Analysis of Many Fatty acid and Volatile Oils in Some *Ganoderma spp*. Using Gas –Liquid Chromatography Technique

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Abstract. Natural compounds are regarded as one of the best important natural sources for getting effective compounds, especially indifferent medical fields due to the nature of their composition. One of these fungi is *Ganoderma spp* presented in Iraq. In this study, the fatty acids were isolated from the fruiting bodies of *Ganoderma spp* under study, calculating their concentration and identification with Gas–Liquid Chromatography technique. Fatty acids compounds which were separated and including Butyric acid, Myristic acid, Palmitic acid, Heptadecanoic acid, Stearic acid, Oleic acid, Linoleic acid, Arachidic acid, Eicosenoic acid, Linolenic acid, Erucic acid, Arachidonic acid, Tricosanoic acid, docosadienoic acid, Nervonic acid. Also, Volatile oil compounds were separated by the light cleveger device and identified with GLC–technique, volatile oils were included Camphor, Sabine, Terpinen, Myrcene, Limonene, Cineole, Linalool, α-Pinene.

1. Introduction

Fungi are widely used in traditional medicine *Ganoderma lucidum* has long history in the pharmacy of Korea, China, Japan and various other countries of southeast Asia [1]. Also, *Ganoderma spp* are considered as one of richest origins of natural compounds as antibiotics and various species of them inhibit the growth of a broad a spectrum of microorganisms [2]. Among different bioactive compounds of this mushroom (including Fatty acids, polysaccharides and also phenolic compounds are considered active compounds and reported to possess many medicinal effects, such as antitumor, cardiovascular, respiratory [3 ; 4].

Many studies were conducted on the antibacterial effect of different extracts of *G. lucidium*. The spores of *G. lucidium* contain a large amount of bioactive substances like the fruiting body of *G. lucidium*. Spore oils to consist of a number chemical compounds Viz- lipid, terpenes, aromatics and also heterocyclic [5]. In addition, multiple fatty acids were quantitatively analyzed by (GC -MS), Predominantly including Oleic acid, Linoleic acid, Palmitic acid, Hexadecenoic acid and Linolenic acid. Moreover, [6] identified 65 compounds of the essential oil from fruit bodies of *G. lucidium*, Major ones were trans-anethol, Linalool, Carvone, Z-pentyl furan, α-terpineol and nonanal. The main components of the oil of the G. Japonicum were nerolidol, decadienial and Linalool [7].
2. Material and Methods

2.1 The Taxonomic of the Ganoderma spp [8].

| Kingdom | Fungi          |
|---------|---------------|
|        | Basidiomycetes|
|        | Aphyllorhales |
| Order   | Ganoderma     |
| Class   | Ganodermaceae |
| Genus:  | Ganoderma     |
| Species:| curtisii, cupreolaccatum |

2.2 Sample Collection:

Ganoderma spp were collected from dam the Mosul, Al-rashedia, Al –qobaa, Alqearra, and other region of Mosul and classified by Dr shimal yonees Abdul-Hadi. After that the fruit bodies of Ganoderma spp were cleaned from dust and, then they were grounded and put in a paper bags and kept in conditions away from moisture unit use.

2.3 Preparation of some Ganoderma spp extracts using continuous soxholet apparatus:

The dry powder of fruiting bodies were digested by an electrical mill, 25 g of ground powder were placed in the Soxhlet batch, 400 ml of (Petroleum ether (40-60)0C, Chloroform, Acetone, IMS and Hot aqueous) respectively, were added to the crude extractor oil of G. curtisii and G. Cupreolactum the extraction continuous at a rate of 7 hours per day until the used solvent in the device became colorless. Finally, the extract were concentrated using a rotary evaporator vacuum (9).

2.4 Volatile oils extracted by Clevenger pivot steam distillation apparatus.

Volatile oils were extracted from the G. curtisii and G. cupreolactum using a specialized Clevenger device to extract the light oil and connected with a volumetric flask a capacity of 500 ml, as 15 g of powder fruit bodies of G. curtisii and G. cupreolactum were mixed with 200 ml of distilled water, and then the distillation process were carry out using a tissue fabric and at a boiling point 1000C and it remain between 1-2 hours. Distilled water containing the volatile oil were collected, put in the separating funnel 100 ml of it and 50 ml of Di ethyl ether were added to it and for two stages, the mixture well shake and then left to settle, so produced two layers: an a bottom layer containing water and upper layer ether with oil, took the upper layer and neglected the lower layer. Then, added the 3 g from anhyrous magnesium sulfate MgSO4 to dry the remaining water in the ether layer. The samples were then concentrated using the rotary vacuum evaporator at a different temperatures. The crude oil were placed in sealed bottles and kept in the refrigerator until identified [10].

2.5 Saponification

Take 5 ml of each one of the crude from Ganoderma curtisii and G. cupreolactatum extract of the (Petroleum ether (40-60)0C, Chloroform, Acetone, IMS and Hot aqueous) respectively, and added 100 ml of 1N (KOH), then heating the solution for 90 minutes at 1000C, then added 100 ml of distilled water and 50 ml ether solvent and put in the separating funnel, while, to the aqueous layer added the amount sulfuric acid H2SO4 until pH=2. In the end add 50 ml of ether and again put in the separating funnel and take the organic layer and retain well [11].

2.6 Identification of Fatty acids and volatile oil by GLC technique.

The separated fatty acids volatile oils were identified in the laboratories of the Ministry of Science and Technology / Department of Environment in Baghdad and Water by GLC model (Shimanezo) Japanese (2010) using ionized flame detector and using the poetic column type (SE-30) wavelength (0.25 mm 0.5mm, 30m). The temperature was in the injection area and
the detector (330 and 280)OC While the column temperature gradually starts from (120-280) m At a rate of 80/min using passive nitrogen gas as a carrier gas at a rate of 100 KP.

3. Results and Discussion

3.1 The identification of fatty acid compounds of Ganoderma spp by GLC technique.

The identification after saponification of the extracts ( Petroleum ether (40-60)0C, Chloroform, Aceton ,IMS and Hot aqueous ) respectively by GLC showed the presence of the following fatty acids figures , table (1) and (2) : Butyric acid found in extracts ( Petroleum ether (40-60) 0C, Chloroform, Aceton ,IMS and Hot aqueous ) respectively at a time of retention (4.056, 4.032, 4.042, 4.032, 4.032) minutes respectively and concentration (0.0012, 0.0003, 0.0012, 0.0012, 0.0019) mg.g-1 respectively of the G. curtisii and a time of retention (4.056, 4.032, 4.056, 4.032, 4.056) min., and concentration (0.0006, 0.0002, 0.0006, 0.0018, 0.0013) mg.g-1. Of the G. cupreolacctum, and corresponds to the standard compound at a time of retention (3.485) minutes. Myristic acid found in extracts ( Petroleum ether (40-60)0C, Chloroform, Aceton ,IMS and Hot aqueous ) respectively at a time of retention (5.128, 5.104, 5.114, 5.104, 5.104) min., respectively and concentration (0.0003, 0.0002, 0.0009, 0.0005, 0.0005) mg.g-1 respectively of the G. curtisii and a time of retention (5.128, 5.104, 5.128, 5.104, 5.128) minutes and concentration (0.0001, 0.0001, 0.0003, 0.0003, 0.00005) mg.g-1. Of the G. cupreolacctum, and corresponds to the standard compound at a time of retention (5.486) minutes. Palmatic acid found in extracts ( Petroleum ether (40-60)0C, Chloroform, Aceton ,IMS and Hot aqueous ) respectively at a time of retention (6.382, 6.356, 6.369, 6.360, 6.360) min., respectively and concentration (0.00001, 0.00001, 0.00001, 0.00001, 0.00002) mg.g-1 respectively of the G. curtisii and a time of retention (6.382, 6.356, 6.382, 6.360, 6.382) minutes and concentration (0.00001, 0.00001, 0.00001, 0.00001, 0.000006) mg.g-1. Of the G. cupreolacctum and corresponds to the standard compound at a time of retention (6.260) minutes. Heptadecanoic acid found in extracts ( Petroleum ether (40-60)0C, Chloroform, Aceton ,IMS and Hot aqueous ) respectively at a time of retention (7.736, 7.704, 7.718, 7.736) min., respectively and concentration (0.011, 0.007, 0.018, 0.018, 0.018) mg.g-1 respectively of the G. curtisii and a time of retention (7.736, 7.704, 7.729, 7.718, 7.718) minutes and concentration (0.013, 0.005, 0.011, 0.015, 0.004) mg.g-1. Of the G. cupreolacctum corresponds to the standard compound at a time of retention (6.918) minutes. Stearic acid found in extracts ( Petroleum ether (40-60)0C, Chloroform, Aceton ,IMS and Hot aqueous ) respectively at a time of retention (8.610, 9.077, 9.103, 9.092, 9.092) min., respectively and concentration (0.0005, 0.0003, 0.001, 0.0007, 0.0001) mg.g-1 respectively of the G. curtisii and a time of retention (9.111, 9.077, 9.111, 9.092, 9.111) minutes and concentration (0.0006, 0.0003, 0.0005, 0.0007, 0.0002) mg.g-1. Of the G. cupreolacctum and corresponds to the standard compound at a time of retention (8.663) minutes. Oleic acid found in extracts ( Petroleum ether (40-60)0C, Chloroform, Aceton ,IMS and Hot aqueous ) respectively at a time of retention (10.459, 10.427, 10.448, 10.437, 10.437) min., respectively and concentration (0.0005, 0.0003, 0.001, 0.0004, 0.0007) mg.g-1 respectively of the G. curtisii and a time of retention (10.459, 10.427, 10.459, 10.437, 10.459) min., and concentration (0.0006, 0.0002, 0.0006, 0.0008, 0.0004) mg.g-1. Of the G. Cupreolacctum and corresponds to the standard compound at a time of retention (10.731) minutes. Linoleic acid found in extracts ( Petroleum ether (40-60)0C, Chloroform, Aceton ,IMS and Hot aqueous ) respectively at a time of retention (12.991, 12.991, 13.005, 12.994, 13.020) min., respectively and concentration (0.0003, 0.0002, 0.0001, 0.0005, 0.0004) mg.g-1 respectively of the G. curtisii and a time of retention (13.020, 12.994, 13.020, 12.991, 13.020) min., and concentration (0.0002, 0.0002, 0.0002, 0.00003, 0.00008) mg.g-1. Of the G. Cupreolacctum, and corresponds to the standard compound at a time of retention (
Arachidic acid found in extracts (Petroleum ether (40-60)°C, Chloroform, Aceton, IMS and Hot aqueous) respectively at a time of retention (14.224, 14.198, 14.204, 14.192) min., respectively and concentration (0.0002, 0.0001, 0.0003, 0.0003, 0.0002, 0.0002) mg.g⁻¹ respectively of the *G. curtisii* and a time of retention (14.224, 14.224, 14.192, 14.224) min., and concentration (0.0001, 0.0001, 0.0001, 0.00002, 0.00001) mg.g⁻¹, Of the *G. Cupreolacctum* and corresponds to the standard compound at a time of retention (12.550) minutes. Eicosenoic acid found in extracts (Petroleum ether (40-60)°C, Chloroform, Aceton, IMS and Hot aqueous) respectively at a time of retention (15.383, 15.353, 15.353, 15.342, 15.340) minutes respectively and concentration (0.0001, 0.0001, 0.0001, 0.0001, 0.00002) mg.g⁻¹ respectively of the *G. curtisii*. and a time of retention (15.203, 15.353, 15.203, 15.342, 15.383) min., and concentration (0.0006, 0.00006, 0.0003, 0.00008, 0.00006) mg.g⁻¹, Of the *G. Cupreolacctum* and corresponds to the standard compound at a time of retention (15.683) minutes. Linolenic acid found in extracts (Petroleum ether (40-60)°C, Chloroform, Aceton, IMS and Hot aqueous) respectively at a time of retention (16.480, 16.454, 16.451, 16.438, 16.438) min., respectively and concentration (0.0003, 0.0002, 0.0002, 0.0003, 0.0002) mg.g⁻¹ respectively of the *G. curtisii* and a time of retention (16.480, 16.454, 16.480, 16.438, 16.480) min., and concentration (0.0001, 0.0001, 0.0002, 0.0001, 0.0003) mg.g⁻¹, Of the *G. Cupreolacctum* and corresponds to the standard compound at a time of retention (16.308) minutes. Arachidonic acid found in extracts (Petroleum ether (40-60)°C, Chloroform, Aceton, IMS and Hot aqueous) respectively at a time of retention (17.544, 17.517, 17.510, 17.496, 17.496) minutes respectively and concentration (0.0002, 0.0001, 0.0002, 0.0002, 0.0002, 0.0002) mg.g⁻¹ respectively of the *G. curtisii* and a time of retention (17.544, 17.517, 17.544, 17.496, 17.544) min., and concentration (0.0001, 0.00009, 0.0001, 0.0001, 0.0001) mg.g⁻¹, Of the *G. Cupreolacctum* and corresponds to the standard compound at a time of retention (17.741) minutes. Tricosanoic acid found in extracts (Petroleum ether (40-60)°C, Chloroform, Aceton, IMS and Hot aqueous) respectively at a time of retention (18.559, 18.531, 15.521, 18.509, 18.509) minutes respectively and concentration (0.00008, 0.00004, 0.00007, 0.0002, 0.00001) mg.g⁻¹ respectively of the *G. curtisii* and a time of retention (18.559, 18.531, 15.559, 18.509, 18.559) min., and concentration (0.0005, 0.00003, 0.00005, 0.0001, 0.00005) mg.g⁻¹, Of the *G. Cupreolacctum* and corresponds to the standard compound at a time of retention (18.294) minutes. Docosadienoic acid found in extracts (Petroleum ether (40-60)°C, Chloroform, Aceton, IMS and Hot aqueous) respectively at a time of retention (19.531, 19.504, 19.494, 19.480, 19.480) min., respectively and concentration (0.000007, 0.000003, 0.000007, 0.0000007, 0.0000002) mg.g⁻¹ respectively of the *G. curtisii* and a time of retention (19.531, 19.504, 19.531, 19.504, 19.531) min., and concentration (0.000007, 0.000004, 0.000007, 0.0000004, 0.0000006) mg.g⁻¹, Of the *G. Cupreolacctum* and corresponds to the standard compound at a time of retention (19.517) minutes. Nervonic acid found in extracts (Petroleum ether (40-60)°C, Chloroform, Aceton, IMS and Hot aqueous) respectively at a time of retention (20.464, 20.439, 20.428, 20.413, 20.413) min., respectively and concentration (0.000009, 0.000005, 0.00001, 0.000006, 0.000004) mg.g⁻¹ respectively of the *G. curtisii* and found in extracts (Petroleum ether (40-60)°C, Aceton, IMS and Hot aqueous) a time of retention (20.464, 20.464, 20.413, 20.464) min., respectively and concentration (0.000008, 0.000007, 0.000004, 0.000004) mg.g⁻¹ respectively, Of the *G. Cupreolacctum* and corresponds to the standard compound at a time of retention (20.008) minutes. Erucic acid found in extracts just only Petroleum ether (40-60)°C at a time of retention (17.323) min., and concentration 0.000006 mg.g⁻¹ of the *G. curtisii* while found in extracts (Petroleum ether (40-60)°C, Aceton, Hot aqueous) a time of retention (17.323, 17.032, 17.323, 17.323) min., and concentration (0.000004, 0.000001, 0.000004, 0.000004) mg.g⁻¹, Of
| No. | Fatty acid | Standard | Ret. min | Rf | M/z-1 | Rf | M/z-2 | Ret. min | Rf | M/z-3 | Ret. min | Rf | M/z-4 |
|-----|------------|----------|----------|----|-------|----|-------|----------|----|-------|----------|----|-------|
| 1.  | Butyric acid | 1.013 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2.  | Palmitic acid | 2.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 3.  | Stearic acid | 3.002 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 4.  | Linolenic acid | 4.003 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 5.  | Oleic acid | 5.004 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6.  | Palmitoleic acid | 6.005 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7.  | Linoleic acid | 7.006 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8.  | Linolenic acid | 8.007 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 9.  | Arachidonic acid | 9.008 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 10. | Eicosapentaenoic acid | 10.009 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 11. | Docosahexaenoic acid | 11.010 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

The compounds identified using the GLC technique for different solvent extract of G. cupreolacctum and corresponds to the standard compound at the time of retention (20.008) minutes.

Table 1: Fatty acids identified using the GLC technique for different solvent extract of G. cupreolacctum.
Figure (1) standard curve of fatty acids compounds by GLC.

Figure (2) curved fatty acids compounds for G. Curtisii using petrolum ether by GLC.

Figure (3) curved fatty acids compounds for G. Curtisii using chloroform by GLC.

Figure (4) curved fatty acids compounds for G. Curtisii using aceton by GLC.
Fig (5) curved fatty acids compounds for *G. Curtisii* using IMS by GLC.

Fig (6) Curved fatty acids compounds for *G. Curtisii* using Hot aqueous by GLC.
| Compounds  | Hot aqueous | Acetone | Chloroform | Petroleum ether |
|------------|-------------|---------|------------|----------------|
| Butyric acid | 10.000000 | 10.000000 | 10.000000 | 10.000000 |
| Undecanoic acid | 1.000000 | 1.000000 | 1.000000 | 1.000000 |
| Myristic acid | 1.000000 | 1.000000 | 1.000000 | 1.000000 |
| Stearic acid | 1.000000 | 1.000000 | 1.000000 | 1.000000 |
| Elaidic acid | 1.000000 | 1.000000 | 1.000000 | 1.000000 |
| Oleic acid | 1.000000 | 1.000000 | 1.000000 | 1.000000 |
| Linoleic acid | 1.000000 | 1.000000 | 1.000000 | 1.000000 |
| Linolenic acid | 1.000000 | 1.000000 | 1.000000 | 1.000000 |
| Erucic acid | 1.000000 | 1.000000 | 1.000000 | 1.000000 |
| Arachidonic acid | 1.000000 | 1.000000 | 1.000000 | 1.000000 |
| Triosanoic acid | 1.000000 | 1.000000 | 1.000000 | 1.000000 |
| Cisdocosadienoic acid | 1.000000 | 1.000000 | 1.000000 | 1.000000 |
| Nervononic acid | 1.000000 | 1.000000 | 1.000000 | 1.000000 |
Figure (7) Curved fatty acids compounds for *G. cupreolacctum*

Figure (8) Curved fatty acids compounds for *G. cupreolacctum* using chloroform by GLC.

Figure (9) Curved fatty acids compounds for *G. cupreolacctum*

Figure (10) Curved fatty acids compounds for *G. cupreolacctum* using IMS by GLC.
3.2 Qualitative identification of volatile oils using GC technique for Ganoderma spp.

Chromatographic analysis charts were obtained in the retention time of each compound was determined for study samples compared to the retention time of the standard sample Camphor(3.553) min., Sabine (4.620) min., Terpinen (4.951) min., Myrcene (6.003) min., Limonene (8.00) min., Cineole (10.132) min., Lenalool (12.198) min., α-Pinene (15.612) min., Figures ----. The identification showed the approval of the essential oil separated of the study Ganoderma spp for a number of standard aromatic compounds, included the table (3). The result indicated the presence of the essential oils in the G. curtisii which included Camphor essential oil with a retention time of (3.418) min., the aromatic compound Sabine with a retention time of (4.614) min., the aromatic compound Terpinen with a retention time of (4.866) min., the aromatic compound Myrcene with a retention time of (6.189) min., the aromatic compound Limonene with a retention time of (8.025) min., the aromatic compound Cineole with a retention time of (10.142) min., the aromatic compound α-Pinene with a retention time of (15.389) min., and the G. cupreolactum found the Camphor essential oil with a retention time of (3.420) min., the aromatic compound Sabine with a retention time of (4.608) min., the aromatic compound Terpinen with a retention time of (4.851) min., the aromatic compound Myrcene with a retention time of (6.171) min., the aromatic compound Camphor

Figure (11) Curved fatty acids compounds for G. cupreolactum Using Hot aqueous by GLC.

Table 3

| Peak | Retention Time | Area | Area% | Result | Name        |
|------|----------------|------|-------|--------|-------------|
| 1    | 3.210          | 100  | 100   |        |             |
| 2    | 4.603          | 98.62| 98.62 |        |             |
| 3    | 5.970          | 97.32| 97.32 |        |             |
| 4    | 7.352          | 95.73| 95.73 |        |             |
| 5    | 8.924          | 93.23| 93.23 |        |             |
| 6    | 10.492         | 90.73| 90.73 |        |             |
| 7    | 12.062         | 88.23| 88.23 |        |             |
| 8    | 13.632         | 85.73| 85.73 |        |             |
| 9    | 15.202         | 83.23| 83.23 |        |             |
| 10   | 16.772         | 80.73| 80.73 |        |             |
| 11   | 18.342         | 78.23| 78.23 |        |             |
| 12   | 19.912         | 75.73| 75.73 |        |             |
| 13   | 21.482         | 73.23| 73.23 |        |             |
| 14   | 23.052         | 70.73| 70.73 |        |             |
| 15   | 24.622         | 68.23| 68.23 |        |             |
| 16   | 26.192         | 65.73| 65.73 |        |             |
| 17   | 27.762         | 63.23| 63.23 |        |             |
| 18   | 29.332         | 60.73| 60.73 |        |             |
| 19   | 30.902         | 58.23| 58.23 |        |             |
| 20   | 32.472         | 55.73| 55.73 |        |             |
| 21   | 34.042         | 53.23| 53.23 |        |             |
| 22   | 35.612         | 50.73| 50.73 |        |             |
| 23   | 37.182         | 48.23| 48.23 |        |             |
| 24   | 38.752         | 45.73| 45.73 |        |             |
| Total| 100.000        | 100  | 100   |        |             |
Limonene with a retention time of 8.003 min., the aromatic compound Cineole with a retention time of 10.012 min., the aromatic compound Linalool with a retention time of 11.955 min., the aromatic compound a-Pinene with a retention time of 15.375 minutes.

Table (3) Show Qualitative identification of volatile oils using GLC technology for Ganoderma spp

| Aromatic compound | G. cupreolaccatum | G. curtisii | Rt standard (min) | G. curtisii |
|-------------------|-------------------|------------|-------------------|------------|
| Camphor           | 3.3418            | 3.418      | 3.553             |            |
| Sabinen           | 4.614             | 4.866      | 4.620             |            |
| Terpenen          | 6.189             | 6.003      | 4.951             |            |
| Myrcine           | 8.025             | 8.005      | 6.003             |            |
| Limonine          | 10.142            | 10.132     | 12.198            |            |
| Linalool          | 11.972            | 15.389     | 15.612            |            |

Figure (12) the standard curve for myrcine essential oils by GLC Technique.

Figure (13) the standard curve for camphor essential oils by GLC Technique.
Figure (14) the standard curve for linalool essential oils by GLC Technique.

Figure (15) the standard curve for limonene essential oils by GLC Technique.

Figure (16) the standard curve for cineole essential oils by GLC Technique.

Figure (17) the standard curve for a-Pinen by GLC Technique.
Figure (18) the standard curve for sabine essential oils by GLC Technique.

Figure (19) The standard curve for terpine essential oils by GLC Technique.

Figure (20) curved essential oils for G. curtisi Dignosed with GLC Technique.

Figure (21) curved essential oils for G. cupreolacteum Dignosed with GLC Technique.
From the results, it is confirmed that the *Ganoderma spp* under study, using body fruits are among the fungi rich in fatty acids compounds and also volatile oils that presented from metabolism of secondary compounds.

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