



## Comparison of Oil Acids Content of Some of Apiaceae Family Genera by Gas Chromatography Technique

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### Abstract

Three genera and four species of the Apiaceae family : *Cuminum cymium* ; *Foeniculum vulgari* ; *Pimpinella affinis* and *Pimpinella anisum* were compared chemically by Gas chromatography (GC) for seven fatty acids ( Heptanoic acid ; Octanoic acid; Lauric acid ; Stearic acid ; Lenolinic acid ; lenolic acid and Palmitic acid) as a chemotaxonomical marker to determine genetic similarities and differences between wild plant *Pimpinella affinis* and other cultivated species , results showed that two of the fatty acids were founded as general distributed in all plant species ( palmitic acid and lauric acid ) other fatty acids are distributed in variable forms in the different species , the wild species *Pimpinella affinis* had the most fatty acids diversity depending on GC analysis compared with other plant .

**Keywords :** Apiaceae ; gas chromatography ; oil acids ; *Cuminum cymium* ; *Foeniculum vulgari* ; *Pimpinella affinis* ; *Pimpinella anisum* ; fatty acids

### 1. Introduction

The family Umbelliferae (Apiaceae ) which have (295) genera and (2550) species distributed in frigid zone tropical ,most of its plants are considered economic and medical for its essential oils ,aromatic , terpenoids , saponins and other compounds ,plants are annual ,biennial or perennial and herbaceous .The most important feature is there Inflorescence which are simple or compound umbel with cremocarp fruit which are often separate into mericarps [1]. Some of these plants are condiments like *Cuminumcymium* and *Foeniculum vulgare* or carminatives . Many chemical studies about family Apiaceae founded that genus *Pimpinella* had impressive diversity chemical compounds indicated that the variations can be generated from individual genetics structure and differences among growing conditions in addition to differences among plant parts [2] , In analytical studies showed that Cumin seeds contain essential oil either polyphenols ,content ranged from 2.0 – 4.0 % with 22 identified compound [3]. AL-Taii used seed of different plants of the family Umbiliferae to extract oils and pointed to the commercial Parsily oil contain palmitic acid and stearic acid ,while commercial oil from Celery contains olic,linolinic,palmitolic ,stearic and erucic acids [4] .in contrast to commercial oil from Coriander which contain linoleic,oleic , palmitic ,

erucic and stearic acids . Studies on (*Foeniculumvulgari* Mill)fatty acids ,showed that major change observed in the essential oil composition were resulted from relative proportions of constituents and not to the presence or absence of new once [5] . Recent study [6] that tested variation in fatty acids composition of Cumin seeds as antiseptic , analgesic ,anti- inflammatory, hemolytic or enzymatic acting sedative and stomachics agents [6] .

### 2. Materials and methods

#### 2.1. Preparing of plants samples

Plant samples prepared in two ways; either by seed cultivation from Serbian market ) included *Cuminumcymium* ; *Foeniculumvulgari* ; and *Pimpinella anisum* . in a green house , growing and harvested at flowering stage ; air dried at room temperature and homogenized. . the wild type *Pimpinella affinis* have been collected from Solaf region (4) km. from Imad-diia (90)km. from center of Dohuk Government at north of Iraq (Kurdistan province) in May also at flowering stage , identified by comparing with herbarium specimen at Mosul University (Museum of Natural History) ; also dried at room temperature and homogenized [7]

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Receive Date: 03 June 2021, Revise Date: 17 June 2021, Accept Date: 30 June 2021

DOI: 10.21608/EJCHEM.2021.79015.3867

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## 2.2. Fatty acids Extraction

Extracts have been prepared by crushing 5 gm of dry weight of whole plants in 20 ml of (2 chloroform : 1ethanol) (v:v) and mixing the mixture for 4 hours at 25 C until completion of lipids solubility .

Then the extracts filtered using filter paper Whatman NO.1 ,the supernatant washed 5 times with 10 ml of ( 2chlorophorm : 1ethanol ) for lipids removing confirmation ,the results of washing evaporated until dryness under low pressure at room temperature , the resulting powder contain lipids and sugar together isolation of lipids and sugar can be done by dissolving them in 50 ml in chloroform in order to get fatty acids as melted .

Methylesters of fatty acids dissolved in suitable volume of chloroform to be ready to analyze in Gas Chromatography technique (shemadzu14A GC, using separation column SE- 30 with Helium gas (He) as a carrier and temperature ranged from 200 – 60 c°

Starting from 60 c° for one minute raising later the temperature at rate 8degrees 1 min until the sample access in this thermal temperature for 3 minute . The detector of FID . (The measurement measured by GC in AbinSina General Company of the Ministry and Minerals , Bagdad 1 Iraq.) [9] .

## 2.3. Fatty acids Estimation

Fatty acids estimation depending on [8] modified method which include oil removing from plant tissues by organic solvent to produce methylester fatty acids and designation them by Gas Chromatography (GC) 9.

## 3. Results and Discussion

The results in table (1) and figure (1) depending on retention time compared with standered fatty acids in figures ( 5 – 11 ) acids that *Pimpinella anisum* extract contain lauric acid (dodecanoic acid) with retention time (11.33) and concentration (0.0026) ; the stearic acid (octadecadieonic acid methylester) with retention time (15.48) and concentration (0.0167) , also lenolenic acid (octadecatrienoic acid) with retention time (16.21) and concentration(0.0463) and palmatic acid (hexadecanoic acid methyester) with retention time (14.62) and concentration(0.0248) . [10] founded that *Pimpinella anisum*olic contains acid ,petroselinic acid ;cis- vaccenic acid and aniseed. [11] pointed that GC is a powerful and unique process in the fatty acids analysis due to high resolution , the high temperature in this technique is needed [11].

Compared with wild species *Pimpinella affinis* which was collected from mountain region about 1075 meter height [12] , showed wide range of peaks and highest content of the studied fatty acids in

compare with cultivated species which contain heptanoic acid in concentration (0.078 ) ; lauric acid in low concentration (0.0019) ; while stearic acid in concentration (0.0185) and lenolenic acid with concentration (0.0104) while palmitic acid concentration was ( 0.0228 ) (table 2) (fig. 2) . Reiter et al analyzed different variation of Apiaceae plants and reported that it contain petrosilinic and cis -vaccenic acids [13]also [14]pointed that all samples of Apiaceae studied species contained palmitic acid ; stearic acid ; petrosilinc acid and linolic acid.

Table 1: A list of fatty acids founded in *Pimpinella anisum*determined by GC

Peak No.	Retention time(min )	Fattyacid	formula	Concentration %
14	11.33	Lauric acid	Dodecanoic acid	0.0026
21	14.62	Palmitic acid	Hexadecanoic acid	0.0248
22	15.48	stearic acid	Octadecandieoc acid	0.0167
23	16.21	Lenolenic acid	Octadeca-trienoic acid	0.0463

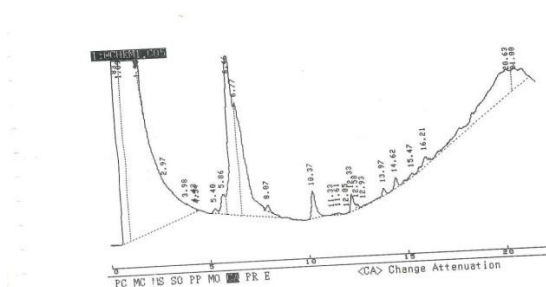


Fig. 1. Fatty acids content curve of *Pimpinellaanisum*determined by GC tech.

Table (3) and fig.2 show that cominun*Cuminumcyminum* extract contain each of the heptanoic acid (oenathic acid ) with retention time (7.75) and concentration (0.0373) followed by the octanoic (caprylic acid) with retention time (9.23) and concentration(0.0088) and lauric acid with retention time ( 11.41 ) and concentration (0.242) ; palmitic acid (0.242) and lenolenic acid (0.076). [3]analyzed cumins seed essential oil from different origins and identified (22) compound among which the most abundant were Cumin aldehyde , and confirmed that the essential oil content varied depending on factors like a growing region and genotype [15]; [6] concluded that Cumin seeds contain unsaturated fatty acids mainly linolenic and linolic and unsaturated fatty acids ( palmitic and myristic ) [6]. [16]also founded that Cumin seeds contain Oleic acid ,linolenic acid , and palmitic acid .

Table 2: A list of fatty acids founded in *Pimpinella affinis* determined by GC

Peak No.	Retention time (min)	Fatty acid	formula	Concentration %
22	7.62	heptanoic acid	Enanthic acid	0.078
26	8.98	Octanoic acid	Caprylic acid	0.0019
29	1.25	Lauric acid	Dodecanoic acid	0.0019
35	14.16	Palmitic acid	Hexadecanoic acid	0.0228
38	15.67	Stearic acid	Octadecadienoic acid	0.0185
39	16.42	Lenolenic acid	Octadecatrienoic acid	0.0104

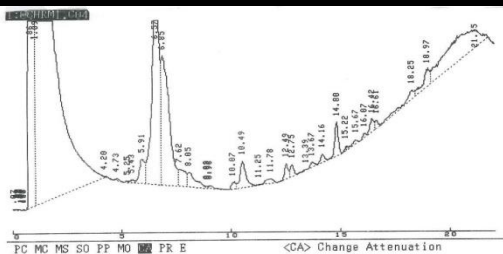


Fig. 2. Fatty acids content curve of *Pimpinella affinis* determined by GC tech.

Table 3: A list of fatty acids founded in *Cuminum cyminum* determined by GC

Peak No.	Retention time(min)	Fatty acid	formula	Concentration %
9	8.16	Heptanoic acid	Oenathic acid	0.0185
13	11.46	Lauric acid	Dodecanoic acid	0.022
19	14.72	Palmitic acid	Hexadecanoic acid	0.1413
21	6.57	Stearic acid	Octadecadienoic acid	0.055

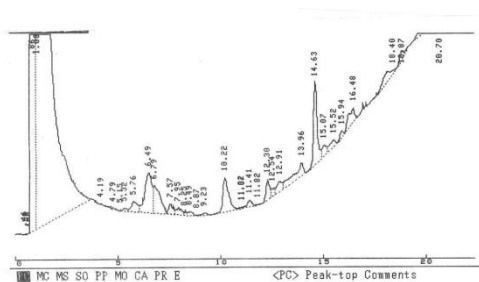


Fig. 3. Fatty acids content curve of *Cuminum cyminum* determined by GC tech.

From the table (4) and figure (4) can be observe occureness of the heptanoic acid in concentration of (0.0185) in the species *Foeniculumvulgari* extract in addition to the lauric acid with concentration (0.022) in contrast palmitic acid which is found in all the studied species in high concentration (0.1413) , stearic acid also found in the extract with concentration (0,055) . Bettaib et al . pointed that Fennel extract contain palmitic and linolinic acids <sup>5, 17</sup>concluded that Fennel seed contain up to 20 % petrosilinic acid linoleic acid ,palmitic acid and oleic acid and there are significant variation observed in fatty acids and derivatives also ,<sup>10</sup>also notice the same .

Table 4: A list of fatty acids founded in *Foeniculumvulgari* determined by GC .

Peak No.	Retention time (min)	Fatty acid	Formula	Concentration %
15	7.57	Heptanoic	Oenathic acid	0.0373
19	9.23	Octanoic acid	Caprylic acid	0.0088
23	11.41	Lauric acid	Docanoic acid	0.242
29	14.63	palmitic acid	Hexadecanoic acid	0.242
33	16.48	Lenolenic acid	Octadecatrienoic acid	0.076

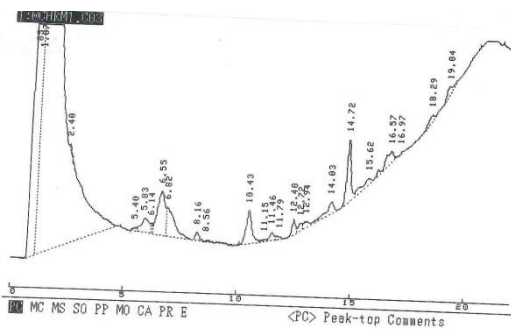


Fig. 4. Fatty acids content curve of *Foeniculumvulgari* determined by GC tech.

The results show that two fatty acids(lauric acid and palmitic acid ) , was most abundant in studied plants this can be due to the similarity in the metabolic pathway belong to the genetic resemble among the genera of the same family , <sup>18</sup>concluded that the percentage of the fatty acids were found to be varied among samples and the most dominant fatty acid were petroselinic ; linolic ;stearic acids founded in three plants except in the genus *Cuminumcymium* in contrast lenolenic acid founded in three plants also exception *Foeniculumvulgari* .

Octanoic acid and heptanoic acid showed less distribution among studied fatty acid and appeared only in *Cuminumcymium* and *Pimpinella affinis* only ; the last species showed wide range of peaks number ( figure 4) in addition occur of all studied fatty acids.

Table 5

A list of standard fatty acids used and in determined by GC

Peak No.	Retention time(min)	Fatty acid	Formula	Concentration %
15	7.57	Heptanoic acid	Oenathic acid	0.0373
19	9.23	Octanoic acid	Caprylic acid	0.0088
23	11.41	Lauric acid	Docanoic acid	0.242
29	14.63	palmitic acid	Hexadecanoic acid	0.242
33	16.48	Lenolenic acid	Octadecatrienoic acid	0.076

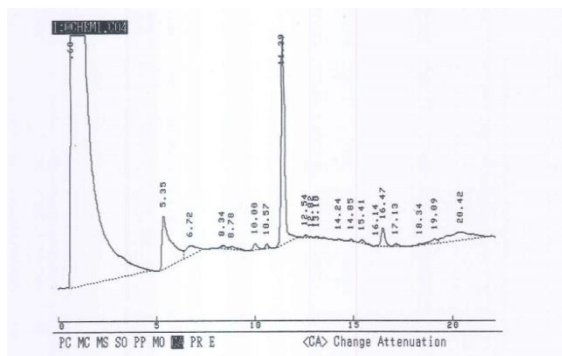


Fig 5. Standardized curve of lauric acid

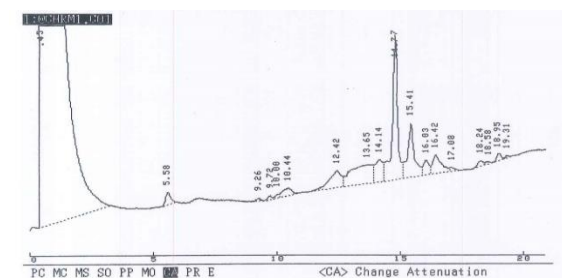


Fig 6. Standardized curve of Palmitic acid

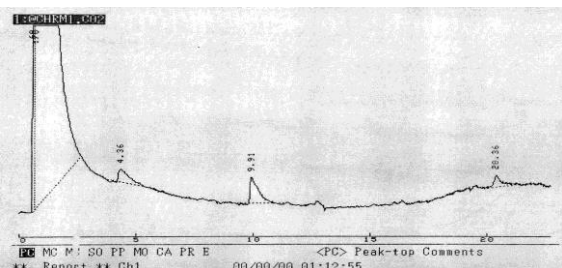


Fig 7. Standardized curve of octanoic acid

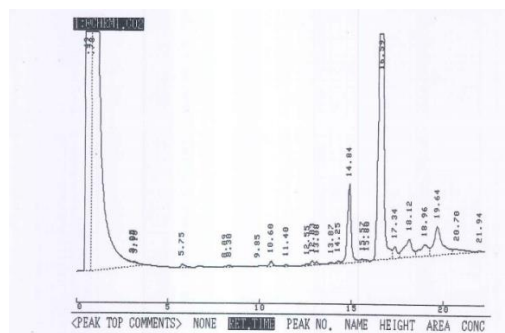


Fig 8. Standardized curve of heptanoic acid

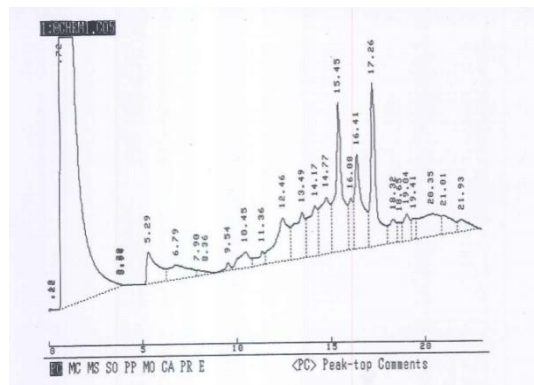


Fig 9. Standardized curve of stearic acid

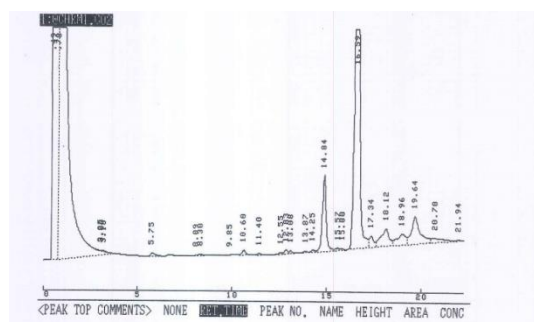


Fig 10. Standard curve of Linoleic

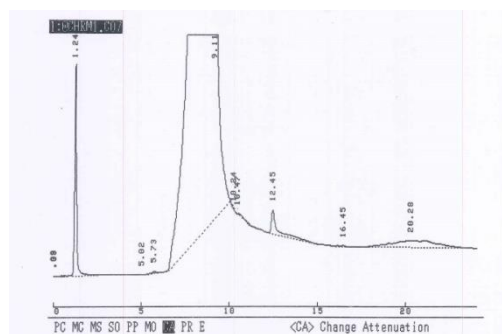


Fig 11. Standardized curve of Lenolenic acid

#### 4. Conclusion

Lauric acid and palmitic acid cannot be used as taxonomic marker in studied plants because they exist in

all studied plants in comparison with Octanoic acid and heptanoic acid which can be used as taxonomic markers to identify *Cuminum cyminum* and *Pimpinella affinis*. the latest species showed the largest number of fatty acids in comparison with *Pimpinella anisum* which contain four fatty acids only.

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