**GAS CHROMATOGRAPHY – MASS SPECTROSCOPIC ANALYSIS OF *LAWSONIA INERMIS* L., *ERUCA SATIVA* MILL., *SIMMONDSIA CHINESIS* (LINK) SCHNEIDER AND *BOSWELLIA* SPP.**

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# Abstract

Due to the importance of jojoba seed oil, watercress seed oil, henna leaves and frankincense in popular medicine for the treatment of many diseases as well as its economic importance for its entry as raw materials in some industries, the study was conducted to determine the chemical components from the previous plantsby using Gas Chromatography – Mass Spectroscopic analysis. The results of analysis showed that in jojoba seed oil, watercress seed oil, henna leaves and frankincense the most prevailing compounds were cis-Vaccenic acid, Diethyl Phthalate and 1-[2-Hydroxyethyl]-4-[4-[7chloro-4-quinolylamino]benzoyl] piperazine.

 ***Key words* :** jojoba seed oil, watercress, cis-Vaccenic acid, Gas Chromatography-Mass Spectroscopic.

# Introduction

Watercress plant *Eruca sativa* Mill. belongs to the family “Brassicaceae”, it is believed to be native to Central Asia and Eastern Europe and can be classified as medical plant due to various curative uses, for example the treatment of dermatitis, local burns, poor digestion, hair loss and hypoglycemia for people with diabetes, by working to slow the absorption of sugar into the intestines. The oil of the plant is used to improve liver function, increase fertility by improving the effectiveness of sexual hormones, in additions, it considers as anti-inflammatory and anti-foot fungus and stomach disease (Bhandari and Chaderl, 1996; Merza *et al.,* 2000 ; Hila *et al.,* 2009).

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Each 100 g of watercress leaves contains 2.6 g protein, 0.7 g fat, 3.6 g carbohydrates and 1.6 g fiber as well as vitamin A, C, sodium, potassium, calcium, iodine, iron, zinc and sulfur, in addition to thiamin, riboflavin, niacin and other substances (Al-Dujoi, 1996).

Henna *Lawsonia inermis* L. belongs to the family Lythraceae, an evergreen shrub native to the Arabian Peninsula and Iran. its dried leaves used as dye of hair, treatment of skin diseases and wounds, and the flowers used in Perfume Industries. The plant contains many compounds such as flavonoids, tannins, alkaloids and terpenoids (Cowan, 1999; Kamel, 2004; Mansour, 2004; Chandhary *et al.,* 2010).

Recent studies showed the effectiveness of henna compounds as anti-bacterial and fungal, as well as antiinflammatory and cancers (Dasgupta *et al.,* 2003).

Jojoba *Simmondsia chinensis* (Link) Schneider is an evergreen shrub, belongs to family Simmondsiaceae. It is known as jojoba, which originates from the deserts of USA native to southwestern Arizona, California and northern Mexico (Stone, 1993), However, it is now planted in many other deserts across the world. The importance of this plant is due to its content of protein glycosides, esters, fatty acids and alcohols with a high oil content of the seeds about 50% of their weight (Naqvi and Ting, 1990; Tada *et al.,* 2005; Evans, 1999).

Jojoba seed oil consists of 97% wax and 3% free fatty acids and contains anti-oxidants and inhibits some types of bacteria, viruses and anti-inflammatory. Its molecules consist of a long carbon chain, unlike vegetable oils that consist of fatty acids and glyceritol, making it a liquid wax without purification and has a high viscosity rate and high degree of stability (Verschuren, 1989; Naqvi and Ting, 1990).

Frankincense (olibanum) a tree of the genus *Boswellia* (family Burseraceae), has been spread in some countries of the Arabian Peninsula, such as Yemen and

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| **Table 1:** Components Identified in jojoba.

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| --- | --- | --- | --- | --- | --- |
| **Peak** | **MW** | **Molecular** | **Name of the compound** | **RT** | **No.** |
| **Area %** |  | **Formula** |  |  |  |
| 0.93 | 394 | C26H50O2 | Cyclopropane tetradecanoic acid, 2-octyl-,methyl ester | 4.106 | 1 |
| 4.12 | 222 | C12H14O4 | Diethyl Phthalate | 13.870 | 2 |
| 1.33 | 530 | C34H58O4 | 1,2-Benzenedicarboxylic acid, ditridecyl ester | 14.016 | 3 |
| 1.06 | 222 | C12H14O4 | Diethyl Phthalate | 14.120 | 4 |
| 2.70 | 254 | C18H38 | Hexadecane | 14.288 | 5 |
| 2.29 | 390 | C24H38O4 | Phthalic acid, ethyl tetradecyl ester | 14.529 | 6 |
| 1.49 | 177 | C8H7N3O2 | Pyrido[3,2-d]pyrimidin-4(3H)-one, 3-hydroxy-2-methyl | 14.666 | 7 |
| 0.61 | 542 | C31H28Cl2N4O | 2,4-Bis[4-chloro-trans-styryl]-6-[(3-pyrrolidinomethyl-4-hydroxyphenyl) amino]pyrimidine | 14.700 | 8 |
| 1.11 | 680 | C38H37N2O6PS | Carbamic acid, [2-[[1-(diphenoxyphosphinyl)-2-phenylethyl]amino]-2-oxo-1-[[(phenylmethyl)thio]methyl]ethyl]-, phenylmethyl ester | 14.814 | 9 |
| 1.81 | 742 | C42H54N4O8 | 3,7,12-Triazabicyclo[13.3.1]nonadeca-1(19),15,17-triene-2-acetic acid, 3,7-diacetyl-12-[3-(benzoylamino)propyl]-16-methoxy-14-[(4-methoxypheny | 14.920 | 10 |
| 0.42 | 248 | C14H16O4 | Phthalic acid, cyclobutyl ethyl ester | 15.007 | 11 |
| 0.77 | 298 | C18H18O4 | Phthalic acid, ethyl 3,4-dimethylphenyl ester | 15.073 | 12 |
| 27.99 | 242 | C15H30O2 | Pentadecanoic acid | 28.151 | 13 |
| 0.76 |  |  | 1-Octadecanol | 30.590 | 14 |
| 0.31 | 322 | C21H38O2 | 11,14-Eicosadienoic acid, methyl ester | 30.673 | 15 |
| 0.61 | 294 | C19H34O2 | 10-Octadecenoic acid, methyl ester | 30.809 | 16 |
| 8.39 | 280 | C18H32O2 | 9,12-Octadecadienoic acid (Z,Z)- | 31.494 | 17 |
| 29.94 | 282 | C18H34O2 | cis-Vaccenic acid | 31.622 | 18 |
| 5.47 | 372 | C22H44O4 | Octadecanoic acid, 2-(2-hydroxyethoxy)ethyl ester | 32.043 | 19 |
| 0.26 | 284 | C18H36O2 | 1-Hexadecanol, acetate | 32.695 | 20 |
| 0.62 | 324 | C21H40O2 | Methacrylic acid, heptadecyl ester | 33.332 | 21 |
| 1.25 | 340 | C23H32O2 | Phenol, 2,2'-methylenebis[6-(1,1-dimethylethyl)-4-methyl- | 35.465 | 22 |
| 1.12 | 530 | C26H18Cl4N2O2 | 2,6-Naphthalenediol, 1,5-bis[(2,4-dichlorobenzylimino)methyl]- | 38.645 | 23 |
| 0.33 | 562 | C28H62O5Si3 | Octadecanoic acid, 9,10,18-tris[(trimethylsilyl)oxy]-, methyl ester | 38.740 | 24 |
| 0.67 | 348 | C22H36O3 | 3.beta.-Hydroxy-bisnorallocholanic acid | 38.773 | 25 |
| 0.40 | 390 | C24H38O4 | Isophthalic acid, 2-ethylhexyl octyl ester | 38.880 | 26 |
| 0.68 | 398 | C24H46O4 | Lauroyl peroxide | 38.985 | 27 |
| 0.21 | 506 | C34H66O2 | 9-Hexadecenoic acid, octadecyl ester, (Z)- | 39.020 | 28 |
| 0.94 | 409 | C25H47NO3 | Adipic acid, monopiperidide, tetradecyl ester | 39.139 | 29 |
| 1.42 | 410 | C30H50 CAS:111-02-4 | 2,6,10,14,18,22-Tetracosahexaene, 2,6,10,15,19,23-hexamethyl-, (all-E)- | 40.379 | 30 |

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Oman are of economic importance, as extracted from the stems of the sap (frankincense) by making of wounds on the stems and then dried and used in the popular medicine to treat many diseases such as tumors, sores, dysentery and chest diseases such as cough, asthma, heart attack in addition to manufacture of incense. Frankincense consists of 56-65% colloidal acids, 20-36% resin, and 48% essential *oils* (Huang *et al*., 2000).

# Materials and Methods

**Plant Sample Extraction**

The method described in Hema *et al*., (2010) was used to extract henna leaves and the method mentioned in Biggs *et al*., (2016) was used to extract frankincense while oil was extracted from watercress and jojoba seeds according to AOAC (2000).

**GC-MS Analysis**

GC-MS analysis was carried out on a gas chromatograph interfaced to a mass spectrometer (GCMS) instrument type GC MS QP210 Ultra, SHIMADZU, APAN supplied with capillary column DB-MS5( 5% phenyl, 95% methyl polysiloxane) as stationary phase in addition to use helium gas (99.9%) employing the following

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| **Table 2:** Components Identified in henna.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Peak** | **MW** | **Molecular** | **Name of the compound** | **RT** | **No.** |
| **Area %** |  | **Formula** |  |  |  |
| 0.69 | 198 | C14H30 | Dodecane, 4,6-dimethyl- | 10.312 | 1 |
| 0.78 | 184 | C13H28 | Nonane, 5-(2-methylpropyl)- | 11.003 | 2 |
| 0.52 | 173 | C12H15N | Quinoline, 1,2-dihydro-2,2,4-trimethyl- | 12.727 | 3 |
| 0.60 | 282 | C20H42 | Eicosane | 13.320 | 4 |
| 0.60 | 254 | :C18H38 | Heptadecane, 2-methyl- | 14.017 | 5 |
| 5.28 | 96 | C6H8O | But-1-ene-3-yne, 1-ethoxy- | 14.900 | 6 |
| 4.70 | 206 | C11H14N2O2 | Benzonitrile, 2-amino-4,5-diethoxy- | 15.013 | 7 |
| 3.20 | 222 | C12H14O4 | Diethyl Phthalate | 15.074 | 8 |
| 16.89 | 242 | C15H30O2 | Pentadecanoic acid | 28.124 | 9 |
| 0.84 | 256 | C16H32O2 | n-Hexadecanoic acid | 28.293 | 10 |
| 0.90 | 332 | C24H44 | 15-Isobutyl-(13.alpha.H)-isocopalane | 30.754 | 11 |
| 0.92 | 388 | C23H32O5 | Fumaric acid, dodecyl 2-formylphenyl ester | 30.818 | 12 |
| 0.62 | 298 | C19H38O2 | Octadecanoic acid, methyl ester | 31.345 | 13 |
| 4.66 | 280 | C18H32O2 | Ethyl 9,12-hexadecadienoate | 31.504 | 14 |
| 22.90 | 282 | C18H34O2 | cis-Vaccenic acid | 31.607 | 15 |
| 2.11 | 304 | C22H40 | Cyclodecacyclotetradecene, 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20-eicosahydro- | 31.860 | 16 |
| 3.21 | 340 | C22H44O2 | Octadecanoic acid, 2-methylpropyl ester | 32.050 | 17 |
| 2.11 | 284 | C18H36O2 | Octadecanoic acid | 32.080 | 18 |
| 0.49 | :268 | C19H40 | Octadecane, 5-methyl- | 32.536 | 19 |
| 2.59 | 340 | C22H44O2 | Eicosyl acetate | 32.694 | 20 |
| 1.52 | 227 | C14H29NO | N,N-Dimethyldodecanamide | 33.340 | 21 |
| 0.64 | 332 | C24H44 | 15-Isobutyl-(13.alpha.H)-isocopalane | 33.773 | 22 |
| 1.30 | 370 | C22H42O4 | Diisooctyl adipate | 35.229 | 23 |
| 0.44 | :438 | C27H50O4 | Fumaric acid, 3,3-dimethylbut-2-yl heptadecyl ester | 35.392 | 24 |
| 13.70 | 340 | C23H32O2 | Phenol, 2,2'-methylenebis[6-(1,1-dimethylethyl)-4-methyl- | 35.467 | 25 |
| 0.71 | 169 | C10H19NO | 3-Cyclopentylpropionamide, N,N-dimethyl- | 36.160 | 26 |
| 0.67 | 296 | C21H44 | Heptadecane, 2,6,10,15-tetramethyl- | 36.649 | 27 |
| 0.58 | 733 | C40H80NO8P | 3,5,9-Trioxa-4-phosphapentacosan-1-aminium, 4-hydroxy-N,N,Ntrimethyl-10-oxo-7-[(1-oxohexadecyl)oxy]-, hydroxide, inner salt, 4-oxide | 37.846 | 28 |
| 0.69 | 396 | C30H36 | Naphthalene, 2-(1-adamantyl)-7-(2-adamantyl)- | 38.027 | 29 |
| 1.52 | 834 | C53H102O6 | Octadecanoic acid, 2-[(1-oxotetradecyl)oxy]-1,3-propanediyl ester | 38.123 | 30 |
| 1.13 | 524 | C26H36O11 | 5H-Cyclopropa[3,4]benz[1,2-e]azulen-5-one, 9,9a-bis(acetyloxy)-3-[(acetyloxy)methyl]-1,1a,1b,2,3,4,4a,7a,7b,8,9,9a-dodecahydro-2,3,4a,7b | 38.972 | 31 |
| 0.91 | 436 | C31H64 | Heneicosane, 11-decyl- | 40.255 | 32 |
| 1.57 | 410 | C30H50 | 2,6,10,14,18,22-Tetracosahexaene, 2,6,10,15,19,23-hexamethyl-, (all-E)- | 40.376 | 33 |

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conditions for gas Chromatography: Column Oven Temp. :50.0 °C, Injection Temp. :250.00 °C, Injection Mode :Split, Flow Control Mode :Pressure, Pressure : 90.0 kPa, Total Flow :79.2 mL/min, Column Flow :1.53 mL/min, Linear Velocity :44.8 cm/sec, Purge Flow :6.0 mL/min, Split Ratio :46.9 and for mass spectrometer: Ion Source Temp :200.00 °C, Interface Temp. :250.00 °C, Solvent Cut Time :4.00 min, Detector Gain Mode :Relative, Detector Gain :0.84 kV +0.40 kV, Start Time :4.00min, End Time :41.71min, ACQ Mode :Scan, Event Time :0.40sec, Scan Speed

:2000, Start m/z :35.00, End m/z :800.00.

# Results and Discussion

Results presented in table 1 and figure 1 indicated to the identification of 29 compounds in jojoba seeds oil. The results indicated that the cis-Vaccenic acid was superior to the rest of the compounds with 29.94% followed by Pentadecanoic acid with 27.9% followed by

9, 12-Octadecadienoic acid with 8.39% and

Octadecanoic acid, 2-hydroxyethoxy ethyl ester with

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| **Table 3:** Components Identified in frankincense.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Peak** | **MW** | **Molecular** | **Name of the compound** | **RT** | **No.** |
| **Area %** |  | **Formula** |  |  |  |
| 9.67 | 222 | C12H14O4 | Diethyl Phthalate | 15.088 | 1 |
| 4.11 | 242 | C15H30O2 | Pentadecanoic acid | 28.162 | 2 |
| 4.82 | 292 | C19H32O2 | Nerolidol isobutyrate | 31.471 | 3 |
| 8.19 | 282 | C18H34O2 |  6-Octadecenoic acid, (Z)- | 31.640 | 4 |
| 3.70 | 348 | C23H40O2 | 8,11,14-Docosatrienoic acid, methyl ester | 31.772 | 5 |
| 0.90 | 340 | C23H32O2 | Phenol, 2,2'-methylenebis[6-(1,1-dimethylethyl)-4-methyl- | 32.707 | 6 |
| 6.09 | 184 | C13H28 | Dodecane, 4-methyl- | 35.469 | 7 |
| 1.47 | 422 | C21H36Cl2O4 | Fumaric acid, 2,2-dichloroethyl pentadecyl ester | 36.027 | 8 |
| 2.80 | 492 | C31H53ClO2 | Stigmastan-3-ol, 5-chloro-, acetate, (3.beta.,5.alpha.)- | 36.541 | 9 |
| 1.56 | 678 | C47H82O2 | Stigmast-5-en-3-ol, oleate | 36.673 | 10 |
| 1.36 | 502 | C32H54O4 | D:A-Friedo-2,3-secooleanane-2,3-dioic acid, dimethyl ester, (4R)- | 37.907 | 11 |
| 0.91 | 562 | C33H46N4O4 | 4,6-Cholestadiene-3-one, 2,4-dinitrophenylhydrazone | 37.960 | 12 |
| 6.90 | 474 | C33H62O | Z,Z-6,24-Tritriacontadien-2-one | 38.068 | 13 |
| 5.32 | 350 | C15H24F6O2 | 1,3-Dioxolane, 4-ethyl-5-octyl-2,2-bis(trifluoromethyl)-, cis | 38.113 | 14 |
| 0.46 | 376 | C26H48O | 4,8-Dimethyl-4Z,8E-tetracosadienal | 38.213 | 15 |
| 1.00 | 208 | C12H16O3 | Acetic acid, 10-oxotricyclo[4.2.1.1(2,5)]dec-9-yl ester | 38.260 | 16 |
| 1.14 | 508 | C34H68O2 | Tetradecanoic acid, eicosyl ester | 38.307 | 17 |
| 0.72 | 186 | C11H22O2 | Hexyl isovalerate | 38.353 | 18 |
| 1.01 | 565 | C30H31NO10 | Spiro[2-cyclohexene-1,2'(1’H)-cyclopenta[de]naphthacene]-9'carboxamide, 7',7’a,8',11',11’a,12'-hexahydro-5',6',7’a,10',11’a,12'hexahydroxy-3'- | 38.413 | 19 |
| 0.80 | 401 | C27H47NO | 5.alpha.-Cholestan-2-one, oxime | 38.447 | 20 |
| 1.24 | 550 | C40H54O | Anhydrolutein II | 38.476 | 21 |
| 2.34 | 476 | C30H56O2Si | Silane, dimethyl(6-methyl-2-tert-butylphenoxy)heptadecyloxy- | 38.580 | 22 |
| 0.77 | 252 | C16H28O2 | Sclaral (sclareolide lactol) | 38.632 | 23 |
| 0.62 | 350 | C15H24F6O2 | 1,3-Dioxolane, 4-ethyl-5-octyl-2,2-bis(trifluoromethyl)-, cis- | 38.660 | 24 |
| 1.74 | 636 | C12H18Br6 | 1,2,5,6,9,10-Hexabromocyclododecane | 38.820 | 25 |
| 0.68 | 422 | C26H46O4 | Fumaric acid, 2-methylallyl octadecyl ester | 38.913 | 26 |
| 1.66 | 470 | C28H58O3Si | Tetracosanoic acid, 2-[(trimethylsilyl)oxy]-, methyl ester | 38.992 | 27 |
| 1.24 | 222 | C14H26N2 | Tetraponerine T4 | 39.047 | 28 |
| 0.52 | 346 | C20H42O2S | Di-n-decylsulfone | 39.127 | 29 |
| 1.67 | 702 | C50H102 | Triacontane, 11,20-didecyl- | 39.553 | 30 |

 |

5.47%.

Thirty three compounds were identified in henna leaf extract (table 2 and fig. 2). The prevailing compound were cis-Vaccenic acid with (22.9 %), Pentadecanoic acid (16.89%), Phenol, 2,2-methylenebis[6-(1,1dimethylethyl)-4-methyl- with (13.7%) and But-1-ene3-yne, 1-ethoxy- with ( 5.28%).

Results obtained from table 3 and figure 3 indicated to identification of thirty compounds by GC-MS analysis of frankincense. Diethyl Phthalate was the most prevailing compound with (9.67%) followed by 6Octadecenoic acid, (Z)- with (8.19%), Z,Z-6,24Tritriacontadien-2-one with (6.9%) and Dodecane, 4methyl- with ( 6.09%).

 Table 4 and figure 4 showed that thirty compounds were identified in watercress seeds oil (HS4) which were

1 - [ 2 - H y d r o x ye t h yl ] - 4 - [ 4 - [ 7 - c h l o r o - 4 quinolylamino]benzoyl]piperazine**,** Ethyl 2-acetamido3,3,3-trifluoro-2-(4-fluoroanilino) propionate**,** Octadecanoic acid, 12-oxo-, trimethylsilyl esterand Diethyl Phthalate with the Peak Areas of (8%, 7.40 %,6.58% and 5.62%) respectively.

Vaccenic acid, also known as (11E)-octadec-11-enoic acid is a naturally occurring transfatty acid found in dairy products such as milk. It is also the predominant fatty acid comprising trans fat in human milk. Pentadecanoic acid (CH3(CH2)13COOH) is a saturated fatty acid. It is rare in nature, being found at the level of 1.2% in the

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 4:** Components Identified in watercress.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Peak** | **MW** | **Molecular** | **Name of the compound** | **RT** | **No.** |
| **Area %** |  | **Formula** |  |  |  |
| 5.62 | 222 | C12H14O4 | Diethyl Phthalate | 15.085 | 1 |
| 5.14 | 356 | C21H40O4 | 9-Octadecenoic acid (Z)-, 2-hydroxy-1-(hydroxymethyl)ethyl ester | 31.633 | 2 |
| 2.12 | 565 | C27H46F7NO3 | l-Valine, n-heptafluorobutyryl-, octadecyl ester | 39.527 | 3 |
| 1.59 | 564 | C30H49F5O2Si | Behenic acid, dimethyl(pentafluorophenyl)silyl ester | 39.566 | 4 |
| 3.74 | 564 | C33H48N4O4 | 1-Coprosten-3-one 2,4-dinitrophenylhydrazone | 39.913 | 5 |
| 1.89 | 338 | C22H42O2 | Cyclopropanedecanoic acid, 2-octyl-, methyl ester | 39.965 | 6 |
| 1.86 | 196 | C13H24O | 1,5,9,9-Tetramethyl-spiro[3.5]nonan-5-ol | 40.012 | 7 |
| 2.99 | 420 | C27H48O3 | Tetrahydrosmilagenin | 40.080 | 8 |
| 1.23 | 142 | C6H10N2O2 | 4-Methylimidazole-2,5-diethanol | 40.107 | 9 |
| 2.00 | 346 | C22H31FO2 |  [1,1'-Bicyclohexyl]-4-carboxylic acid, 4'-propyl-, 4-fluorophenyl ester | 40.133 | 10 |
| 1.67 | 518 | C23H34O13 | alpha.-D-Glucofuranose, 3-O-(2,3,5-O-acetyl-.beta.-D-lyxofuranosyl)-1,2:5,6-DI-O-isopropylidene- | 40.173 | 11 |
| 1.49 | 181 | C8H8FN3O | 3-Fluorobenzaldehyde semicarbazone | 40.208 | 12 |
| 1.42 | 562 | C33H46N4O4 | 4,6-Cholestadiene-3-one, 2,4-dinitrophenylhydrazone | 40.233 | 13 |
| 2.93 | 574 | C36H47ClN2O2 | N,N’-Bis-(4-octyloxybenzylidene)-2-chloro-1,4-phenylenediamine | 40.280 | 14 |
| 2.43 | 264 | C14H17FN2O2 | Pyrrolidine-3-carboxamide, N-(4-fluorophenyl)-1-isopropyl-5-oxo-$$ N-(4-Fluorophenyl)-1-isopropyl-5-oxo-3-pyrrolidinecarboxamide | 40.320 | 15 |
| 5.04 | 578 | C30H42O11 | 9-Desoxo-9-xi-hydroxy-3,7,8,9,12-pentaacetate ingol | 40.380 | 16 |
| 7.40 | 322 | C13H14F4N2O3 | Ethyl 2-acetamido-3,3,3-trifluoro-2-(4-fluoroanilino)propionate | 40.513 | 17 |
| 5.25 | 508 | C25H50Br2 | erythro-9,10-Dibromopentacosane | 40.593 | 18 |
| 4.65 | 370 | C21H38O5 | Methyl 10-methoxycarbonyl-17-oxooctadecanoate | 40.670 | 19 |
| 3.33 | 562 | C11H3F17N4O3 | Propanamide, 2,3,3,3-tetrafluoro-2-[2-(perfluoropropoxy) perfluoropropoxy]-N-(1,2,4-triazol-3-yl)- | 40.700 | 20 |
| 1.98 | 430 | C29H50O2 | Cholestan-3-ol, acetate, (3.beta.)- | 40.747 | 21 |
| 8.00 | 410 | C22H23ClN4O2 | 1-[2-Hydroxyethyl]-4-[4-[7-chloro-4-quinolylamino]benzoyl]piperazine | 40.793 | 22 |
| 2.44 | 452 | C28H52O4 | Fumaric acid, 2,4-dimethylpent-3-yl heptadecyl ester | 40.882 | 23 |
| 3.79 | 208 | C12H20N2O | 5,7-Diethyl-1,3-diazaadamantan-6-one | 40.922 | 24 |
| 4.67 | 240 | C15H28O2 | Tetrahydroionyl acetate | 40.994 | 25 |
| 6.58 | 370 | C21H42O3Si | Octadecanoic acid, 12-oxo-, trimethylsilyl ester | 41.049 | 26 |
| 1.17 | 564 | C38H76O2 | 9-Octadecene, 1-[2-(octadecyloxy)ethoxy]- | 41.127 | 27 |
| 3.82 | 582 | C36H42N2O5 | 6-[(7-Isopropyl-1,4a-dimethyl-1,2,3,4,4a,9,10,10a-octahydrophenanthren-1-ylmethyl)carbamoyl]-6'-methyl-2'-nitrobiphenyl-2-carboxy- | 41.193 | 28 |
| 2.16 | 562 | C32H51F5O2 | Stigmastanol, pentafluoropropionate | 41.227 | 29 |
| 1.58 | 346 | C20H42O2S | Di-n-decylsulfone | 41.280 | 30 |

 |

milk fat from cows, while Octadecadienoic acid is a doubly unsaturated fatty acid, occurring widely in plant glycosides. Diethyl phthalic acid also known as diethyl phthalate, 1, 2-diethyl phthalic acid or 1, 2-benzenedicarboxylic acid diethyl ester, is classified as a member of the benzoic acid esters (Precht and Molkentin, 1999 ; Wolff, 2005; Friesen and Innis, 2006).

Present work at the same line with the investigation conducted by Hema *et al*., (2010) to study gas chromatography-mass spectroscopic analysis of *Lawsonia inermis* leaves which found that henna leaves contain mainly á-D-Glucopyranoside, methyl (51.73%) and 1,4-Naphthalenedione, 2-hydroxy-.Also with the study of AL-Qizwini *et al*., ( 2014) on Jordanian jojoba (*SIMMONDSIA CHINENSIS*) liquid wax that indicated that the fatty acid á-linolenic acid was in higher percentages within the Jordanian oil than those of *Jojoba* oil found in other parts of the world. On the other hand, the fatty acids palmitic acid, oleic acid, vaccenic acid, and gondoic acid were in lower percentages within the Jordanian oil. Swami *et al*., ( 2016) mentioned that different peaks with low and high molecular weight determining the presence of 51 compounds. Among them predominantly Squalene (19.77%) 9,12,15-

Octadecatrienoic acid, (Z,Z,Z)- (14.90%); 9,12,15-

Octadecatrienoic acid, methyl ester, (Z,Z,Z)- (11.52%); Pentadecanoic acid (10.54%); Vitamin E (6.82);

Hexadecanoic acid, methyl ester (5.85%); 9,12-

Octadecadienoicc acid (Z,Z)-, Methyl ester (4.98%); Stigmast-5-En-3- Ol, (3.Beta.)- (5.67), Phytol (1.77%) were present.

Alghamdi *et al*., (2017) found that the fatty acid

Behenic acid methyl ester (C22:0) and Cis-13, 16 Docosadienoic acid methyl ester (C22:2) were in higher percentages within the Egyptian oil of jojoba. On the other

**Fig.1:** Components Identified in jojoba. hand, Egyptian oil was found to have lower percentage of the fatty acids; Eliadic acid, YLinolenic acid, Cis8,11,14 Eieosatrienoic acid, and Lingocernic acid.

# Conclusion

It is concluded from the study that Gas Chromatography – Mass Spectroscopic analysis showed that cis-Vaccenic acid was the most prevailing compound in jojoba seed oil and henna leaves, while Diethyl Phthalate and 1-[2-Hydroxyethyl]-4-[4-[7-chloro-4quinolylamino]benzoyl]piperazine were most prevailing compound in frankincense and watercress seed oil **Fig. 2:** Components Identified in henna. respectively.

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**Fig. 3:** Components Identified in frankincense.

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