

## Molecular identification and chemical profile of parasitic higher plants in the botanical garden of University of Ilorin, Ilorin, Nigeria

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ARTICLE INFORMATION	ABSTRACT
<p>MS No. JOBAS_2026_008</p> <p>Received: 13/08/2025 Revised: 27/10/2025 Accepted: 04/12/2025</p> <p><b>Keywords:</b> Bioactive compounds Botanical garden Molecular identification Parasitic higher plants Phytochemicals *Corresponding author: <a href="mailto:olahan.gs@unilorin.edu.ng">olahan.gs@unilorin.edu.ng</a> Tel: +2348065919065</p> <p>ORCID: 0000-0002-5911-0859</p>	<p>Parasitic higher plants cause plant diseases and may also serve as agents that spread plant viruses. This study was carried out to identify parasitic higher plants in the University of Ilorin Botanical Garden and to investigate the phytochemicals they contain. Survey of parasitic higher plants existing in the Unilorin botanical garden was carried out and documented. Their leaf samples were collected and subjected to molecular identification. The obtained sequences were compared with those available in the NCBI database. Only two parasitic higher plants were identified as <i>Cuscuta europaea</i> (on a moringa tree), and <i>Moquiella rubra</i> (on a citrus tree). For the phytochemical analysis, the dried leaves were extracted using 70% ethanol and screened using GC – MS. A total of one hundred and three bioactive compounds were identified, with fifty four found in <i>Cuscuta europaea</i> and forty nine present in <i>Moquiella rubra</i>. Twenty five phytochemicals out of the 103 identified were common in both parasitic higher plants. However, only seven compounds in each species appeared in significant amounts. Some of the major compounds detected, such as phytol, squalene, and hexadecanoic acid, are known to possess antimicrobial, antioxidant and anti-inflammatory activities. The findings suggest that although these parasitic plants pose a biological threat to their hosts, they also have the potential to serve as valuable sources of natural therapeutic products.</p>

### 1.0 Introduction

Parasitic higher plants are a specialized group of angiosperms that obtain water, minerals, and organic nutrients from host plants through haustorial connections, often compromising host vitality and productivity [1]. These plants, particularly those in the families, Loranthaceae and Orobanchaceae, are ecologically significant and widely distributed across tropical and subtropical regions. In Nigeria, species such as *Tapinanthus bangwensis* and *Globimetula braunii* are commonly found parasitizing economically

important trees including *Mangifera indica*, *Persea americana*, and *Theobroma cacao* [2]. These mistletoes are hemiparasitic, retaining photosynthetic capability while relying on their hosts for water and mineral nutrients. Their occurrence is influenced by host specificity, environmental conditions, and ecological interactions, making them important components of plant community dynamics.

Beyond their ecological roles, parasitic higher plants have long been recognized in traditional medicine across Africa, Asia, and Europe. Ethnobotanical records document their use in

treating a wide range of ailments such as hypertension, diabetes, microbial infections, cancer, and inflammatory disorders [3-5]. These therapeutic applications are attributed to their rich phytochemical composition, which includes phenolic compounds, flavonoids, alkaloids, terpenoids, fatty acids, and sterols. Compounds such as lupeol, phytol, glycerin, and various phenolics have been reported to exhibit antimicrobial, antioxidant, anti-inflammatory, anticancer, and neuroprotective activities [6-8]. However, most existing studies have focused on individual species or generalized extracts, with limited comparative analyses of co-occurring parasitic plants within defined ecological settings.

The University of Ilorin Botanical Garden, located in Ilorin, Nigeria, represents a unique and underexplored microhabitat that supports a diverse assemblage of native and exotic plant species, including parasitic taxa. Despite its ecological and educational significance, there remains a lack of systematic documentation on the identity and phytochemical composition of parasitic higher plants within localized ecosystem. Morphological identification alone is often insufficient due to phenotypic variability influenced by host species and environmental conditions, necessitating the use of molecular tools such as DNA barcoding for accurate species delimitation [9]. Furthermore, advanced analytical techniques like Gas Chromatography-Mass Spectrometry (GC-MS) are essential for profiling bioactive compounds with pharmacological potential. This study therefore aimed at identifying parasitic higher plants present in the University of Ilorin Botanical Garden molecularly and characterizing their phytochemical constituents using GC-MS approaches.

## 2.0 Materials and Methods

### 2.1 Study Site

The field survey was conducted on May 23, 2023, within the University of Ilorin Botanical Garden, Ilorin, Nigeria, under the supervision of the Curator, Department of Plant Biology Herbarium and given the voucher numbers UIL/001/1048/2023 and UIL/991/1048/2023. Preliminary identification of the parasitic higher plants present in the area was carried out based on characteristic morphological features, including the presence of haustorial attachments to host plants and the absence or reduction of chlorophyll in the leaves, which are diagnostic traits of parasitic angiosperms.

### 2.2 Sample Collection

Fresh leaves of parasitic higher plants identified within the University of Ilorin Botanical Garden were carefully harvested during early morning

hours to minimize post-harvest metabolic changes. Each sample was immediately sorted and labeled according to species identity: *Sample A* and *Sample B*. To preserve the integrity of the phytochemical constituents, the leaves were first rinsed gently with distilled water to remove surface debris and contaminants, then air-dried under shade at ambient temperature (25-28°C) for 7-10 days. Shade drying was preferred to prevent degradation of heat-sensitive compounds and to maintain the natural phytochemical profile. Once fully dried, the leaves were pulverized using a sterile electric grinder to obtain a fine powder. The powdered samples were stored in clean, airtight amber glass containers to protect them from light and moisture, and kept at room temperature in a dry cabinet until further use for phytochemical screening and GC-MS analysis.

### 2.3 Molecular Identification of Parasitic Higher Plants

Genomic DNA was extracted from young leaves of each parasitic higher plant following the cetyltrimethylammonium bromide (CTAB) method described by Zhang et al. [10] with minor modifications. Approximately 100 mg of fresh leaf tissue was ground in liquid nitrogen and mixed with 700  $\mu$ L of preheated (65°C) CTAB extraction buffer comprising 2% CTAB (w/v), 100 mM Tris-HCl (pH 8.0), 20 mM EDTA, and 1.4 M NaCl. The homogenate was incubated at 65°C for 30 minutes, extracted with chloroform:isoamyl alcohol (24:1, v/v), and the aqueous phase transferred into a new tube. DNA was precipitated with cold isopropanol, washed twice with 70% ethanol, air-dried, and resuspended in 50  $\mu$ L of TE buffer (10 mM Tris-HCl, 1 mM EDTA, pH 8.0). The DNA purity and concentration were evaluated using a NanoDrop 2000 spectrophotometer (Thermo Fisher Scientific, USA) and by electrophoresis on 1% agarose gel.

Polymerase Chain Reaction (PCR) amplification was conducted at the Molecular Biology Laboratory, International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria) using Premix Taq™ Version 2.0 (TaKaRa Bio Inc., Japan) and the primer pairs H1f-F (5'-CCACAAACAGAGACTAAAGC-3') and Fofana-R (5'-GTAAAATCAAGTCCACCGCG-3'). Each 25  $\mu$ L reaction mixture contained 12.5  $\mu$ L of Premix Taq, 1  $\mu$ L of each primer (10  $\mu$ M), 2  $\mu$ L of template DNA ( $\approx$ 50 ng), and 8.5  $\mu$ L of nuclease-free water. The amplification profile consisted of an initial denaturation at 95°C for 5 minutes, followed by 35 cycles of denaturation at 94°C for 30 seconds, annealing at 55°C for 45 seconds, and extension at 72°C for 1 minute, with a final extension at 72°C for 10 minutes. The PCR products were resolved on 1.5% agarose gel prepared in 1 $\times$  TAE buffer (40 mM Tris-acetate, 1 mM EDTA, pH 8.0), stained with ethidium

bromide (0.5 µg/mL), and visualized under UV light using a Gel Doc™ EZ Imager (Bio-Rad, USA). Amplicons were purified and sequenced using the Sanger sequencing method. Forward and reverse reads were assembled and edited in SeqTrace software, and consensus sequences were compared with homologous sequences in the NCBI GenBank database using BLAST-n (<https://blast.ncbi.nlm.nih.gov/Blast.cgi>) to confirm species identity.

#### 2.4 Preparation of Leaf Samples of the Parasitic Higher Plants for Phytochemical Screening

Powdered leaf samples (10 g each) were weighed accurately into 250 mL conical flasks and extracted with 100 mL of 75% ethanol (v/v) prepared using absolute ethanol (≥99.8%, analytical grade; Sigma-Aldrich, St. Louis, MO, USA) and distilled water. The flasks were tightly stoppered and allowed to stand for 24 hours at room temperature (25 ± 2 °C) with intermittent vigorous shaking to enhance solute–solvent interaction. After extraction, the mixtures were filtered using Whatman No. 1 filter paper (Whatman International Ltd., Maidstone, England) into clean glass beakers. The filtrates were concentrated by air-drying under a fume hood at ambient temperature until the solvent completely evaporated, leaving behind the crude ethanolic extracts. The dried extracts were carefully scraped, weighed, and transferred into pre-cleaned, well-labeled amber glass vials (Fisher Scientific, Waltham, MA, USA) with airtight screw caps to prevent oxidation or photodegradation. The vials were then stored at –20 °C in a deep freezer until further analysis by GC–MS. All reagents used were of analytical grade, and glassware was properly sterilized and oven-dried before use to avoid contamination.

#### 2.5 GC–MS Profiling and Quantification of Chemical Constituents in the Extract

The chemical constituents of the extract were analyzed using an Agilent Technologies 8890 Series GC System coupled with a 5977B Mass Selective Detector operating with Electron Impact Ionization (EI) at 70 eV. The dried extract was first reconstituted in analytical-grade methanol to obtain a concentration of 1 mg/mL. The solution was filtered through a 0.22 µm PTFE syringe filter to remove any particulate matter before analysis. Approximately 1 µL of the filtrate was drawn into an autosampler vial for GC–MS injection. The injection port was maintained at 250°C and operated in a splitless mode. The carrier gas was high-purity helium (99.999%) at a constant flow rate of 1 mL/min, with a column head pressure of 8.35 psi. A 5% phenyl methyl siloxane capillary

column (30 m × 0.32 mm × 0.25 µm film thickness) was used for compound separation. The oven temperature was initially held at 90 °C for 3 minutes, ramped at 30 °C/min to 200 °C and held for 15 minutes, then increased to 265 °C and maintained for 5 minutes, followed by a final ramp of 3 °C/min to 276°C, where it was held for 15 minutes. The purge flow was 30 mL/min with a purge time of 1.0 minute, and the total flow rate was 35.35 mL/min. The separated components were ionized in the MS detector and scanned within the range of 50–550 m/z. Identification of the bioactive compounds was achieved by comparing their mass spectra and retention indices with those in the NIST library database.

#### 3.0 Results

Only 2 samples of parasitic higher plants were identified, and labeled Samples A and B, respectively. Sample A was found growing on a *Moringa* tree at university of Ilorin botanical garden (at latitude 8.466943°E.; longitude 4.660237°N.), while sample B was found growing on a *Citrus* tree university of Ilorin botanical garden (at latitude 8.46876°E.; longitude 4.658759°N).

The consensus sequences were juxtaposed with one hundred sequences from the biological database of NCBI. Consensus sequence for sample A matched identically (100%) with *Cuscuta europaea* (AY554401.1), and for sample B, it showed a 97% similarity to *Moquiniella rubra* (MH390675.1).

Table 1 presents the retention times (R.T.s), molecular formulae, molecular weights, peak heights, and compound names of the 54 bioactive constituents identified in the leaf extract of *Cuscuta europaea*, while Table 2 shows the corresponding parameters for the 49 compounds detected in the leaf extract of *Moquiniella rubra*. Interestingly, twenty-five of the compounds identified in *Cuscuta europaea* were also present in *Moquiniella rubra* collected from the University of Ilorin Botanical Garden. Among the 54 compounds detected in *Cuscuta europaea*, seven exhibited notably high peak intensities, suggesting their relative abundance in the extract. These include n-Hexadecanoic acid (11.90%), Phytol (11.64%), Hexadecanoic acid, ethyl ester (5.69%), 9,12-Octadecadienoic acid (Z,Z)- (6.67%), 4-Oxazolecarboxylic acid, 4,5-dihydro-2-phenyl-, 1-methylethyl ester (4.45%), E-10,13,13-Trimethyl-11-tetradecen-1-ol acetate (3.27%), and 2-Pentadecanone, 6,10,14-trimethyl- (2.92%). Similarly, out of the 49 bioactive compounds identified in *Moquiniella rubra*, seven were present in appreciable quantities based on peak height, namely: Phytol (13.58%), n-Hexadecanoic acid (7.71%), 5H-3,5a-Epoxy-naphth[2,1-c]oxepin, dodecahydro-3,8,8,11a-tetramethyl-, [3S-

(3 $\alpha$ ,5 $\alpha$ ,7 $\alpha$ ,11 $\beta$ ,11 $\beta$ )]- (7.43%), Lupeol (6.77%),

Z,Z-8,10-Hexadecadien-1-ol (6.02%),  $\beta$ -Amyrin

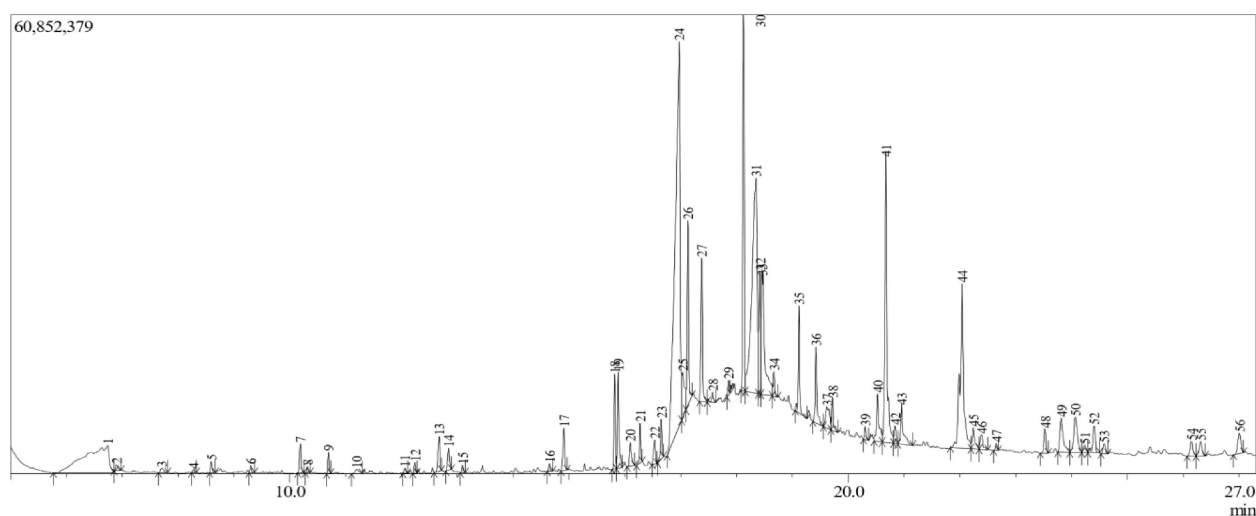
(4.78%), and Hexadecanoic acid, 2-hydroxy-1-

(hydroxymethyl)ethyl ester (4.44%).

**Table 1: Chemical Compounds in *Cuscuta europaea* Leaves *europaea* Leaves on *Moringa* tree**

S/no.	Compound Name	Retention Time (min)	Peak Height (%)	Molecular Formula	Molecular Weight
1	Glycerin	6.74	0.84	C <sub>3</sub> H <sub>8</sub> O <sub>3</sub>	92
2	Butanoic acid, 2-hydroxy-, ethyl ester	6.90	0.18	C <sub>6</sub> H <sub>12</sub> O <sub>3</sub>	132
3	1H-Isoindole, 3-ethoxy-	7.71	0.14	C <sub>10</sub> H <sub>11</sub> NO	161
4	Octanoic acid	8.27	0.09	C <sub>8</sub> H <sub>16</sub> O <sub>2</sub>	144
5	Octanoic acid, ethyl ester	8.60	0.36	C <sub>10</sub> H <sub>20</sub> O <sub>2</sub>	172
6	Nonanoic acid	9.30	0.22	C <sub>9</sub> H <sub>18</sub> O <sub>2</sub>	158
7	Benzene, (isothiocyanatomethyl)-	10.19	0.90	C <sub>8</sub> H <sub>7</sub> NS	149
8	n-Decanoic acid	10.32	0.20	C <sub>10</sub> H <sub>20</sub> O <sub>2</sub>	172
9	Decanoic acid, ethyl ester	10.70	0.68	C <sub>12</sub> H <sub>24</sub> O <sub>2</sub>	200
10	Benzeneacetonitrile, 4-hydroxy-	11.20	0.14	C <sub>8</sub> H <sub>7</sub> NO	133
11	Phenol, 2,4-bis(1,1-dimethylethyl)-	12.06	0.16	C <sub>14</sub> H <sub>22</sub> O	206
12	2(4H)-Benzofuranone, 5,6,7,7a-tetrahydro-4,4,7a-trimethyl-	12.24	0.34	C <sub>11</sub> H <sub>16</sub> O <sub>2</sub>	180
13	Dodecanoic acid	12.68	1.07	C <sub>12</sub> H <sub>24</sub> O <sub>2</sub>	200
14	Diethyl Phthalate	12.84	0.68	C <sub>12</sub> H <sub>14</sub> O <sub>4</sub>	222
15	Dodecanoic acid, ethyl ester	13.09	0.22	C <sub>14</sub> H <sub>28</sub> O <sub>2</sub>	228
16	Acetic acid, 2-(2,2,6-trimethyl-7-oxa-bicyclo[4.1.0]hept-1-yl)-propenyl ester	14.65	0.24	C <sub>14</sub> H <sub>22</sub> O <sub>3</sub>	238
17	Tetradecanoic acid	14.91	1.31	C <sub>14</sub> H <sub>28</sub> O <sub>2</sub>	228
18	2-Pentadecanone, 6,10,14-trimethyl-	15.82	2.92	C <sub>18</sub> H <sub>36</sub> O	268
19	Phytol, acetate	15.99	1.85	C <sub>22</sub> H <sub>42</sub> O <sub>2</sub>	338
20	3,7,11,15-Tetramethyl-2-hexadecen-1-ol	16.27	1.23	C <sub>20</sub> H <sub>40</sub> O	296
21	Tricosanoic acid, methyl ester	16.53	0.75	C <sub>24</sub> H <sub>48</sub> O <sub>2</sub>	368
22	Dibutyl phthalate	16.65	1.24	C <sub>16</sub> H <sub>22</sub> O <sub>4</sub>	278
23	n-Hexadecanoic acid	16.97	11.90	C <sub>16</sub> H <sub>32</sub> O <sub>2</sub>	256
24	Ethyl 9-hexadecenoate	17.04	1.41	C <sub>18</sub> H <sub>34</sub> O <sub>2</sub>	282
25	Hexadecanoic acid, ethyl ester	17.13	5.69	C <sub>18</sub> H <sub>36</sub> O <sub>2</sub>	284
26	4-Oxazolecarboxylic acid, 4,5-dihydro-2-phenyl-,1-methylethyl ester	17.38	4.45	C <sub>13</sub> H <sub>15</sub> NO <sub>3</sub>	233
27	Oleic Acid	17.57	0.31	C <sub>18</sub> H <sub>34</sub> O <sub>2</sub>	282
28	n-Nonadecanol-1	17.86	0.45	C <sub>19</sub> H <sub>40</sub> O	284
29	Phytol	18.13	11.64	C <sub>20</sub> H <sub>40</sub> O	296
30	9,12-Octadecadienoic acid (Z,Z)-	18.35	6.67	C <sub>18</sub> H <sub>32</sub> O <sub>2</sub>	280
31	Linoleic acid ethyl ester	18.42	3.75	C <sub>20</sub> H <sub>36</sub> O <sub>2</sub>	308
32	cis,cis,cis-7,10,13-Hexadecatrienal	18.46	3.75	C <sub>16</sub> H <sub>26</sub> O	234
33	Octadecanoic acid, ethyl ester	18.67	0.74	C <sub>20</sub> H <sub>40</sub> O <sub>2</sub>	312
34	E-10,13,13-Trimethyl-11-tetradecen-1-ol acetate	19.12	3.27	C <sub>19</sub> H <sub>36</sub> O <sub>2</sub>	296
35	Butyrophenone, 2-phenyl-	19.43	2.19	C <sub>16</sub> H <sub>16</sub> O	224
36	Stigmasterol	19.62	0.67	C <sub>29</sub> H <sub>48</sub> O	412
37	4,8,12,16-Tetramethylheptadecan-4-olide	19.72	1.01	C <sub>21</sub> H <sub>40</sub> O <sub>2</sub>	324
38	6,9,12,15-Docosatetraenoic acid, methyl ester	20.30	0.38	C <sub>23</sub> H <sub>38</sub> O <sub>2</sub>	346
39	Cycloheptadecanol	20.53	1.42	C <sub>17</sub> H <sub>34</sub> O	254
40	Hexadecanoic acid, 2-hydroxy-1-(hydroxymethyl)ethyl Ester	20.68	8.92	C <sub>19</sub> H <sub>38</sub> O <sub>4</sub>	330
41	Nonacosane	20.84	0.54	C <sub>29</sub> H <sub>60</sub>	408
42	Diisooctyl phthalate	20.96	1.23	C <sub>24</sub> H <sub>38</sub> O <sub>4</sub>	390
43	E,E,Z-1,3,12-Nonadecatriene-5,14-diol	22.04	4.97	C <sub>19</sub> H <sub>34</sub> O <sub>2</sub>	294
44	Octadecanoic acid, 2,3-dihydroxypropyl ester	22.24	0.64	C <sub>21</sub> H <sub>42</sub> O <sub>4</sub>	358
45	Hexadecane	22.39	0.45	C <sub>16</sub> H <sub>34</sub>	226

46	1,3-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester	22.65	0.22	C <sub>24</sub> H <sub>38</sub> O <sub>4</sub>	390
47	Squalene	23.53	0.72	C <sub>30</sub> H <sub>50</sub>	410
48	2H-1-Benzopyran-6-ol, 3,4-dihydro-2,8-dimethyl-2-(4,8,12-trimethyltridecyl)-,[2R-[2R*(4R*,8R*)]]	23.94	1.06	C <sub>27</sub> H <sub>46</sub> O <sub>2</sub>	402
49	17-Pentatriacontene	24.23	0.23	C <sub>35</sub> H <sub>70</sub>	490
50	Tetratriacontane	24.41	0.81	C <sub>34</sub> H <sub>70</sub>	478
51	Oxirane, 2,2-dimethyl-3-(3,7,12,16,20-pentamethyl-3,7,11,15,19-heneicosapentaenyl)-, (all-E)-	24.59	0.30	C <sub>30</sub> H <sub>50</sub> O	426
52	.gamma.-Tocopherol	26.15	0.45	C <sub>28</sub> H <sub>48</sub> O <sub>2</sub>	416
53	1,6,10,14,18,22-Tetracosahexaen-3-ol, 2,6,10,15,19,23-hexamethyl-, (all-E)-	26.31	0.44	C <sub>30</sub> H <sub>50</sub> O	426
54	Cholesta-4,6-dien-3-ol, (3.beta.)-	27.01	0.62	C <sub>27</sub> H <sub>44</sub> O	384

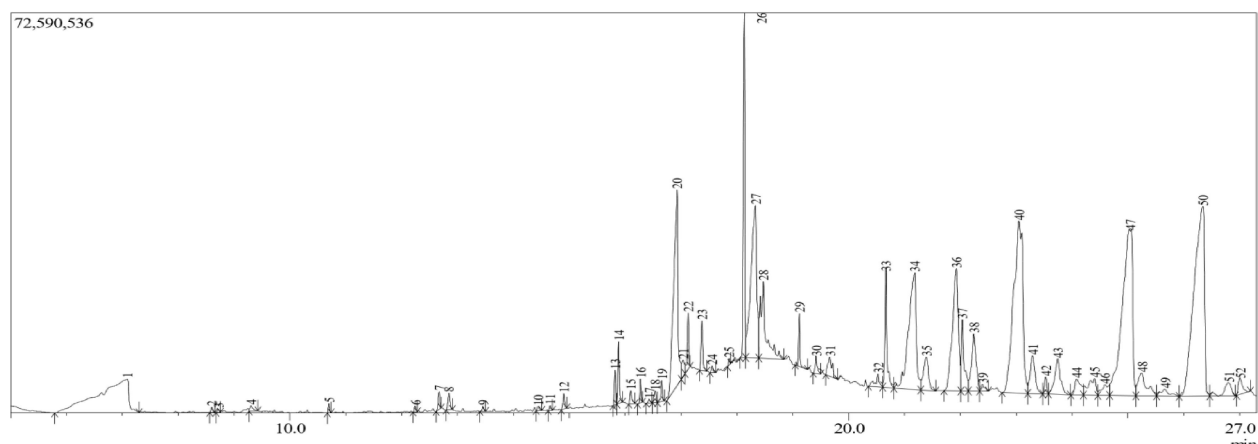


**Figure 1:** Gas Chromatography-Mass Spectroscopic of ethanolic extracts of *Cuscuta europaea* Leaves on *Moringa* tree

**Table 2:** Chemical Compounds in *Moquiiniella rubra* Leaves

S/no.	Compound Name	Retention Time (min)	Peak Height (%)	Molecular Formula	Molecular Weight
1	Glycerin	7.09	1.33	C <sub>3</sub> H <sub>8</sub> O <sub>3</sub>	92
2	Octanoic acid, ethyl ester	8.60	0.21	C <sub>10</sub> H <sub>20</sub> O <sub>2</sub>	172
3	Benzofuran-2,3-dihydro	8.72	0.13	C <sub>8</sub> H <sub>8</sub> O	120
4	Nonanoic acid	9.30	0.22	C <sub>9</sub> H <sub>18</sub> O <sub>2</sub>	158
5	Decanoic acid, ethyl ester	10.70	0.36	C <sub>12</sub> H <sub>24</sub> O <sub>2</sub>	200
6	2(4H)-Benzofuranone, 5,6,7,7a-tetrahydro-4,4,7a-trimethyl-	12.24	0.24	C <sub>11</sub> H <sub>16</sub> O <sub>2</sub>	180
7	Dodecanoic acid	12.67	0.71	C <sub>12</sub> H <sub>24</sub> O <sub>2</sub>	200
8	Diethyl Phthalate	12.85	0.66	C <sub>12</sub> H <sub>14</sub> O <sub>4</sub>	222
9	4-Hydroxy-.beta.-ionone	13.45	0.22	C <sub>13</sub> H <sub>20</sub> O <sub>2</sub>	208
10	Heptadecanal	14.45	0.16	C <sub>17</sub> H <sub>34</sub> O	254
11	Acetic acid, 2-(2,2,6-trimethyl-7-oxa-bicyclo[4.1.0]hept-1-yl)-propenyl ester	14.66	0.19	C <sub>14</sub> H <sub>22</sub> O <sub>3</sub>	238
12	Tetradecanoic acid	14.90	0.61	C <sub>14</sub> H <sub>28</sub> O <sub>2</sub>	228
13	1,2-Pentadecanone, 6,10,14-trimethyl-	15.82	1.37	C <sub>18</sub> H <sub>36</sub> O	268
14	Phytol, acetate	15.99	1.49	C <sub>22</sub> H <sub>42</sub> O <sub>2</sub>	338
15	3,7,11,15-Tetramethyl-2-hexadecen-1-ol	16.27	0.95	C <sub>20</sub> H <sub>40</sub> O	296
16	5,9,13-Pentadecatrien-2-one, 6,10,14-trimethyl-, (E,E)-	16.43	0.15	C <sub>20</sub> H <sub>40</sub> O	296

17	Octacosanoic acid, methyl ester	16.54	0.47	C <sub>29</sub> H <sub>58</sub> O <sub>2</sub>	438
18	Dibutyl phthalate	16.66	0.83	C <sub>16</sub> H <sub>22</sub> O <sub>4</sub>	278
19	n-Hexadecanoic acid	16.93	7.71	C <sub>16</sub> H <sub>32</sub> O <sub>2</sub>	256
20	Ethyl 9-hexadecenoate	17.04	0.64	C <sub>18</sub> H <sub>34</sub> O <sub>2</sub>	282
21	Hexadecanoic acid, ethyl ester	17.13	2.21	C <sub>18</sub> H <sub>36</sub> O <sub>2</sub>	284
22	4-Oxazolecarboxylic acid, 4,5-dihydro-2-phenyl-, 1-methylethyl ester	17.37	1.96	C <sub>13</sub> H <sub>15</sub> NO <sub>3</sub>	233
23	cis-10-Heptadecenoic acid	17.56	0.27	C <sub>17</sub> H <sub>32</sub> O <sub>2</sub>	268
24	n-Pentadecanol	17.86	0.27	C <sub>15</sub> H <sub>32</sub> O	228
25	Phytol	18.13	13.58	C <sub>20</sub> H <sub>40</sub> O	296
26	Z,Z-8,10-Hexadecadien-1-ol	18.33	6.02	C <sub>16</sub> H <sub>30</sub> O	238
27	Ethyl Oleate	18.48	2.96	C <sub>20</sub> H <sub>38</sub> O <sub>2</sub>	310
28	1 E-10,13,13-Trimethyl-11-tetradecen-1-ol acetate	19.12	1.99	C <sub>19</sub> H <sub>36</sub> O <sub>2</sub>	296
29	Stigmasterol	19.66	0.76	C <sub>29</sub> H <sub>48</sub> O	412
30	Cycloheptadecanol	20.53	0.50	C <sub>17</sub> H <sub>34</sub> O	254
31	Hexadecanoic acid, 2-hydroxy-1-(hydroxymethyl)ethyl ester	20.67	4.44	C <sub>19</sub> H <sub>38</sub> O <sub>4</sub>	330
32	.gamma.-Sitosterol	21.18	4.61	C <sub>29</sub> H <sub>50</sub> O	414
33	Stigmastano	21.39	1.30	C <sub>29</sub> H <sub>50</sub> O	416
34	beta.-Amyrin	21.93	4.78	C <sub>30</sub> H <sub>50</sub> O	426
35	Oleoyl chloride	22.04	2.80	C <sub>18</sub> H <sub>33</sub> ClO	300
36	Lup-20(29)-en-3-ol, acetate, (3.beta.)-	22.24	2.22	C <sub>32</sub> H <sub>52</sub> O <sub>2</sub>	468
37	Heneicosane	22.40	0.27	C <sub>21</sub> H <sub>44</sub>	296
38	Lupeol	23.05	6.77	C <sub>30</sub> H <sub>50</sub> O	426
39	D:B-Friedo-B':A'-neogammacer-5-en-3-ol, (3.beta.)-	23.29	1.49	C <sub>30</sub> H <sub>50</sub> O	426
40	Squalene	23.53	0.67	C <sub>30</sub> H <sub>50</sub>	410
41	Vitamin E	23.74	1.41	C <sub>29</sub> H <sub>50</sub> O <sub>2</sub>	430
42	2H-1-Benzopyran-6-ol, 3,4-dihydro-2,8-dimethyl-2-(4,8,12-trimethyltridecyl)-, [2R-[2R*(4R*,8R	24.08	0.62	C <sub>27</sub> H <sub>46</sub> O <sub>2</sub>	402
43	Hexatriacontane	24.40	0.66	C <sub>36</sub> H <sub>74</sub>	506
44	Oxirane, 2,2-dimethyl-3-(3,7,12,16,20-pentamethyl-3,7,11,15,19-heneicosapentaenyl)-, (all-E)-	24.59	0.42	C <sub>30</sub> H <sub>50</sub> O	426
45	Olean-18-ene	25.25	0.87	C <sub>30</sub> H <sub>50</sub>	410
46	5H-3,5a-Epoxynaphth[2,1-c]oxepin, dodecahydro-3,8,8,11a-tetramethyl-, (3.alpha.,5a.alpha.,7a.alpha.,11a.beta.,11b.alpha.)-]	26.34	7.43	C <sub>18</sub> H <sub>30</sub> O <sub>2</sub>	278
47	Friedelan-3-one	26.80	0.49	C <sub>30</sub> H <sub>50</sub> O	426
48	Stigmasta-5,22-dien-3-ol, acetate, (3.beta.)-	27.01	0.63	C <sub>31</sub> H <sub>50</sub> O <sub>2</sub>	454
49	2-phenylbutyrophenone	19.42	0.65	C <sub>16</sub> H <sub>16</sub> O	224



**Fig. 2:** GC-MS chromatogram of extracts of *Moquiiniella rubra* Leaves found growing on Citrus tree

## 5.0 Discussion

In this study, two parasitic higher plant species collected from the University of Ilorin Botanical Garden were molecularly identified as *Cuscuta europaea* and *Moquiella rubra*, showing sequence identities of 100% and 97%, respectively. These values fall within the threshold for reliable molecular identification as suggested by Raja et al [11], who emphasized that a minimum sequence similarity of 97% is required to ensure accurate species classification using BLAST analysis on the NCBI database.

The GC-MS analysis of the ethanolic leaf extracts of both species revealed a wide range of secondary metabolites, with 54 compounds identified in *C. europaea* and 49 in *M. rubra*. Notably, twenty-five compounds were common to both species, indicating a close biochemical relationship and suggesting that they may share similar metabolic pathways associated with parasitism. These compounds largely include fatty acids, terpenoids, alcohols, esters, and hydrocarbons, all of which are commonly linked to essential biological and ecological functions such as defense, adaptation, and host-parasite interactions [12-14].

The high concentration of fatty acids such as n-hexadecanoic acid, linoleic acid derivatives, and related esters indicates that both plants synthesize lipid-based compounds with potential roles in structural integrity and stress response. Fatty acids are also known to contribute to antimicrobial and anti-inflammatory activities, which may help the parasitic plants resist microbial attack or oxidative stress encountered in their host environment [15]. The identification of terpenoid compounds such as phytol, lupeol, and  $\beta$ -amyryn highlights the plants' ability to produce bioactive metabolites that act as chemical defenses and signaling molecules. Terpenoids are reported to possess diverse biological activities including antioxidant, anticancer, and immune-modulating effects [14-17].

The presence of lupeol,  $\beta$ -amyryn, and related triterpenoids in *M. rubra* further supports the adaptive nature of its secondary metabolism. These compounds have been widely recognized for their pharmacological properties particularly in mitigating inflammation, oxidative stress, and microbial infections [13, 14]. Similarly, the high abundance of phytol in both *C. europaea* (11.64%) and *M. rubra* (13.58%) underscores its importance as a key metabolic intermediate and bioactive constituent. Phytol is an acyclic diterpene alcohol that has been reported to possess antimicrobial, antioxidant, and anticancer properties, in addition to being used as a precursor in the synthesis of vitamins E and K [16].

The detection of compounds such as 4-oxazolecarboxylic acid derivatives and long-chain

alcohols in both extracts suggests additional metabolic diversity. These compounds have been linked to antimicrobial and antifungal activities, providing further evidence of the biochemical arsenal available to these parasitic plants for survival and host colonization [18, 19]. Moreover, the similarities in the chemical profiles of both plants indicate a potential convergence in metabolic evolution, enabling them to thrive under similar ecological conditions and host influences. Similarly, the presence of these bioactive compounds highlights the pharmaceutical and industrial potential of both *C. europaea* and *M. rubra*. For instance, fatty acid esters and terpenoids identified in this study have established applications in drug formulation, cosmetics, and food industries due to their antioxidant and preservative properties [17, 20]. Furthermore, the antimicrobial compounds detected could be explored as natural alternatives to synthetic antimicrobials, aligning with current trends toward sustainable and plant-based therapeutics.

The findings of this study are in agreement with previous phytochemical reports on parasitic and medicinal plants. Similar compounds have been identified in *Cuscuta reflexa* [21], *Pterocarpus angolensis* and *Albizia adianthifolia* [15], *Nigella sativa* [17], and *Camptotheca acuminata* [19], among others. These similarities reinforce the view that parasitic higher plants, despite their reduced morphology, retain the biochemical capacity to synthesize a wide spectrum of bioactive metabolites with ecological and medicinal significance.

In conclusion, *Cuscuta europaea* and *Moquiella rubra* were identified as parasitic higher plants present within the University of Ilorin Botanical Garden. The findings revealed a rich composition of bioactive compounds, particularly fatty acids and terpenoids, which may play essential roles in their parasitic mechanisms and adaptive survival strategies. The abundance of these compounds also indicates potential pharmacological, agricultural, and biotechnological applications. The study provides valuable baseline data for future research on the functional roles and commercial prospects of metabolites derived from parasitic higher plants.

It is recommended that further bioassay-guided studies be conducted to isolate and characterize the identified bioactive compounds and evaluate their pharmacological and antimicrobial potentials. Toxicological assessments should be carried out to confirm their safety for pharmaceutical and nutraceutical applications. Comparative metabolomic studies on other parasitic plants are also suggested to elucidate compound exchange mechanisms. Moreover, conservation and sustainable utilization of *Cuscuta europaea* and

*Moquiniella rubra* should be ensured to support ongoing research and biotechnological applications.

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None

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None

### Authors Contributions

GSO: Conceptualisation and Design; BIT: Laboratory Works, and Data Accumulation; AI and BIT: Draft Manuscript; GSO: Review for Intellectual Content; BIT, AI and GSO: Submission Approval

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