$
	19	Pentadecanal	-	-	-	0.45	27.022	40		$C_{15}H_{30}O$
	20	1-Octacosanol	-	-	-	0.71	27.573	41		$C_{28}H_{58}O$
	21	Palmtic acid-beta- monoglyceride	-	-	-	0.64	24.456	34		$C_{19}H38O4$
	22	2-Hexadecycloxirane	-	-	-	0.65	18.573	22		$C_{18}H_{36}O$
	23	Hexadecanoic acid,15- methyl-, methyl ester	-	-	-	0.31	18.995	23		$C_{18}H_{36}O_2$
	24	Pentadecanoic acid	-	-	-	3.00	19.396	24		$C_{15}H_{30}O_2$
	25	Linolenic acid	-	-	-	3.92	21.214	27		$C_{18}H_{30}O_2$
	26	7-Hexadecenoic acid, methyl ester	-	-	-	0.41	23.865	32		$C_{17}H_{32}O_2$
	27	6-Methoxy-2-phenacylo-3(2H)-pyridazinone	-	-	-	0.32	20.411	25		$C_{13}H_{12}N_2O_4$

Amino acid	28	Sebacic acid	-	-	-	0.44	21.419	28		$C_{10}H_{18}O_4$
	29	Octaediamide,N,N-di-benzoyloxy	-	-	-	0.49	21.716	29		$C_{22}H_{24}N_2O_6$
	30	N-Benzyl-2-amino inanimate,methyl ester	-	-	-	0.39	28.923	32		$C_{17}H_{17}NO_2$
	31	Armed E	-	-	-	1.81	26.607	39		$C_{22}H_{43}NO$
Alkanes compound	32	2-Pentenal,(E)	-	-	-	0.49	5.984	3		C_5H_8O
	33	(2Z)-3-methyl-2-undecene	-	-	-	4.32	6.342	4		$C_{12}H_{24}$
	34	3-Nitro-1-phenyl-propane	-	-	-	0.62	16.925	18		$C_9H_{11}NO_3$
	35	Z-8-Octadecen-1-ol-acetate	-	-	-	0.42	18.371	21		$C_{20}H_{38}O_2$
	36	5-Phenyl-1-pentene	-	-	-	5.63	21.233	38		$C_{11}H_{14}$
Ester compound	37	Pentafluoropropionic acid, dodecyl ester	-	-	-	0.20	15.206	15		$C_{15}H_{25}F_5O_2$
	38	Oxalic acid, allylpentyl ester	5.73	2.115	1	-	-	-		C_5H_9NO
	39	6-Azabicyclo[3.2.1] octane	-	-	-	11.71	13.24	10		$C_7H_{13}N$
Alkanes compounds	40	Citric acid, butyl ester, acetate	-	-	-	4.36	22.263	30		$C_{20}H_{34}O_8$
	41	1.5-Diphenyl-3-(-2- phenylethyl)-2-pentene	-	-	-	5.32	25.137	36		$C_{25}H_{26}$
Carbonyurate compounds	42	Sacrose	-	-	-	4.70	13.527	13		$C_{12}H_{22}O_{11}$
	43	Hexose	-	-	-	0.99	14.013	14		$C_6H_{12}O_6$

(-) :absence

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