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Article

Phytochemical Screening and chemical investigation of lipoidal matter of the leaves of *Latania verschaffeltii* Lem. Family Arecaceae cultivated in Egypt

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This study presents the first preliminary phytochemical screening and investigation of the lipoidal matter of *Latania verschaffeltii* Lem. leaves, belonging to the Arecaceae family. Gas chromatography coupled with mass spectroscopy (GC/MS) was used to analyze and identify compounds of saponifiable and unsaponifiable content. The preliminary phytochemical screening of total methanolic extract of *Latania verschaffeltii* Lem. leaves revealed the presence of unsaturated sterols and /or triterpenes, carbohydrates and /or glycosides, flavonoids, tannins, saponins, and phenolic acids in the leaves. However, cardenolides, cyanogenic compounds, alkaloids, and iridoids were not detected. The results of the gas chromatography/mass spectrometry (GC/MS) analysis indicated that the percentage of saturated fatty acids (83.82%) is higher than that of unsaturated fatty acids (9.42%). The predominant methyl ester of a saturated fatty acid detected in the sample was hexadecanoic acid methyl ester, accounting for 41.68% of the total. The composition of the unsaponifiable matter consisted of hydrocarbons (5.66%), fatty alcohols (0.96%), terpenes (85.97%), and sterols (2.18%). The major terpenes observed were phytol (43.62%) and squalene (39.27%).

Keywords: *Latania verschaffeltii* Lem. GC/MS. Lipoidal matter. Phytochemical screening.

INTRODUCTION

Family Arecaceae (Palmae) comprises approximately 181 genera and an estimated 2600 species distributed in tropical and subtropical regions (Christenhusz, Maarten, Byng, 2016). This family includes monocot shrubs, climbers, and palm trees (Basu, Sengupta, Zandi, 2014). Phoenix and Areca catechu are the most chemically and biologically investigated genera. In addition, some genera belonging to the family Arecaceae hold significant economic value, such as coconuts, true sago palm, date palm, and oil palm (De Souza *et al*.,2020). It has been reported that members of the family Arecaceae are characterized mainly by the presence of flavonoids, steroids, terpenoids, phenolic acids, and fatty acids derivatives (Mohammed, Fouad, 2022). Plants belonging to this family have demonstrated various biological properties, including anti-hyperlipidemic, anti-diabetic, antioxidant, anti-parasitic, renal protective, antimicrobial (antibacterial, antifungal, and antiviral), antipyretic, cardioprotective, anti-mutagenic, antihypertensive, anti-ulcer, neuropharmacological, hepatoprotective, anti-acetylcholinesterase, anti-inflammatory, and cytotoxic activities (Mohammed, Fouad,2022).

The genus *Latania*, commonly known as Latan palm, belongs to the family Arecaceae and is regional to the Mascarene Islands in the western Indian Ocean (Govaerts, Dransfield, 2005). *Latania* is a large, single-stem palm with unisexual plants (dioecy), characterized by its leaf shedding and scarred trunk. The stamens are small in clusters and emerge from within leather-like inflorescences. The pistils are comparatively larger, and they are present as individual structures rather than being concealed within the bracts. The fruit contains 1-3 pyrenes, seeds enclosed in wooded endocarps (Dransfield *et al*., 2008). It includes three species, namely *Latania*

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lontaroides (Gaertn.) H.E.Moore, *Latania loddigesii* Mart., and *Latania verschaffeltii* Lem. Species are most likely differentiated based on leaf color by exclusively considering young leaves, as the variations in color among palm trees tend to fade with age. The entire leaf of *Latania loddigesii* Mart. (blue latan) is blue-gray. Petiole, leaf margins, and veins of *Latania lontaroides* (Gaertn.) H.E. Moore (red latan) and *Latania verschaffeltii* Lem. (yellow latan) are reddish and deep orange-yellow, respectively (Dehgan, 2023). The leaves are used as thatch, trunks as wood sources, and young seeds are considered edible. All species are beautiful ornamentals (Dransfield *et al*., 2008). *Cleophora verschaffeltii* Lem. O.F. Cook and *Latania aurea* Duncan are synonyms for *Latania verschaffeltii* Lem. There is a scarcity of specific data pertaining to these species. Nevertheless, compelling data has been documented regarding other members of this particular family, including Areca catechu seeds, which exhibit significant anti-cell adhesive activity. The treatment of venereal diseases involves the utilization of a decoction prepared by combining the roots and leaves of *Argemone mexicana* and *Caesalpinia bonduc* (Gurib-Fakim *et al*.,1996).

MATERIAL AND METHODS

Plant Material

The fresh leaves of the plant used in this study were collected from Mazhar Botanical Garden, Nahia, Imbaba, Giza, Egypt. Engineer Teres Labib, director of El-Orman Garden in Giza, Egypt, and consultant of plant taxonomy at the Ministry of Agriculture, provided and authenticated this plant. The voucher specimen (Aun-Phg- 102021) was maintained in the Pharmacognosy Department Herbarium, Faculty of Pharmacy, Assiut University.

Chemicals

For phytochemical screening, we used 1 % hydrochloric acid, 20 % sodium hydroxide, concentrated ammonium hydroxide solution, pyridine, sodium nitroprusside, sodium picrate paper, 10% NaCl, 1% gelatin, 10 % alcoholic solution of α- naphthol, sulfuric acid, concentrated hydrochloric acid, 5% ferric chloride solution, chloroform, Molish's solution, Trim–Hill reagent (prepared using 10 ml acetic acid, 1 ml of 0.2% copper sulfate ($CuSO_4$, $5H_2O$), and Dragendorff's reagent (stock solution: 5.2gm bismuth carbonate + 4gm sodium iodide + 50mL glacial acetic acid, boiled for few min., after 12 hr. precipitated sodium acetate crystals are filtered by sintered glass funnel; 40mL filtrate + 160mL ethyl acetate + 1 mL distilled water, (stored in amber-colored glass bottle). The working solution included 10 mL stock solution + 20 mL acetic acid + distilled water to make the final volume 100 mL).

For investigation of Lipoidal matter, *n*-Hexane, 0.5N alcoholic potassium hydroxide, ether, 10 % 2N hydrochloric acid, 10, 20 % sulphuric acid, methanol, anhydrous sodium sulfate, and dilute ammonium hydroxide were utilized.

Apparatus

Thermo Scientific™ TRACE™ 1310 GC system, equipped with Electron Impact Ionization (EI) detector, TR-5 MS column (30 m x 0.32 mm i.d., 0.25 µm film thickness) was used (Faculty of Science, Assiut University).

Methods

Preparation of Extract for Phytochemical Screening

The methanol extraction method was employed to obtain a 20g viscous residue from 100g of air-dried powdered leaves of Latania verschaffeltii Lem. Qualitative phytochemical screening was conducted on the residue using the standard procedure for each constituent (Trease, Evans, 1989; Evans,1996).

Test for Sterols and Triterpenoids:

Salkowski's Test : About 0.5 g of the plant extract was dissolved in 5 chloroform and filtered, then a few milliliters of the filtrate mixed with a few drops of conc. After shaking H_2SO_4 well and allowing it to stand, the formation of a golden yellow layer at the bottom indicates a positive test for steroids and triterpenoids (Singh, Kumar,2017).

Test for Saponins:

The Foam Test: powder of the plant was mixed with 10 mL water. The mixture was vigorously shaken and

observed for the presence of froth. The froth persisted for a duration of 10 min, indicating a positive result (Tiwari *et al*.,2011).

Test for Tannins:

The Gelatin Test*: It* involves dissolving 1 g of plant extract in 10 milliliters of distilled water, which is then mixed with a 1% gelatin solution and 10% sodium chloride. The formation of a white precipitate would indicate the presence of tannins (Tiwari *et al*.,2011; Pandey, Tripathi, 2014)

Test for Flavonoids:

The Ammonia Test*:* It involved combining approximately 0.5 units of extract with 5 mL of diluted ammonia solution. The addition of concentrated H_2SO_4 resulted in the formation of yellow color, indicating the presence of flavonoids (Kumar *et al*.,2013).

Test for Phenolic Compounds:

The Ferric Chloride Test: Approximately 2 g of extract was added to a few drops of 5% ferric chloride sol. would result in the formation of a dark green/bluish-black color, indicating the presence of phenolic compounds

(Raaman, 2006; Tiwari *et al*., 2011).

Test for Carbohydrates and/or Glycosides:

Molish's Test –about 0.1 g solvent free extract is dissolved in 5 mL of distilled water and filtered then 2 mL filtrate was mixed with two drops of alcoholic α–naphthol and 1mL conc.H_2SO_4 (along the sides of test tube) a violet ring indicating the presence of Carbohydrates and /or glycosides (Raaman, 2006; Singh, Kumar,2017).

Test for Cardenolides:

About 0.5 g of extract of the plant was added to pyridine, Sodium nitroprusside, and 20% NaOH give red colour, fades to brownish yellow colour indicating the presence of Cardenolides (Audu, Mohammad, Kaita, 2007).

Test for Alkaloid:

Dragendroff's Test: About 0.5g plant extract was mixed with a few millimeters of dil. HCl and then filtered, then a few millimeters of the filtrate was mixed with 1-2 mL Dragendorff's reagents to give a reddish-brown precipitate. A positive result is indicated by the formation of a reddish-brown precipitate (Silva, Abeysundara, Aponso, 2017; Singh, Kumar,2017).

Test for Cyanogenic Glycoside:

Guignard's Test: When the powder is wet in water and heated for 30 min in a water bath, the yellow color of the sodium picrate paper inserted into the test tube will turn brick-red due to the formation of sodium isopurpurate, indicating the presence of cyanogenic glycoside (Brinker, David, 1989).

Test for Iridoids:

Trim & Hill Color Reaction: It involved the collection of approximately 0.4 g of plant extract in a test tube. This extract was then combined with 5 ml of 1% aqueous HCl. Following a time interval of 3 to 6 hours, a volume of 0.1 mL from the macerate was transferred into a separate tube containing 1 mL of the Trim–Hill reagent. When the tube is heated in flame briefly, a color is produced if certain iridoids are present (Wagner, Baldt, Zgainski,1984).

Preparation of Lipoidal Matter

The air-dried powder of *L*atania *verschaffeltii* Lem. (100g) was extracted utilizing *n*-hexane. The solvent was evaporated at 40°C under reduced pressure to yield 5 g residue of lipoidal matter.

Preparation of Unsaponifiable Matter

The *n*-hexane extract of the leaves was saponified with about 5 g of 0.5 N alc. KOH for 3 hrs. and refluxed into a boiling water bath. A significant part of the alcohol present was distilled, and the concentrated extract was diluted with distilled water. Afterward, the unsaponifiable matter (1.75 g) was extracted utilizing several portions of ether until exhaustion (Johnson, Davenport,1971).

Preparation of Saponifiable Matter

The alkaline aqueous solution (soap) that remained after the removal of the unsaponifiable matter was acidified with sulphuric acid (20%), and the liberated fatty acids were extracted with ether. The combined ether extract was washed several times with distilled water until the washings were acidity-free. The ether extract was dried over anhydrous sodium sulfate. The solvent was subjected to distillation under reduced pressure, resulting in the formation of a thick residue composed of free fatty acids. These fatty acids exhibited a yellowish-brown color. The residue was subsequently subjected to methylation (Johnson, Davenport,1971).

Preparation of Fatty Acid Methyl Esters

The obtained fatty acid residue was dissolved in 150 mL of 10% H_2SO_4 in MeOH and then refluxed for 4 – 6 hrs. The solvent was distilled off, and the residue was taken in 10 mL of distilled water. The aqueous solution was made alkaline with dilute ammonium hydroxide, where an oily layer was separated and extracted with ether till exhaustion. The ethereal extracts were combined and distilled to give a yellowish-brown residue (2.45 g). A part of this residue was kept for further investigation (Johnson, Davenport,1971).

Gas Chromatography-Mass Spectrometry Technique (Gc-Ms):

The sample was analyzed on Thermo Scientific™ TRACE™ 1310 GC system, equipped with Electron Impact Ionization (EI) detector, TR-5 MS column (30 m x 0.32 mm i.d., 0.25 µm film thickness) and connected to Mass Spectrometer operating in EI mode (70 eV; m/*z* 40–750; source temperature, 300 °C; Run Time: 74.00 min.; Initial temperature: 60.0 °C; Initial hold time: 2.00 min; Sample volume: 2.00 µL). The final temperature at the first ramp was 150 °C for 10 min, increased to 200 °C at 10 °C/min, and maintained for 15 min at 280°C. The carrier gas was helium at a 1.0 mL/min flow rate. The transfer line temperature was maintained at 280 °C, and the split ratio was 1:10.

Investigation of Lipoidal Matter

The GC chromatogram of the analyzed sample is shown in (Figures 1 & 2). Components were identified based on their retention times and interpretation of spectrometric fragmentation using the National Institute of Standards and Technology (NIST) database. The database is based on more than sixty thousand patterns of known compounds. Non-congruent peaks with corresponding peaks in a library spectrum were excluded, whereas congruent peaks were classified as impurities to ensure a rigorous standard of accuracy and precision in the results.

RESULTS

Preliminary Phytochemical Screening

The preliminary phytochemical screening of *Latania verschaffeltii* Lem. leaves showed the presence of carbohydrates and /or glycosides, unsaturated sterols and /or triterpenes, phenolic acids, tannins, flavonoids, and saponins. Conversely, cardienolides, cyanogenic compounds, alkaloids, and iridoids were absent.

Gc-Ms Analysis of Fatty Acid Methyl Esters and Unsaponifiable Matter

The results of GC-MS analysis of fatty acid methyl esters are depicted in (Figure 1 & Table I). The analysis detected the presence of 25 compounds. Most of these compounds are saturated fatty acids methyl esters (83.82%). In contrast, the unsaturated fatty acids methyl esters and the unidentified compound represent 9.42% and 6.76%, respectively. The most abundant saturated fatty acid methyl esters in the saponifiable fraction are hexadecanoic acid methyl ester (41.68%), thiophene-2-acetic acid undecyl ester (18.73%), methyl tetradecanoate (7.24%), dodecanoic acid methyl ester (6.25%), and octadecanoic acid methyl ester (3.95%). The major unsaturated fatty acid was (*E*)-9-octadecenoic acid methyl ester (2.90%).

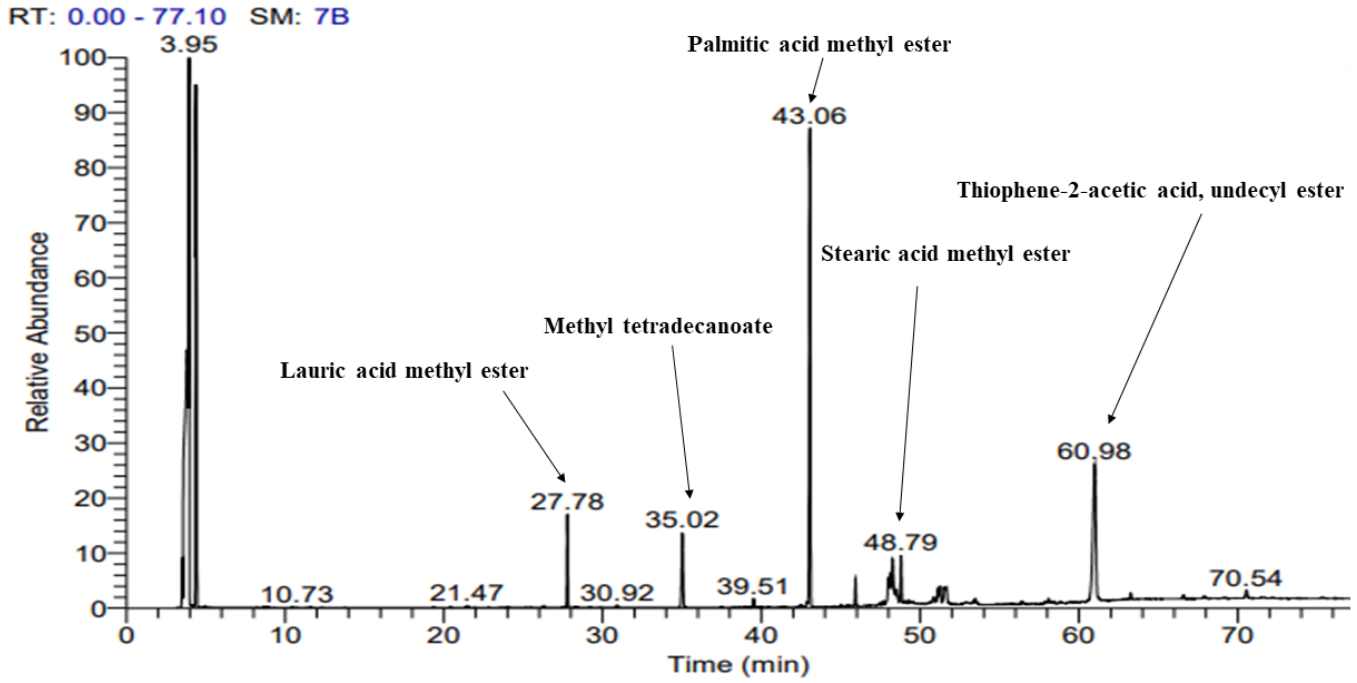

FIGURE 1 - Chromatogram of GC/MS analysis of the fatty acid methyl esters of *Latania verschaffeltii* Lem. leaves.

TABLE I - Results of GC/MS analysis of fatty acid methyl esters of *Latania verschaffeltii* Lem. Leaves

Component name	Classification of compounds	Molecular Formula	Similarity %	RT (min)	Molecular ion peak (m/z)	PA (%)
Decanoic acid methyl ester (Capric acid methyl ester)	Saturated fatty acid methyl ester	$C_{11}H_{22}O_2$	22.8	21.47	186	0.12
Dodecanoic acid methyl ester (Lauric acid methyl ester)	**Saturated fatty acid methyl ester**	**$C_{13}H_{26}O_2$**	**76.4**	**27.78**	**214**	**6.25**
Tridecanoic acid methyl ester	Saturated fatty acid methyl ester	$C_{14}H_{28}O_2$	35.6	30.92	228	0.17
Methyl tetradecanoate	**Saturated fatty acid methyl ester**	**$C_{15}H_{30}O_2$**	**71.4**	**35.02**	**242**	**7.24**
Pentadecanoic acid methyl ester	Saturated fatty acid methyl ester	$C_{16}H_{32}O_2$	68.9	39.51	256	0.75
11-Hexadecenoic acid methyl ester	Unsaturated fatty acid methyl ester	$C_{17}H_{32}O_2$	7.1	42.52	268	0.16
(*Z*)-9-Hexadecenoic acid methyl ester (Methyl palmitoleate)	Unsaturated fatty acid methyl ester	$C_{17}H_{32}O_2$	10.5	42.88	268	0.12
Hexadecanoic acid methyl ester (Palmitic acid methyl ester)	**Saturated fatty acid methyl ester**	**$C_{17}H_{34}O_2$**	**85.8**	**43.06**	**270**	**41.68**

TABLE I - Results of GC/MS analysis of fatty acid methyl esters of *Latania verschaffeltii* Lem. Leaves

Component name	Classification of compounds	Molecular Formula	Similarity %	RT (min)	Molecular ion peak (m/z)	PA (%)
Hexadecanoic acid ethyl ester	Saturated fatty acid ethyl ester	$C_{18}H_{36}O_2$	63.4	45.01	284	0.10
(*Z, Z*)-9-Hexadecenoic acid, 9-octadecenyl ester	Unsaturated fatty acid 9-octadecenyl ester	$C_{34}H_{64}O_2$	5	45.47	504	0.13
Heptadecanoic acid methyl ester (Margaric acid methyl ester)	Saturated fatty acid methyl ester	$C_{18}H_{36}O_2$	57.1	45.92	284	2.00
(*E, E*)-9,12-Octadecadienoic acid methyl ester **(**Linolelaidic acid methyl ester)	Unsaturated fatty acid methyl ester	$C_{19}H_{34}O_2$	10.1	47.67	294	0.29
9,12-Octadecadienoic acid (*Z, Z*)-, methyl ester (Linoleic acid methyl ester)	Unsaturated fatty acid methyl ester	$C_{19}H_{34}O_2$	12.5	47.99	294	1.46
(*E*)-9-Octadecenoic acid methyl ester (Elaidic acid methyl ester)	**Unsaturated fatty acid methyl ester**	**$C_{19}H_{36}O_2$**	**10.1**	**48.26**	**296**	**2.90**
8,11-Octadecadienoic acid methyl ester	Unsaturated fatty acid methyl ester	$C_{19}H_{34}O_2$	8.1	48.51	294	0.60
Octadecanoic acid methyl ester (Stearic acid methyl ester)	**Saturated fatty acid methyl ester**	**$C_{19}H_{38}O_2$**	**61.8**	**48.79**	**298**	**3.95**
Linoleic acid ethyl ester	Unsaturated fatty acid ethyl ester	$C_{20}H_{36}O_2$	6.3	49.13	308	0.23
10,13-Eicosadienoic acid methyl ester	unsaturated fatty acid methyl ester	$C_{20}H_{36}O_2$	8.3	49.29	322	0.27
7,10-Octadecadienoic acid methyl ester	unsaturated fatty acid methyl ester	$C_{19}H_{34}O_2$	10.9	50.87	294	0.64
2-Furanoctanoic acid,5-hexyltetrahydro-methyl ester	Unsaturated carboxylic acid methyl ester	$C_{19}H_{36}O_3$	18.4	51.12	312	1.22
Docosanoic acid, 8,9-dihydroxy- methyl ester	Saturated fatty acid methyl ester	$C_{23}H_{46}O_4$	3.9	51.25	386	1.49
6,9,12,15-Docosatetraenoic acid methyl ester	unsaturated fatty acid methyl ester	$C_{23}H_{38}O_2$	5.8	51.64	346	1.40
Thiophene-2-acetic acid undecyl ester	**saturated fatty acid undecyl ester**	**$C_{17}H_{28}O_2S$**	**79.6**	**60.98**	**296**	**18.73**
Docosanoic acid methyl ester (Behenic acid methyl ester)	saturated fatty acid methyl ester	$C_{22}H_{44}O_2$	4.8	63.26	340	0.53
Tetracosanoic acid methyl ester (Methyl lignocerate)	saturated fatty acid methyl ester	$C_{25}H_{50}O_2$	10.8	70.54	382	0.81

TABLE I - Results of GC/MS analysis of fatty acid methyl esters of *Latania verschaffeltii* Lem. Leaves

Component name	Classification of compounds	Molecular Formula	Similarity %	RT (min)	Molecular ion peak (m/z)	PA (%)
Saturated fatty acids						**83.82**
Unsaturated fatty acids						**9.42**
Unidentified compounds						**6.76**

RT: Retention time; **PA**: Peak area; **m/z**: mass to charge ratio.

The results of GC-MS analysis of the unsaponifiable matter are depicted in (Figure 2 and Table II). The analysis revealed the presence of 85.97% terpenes, 5.66% hydrocarbons, 2.18% sterols,0.96% fatty alcohols, and 5.23 % unidentified compounds. (1-butyloctyl)-Benzene (0.47%) and 2-phenyl-pentadecane (0.45%) represented the major hydrocarbons. 2-Propyl-1-pentanol (0.75%) was the major fatty alcohol, phytol (43.62%) and squalene (39.27%) were the major terpenes. Cyclic 1,2-ethanediylaetal, (5á)-cholestan-3-one (1.20%) was the major sterol identified.

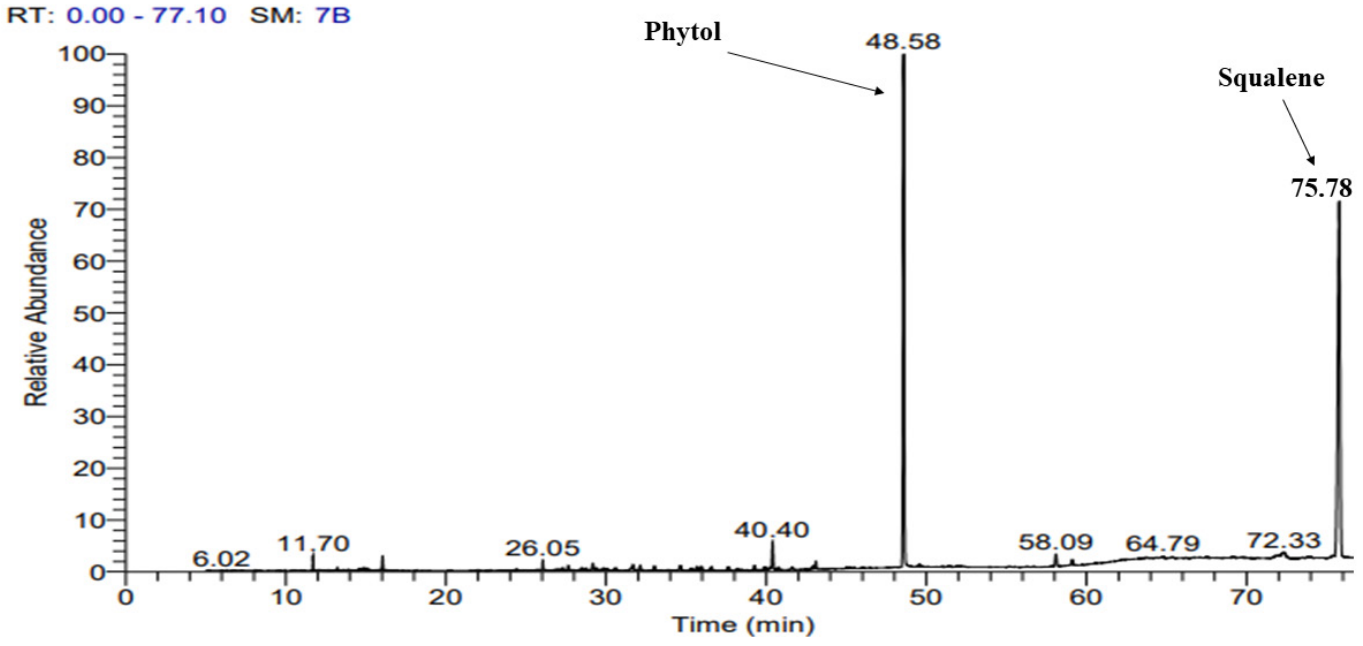

FIGURE 2 - Chromatogram of GC/MS analysis of the unsaponifiable matter of *Latania verschaffeltii* Lem. leaves.

TABLE II - Results of GC/MS analysis of the unsaponifiable matter of *Latania verschaffeltii* Lem. leaves

Component name	Classification of compounds	Molecular Formula	Similarity (%)	RT (min)	Molecular ion peak (m/z)	PA (%)
2-Propyl-1-pentanol	**fatty alcohol**	**$C_8H_{18}O$**	**59.3**	**11.70**	**130**	**0.75**
3-ethyl-5-(2-ethylbutyl)-Octadecane	hydrocarbon	$C_{26}H_{54}$	17.5	13.22	366	0.18
6-methyl -Octadecane	hydrocarbon	$C_{19}H_{40}$	17.9	14.91	368	0.15
Dodecane	hydrocarbon	$C_{12}H_{26}$	20.7	16.04	170	1.00
(*E*)-6,10-dimethyl -5,9-Undecadien-2-one	terpene	$C_{13}H_{22}O$	44.9	26.05	194	0.61
(1-butylhexyl)-Benzene.	hydrocarbon	$C_{16}H_{26}$	26.2	28.47	218	0.17
(1-propylheptyl)-Benzene	hydrocarbon	$C_{16}H_{26}$	14.2	28.75	218	0.15
17-Pentatriacontene	hydrocarbon	$C_{35}H_{70}$	6.7	29.85	490	0.12
(1-methylhexadecyl)-Benzene.	hydrocarbon	$C_{23}H_{40}$	22.5	30.59	316	0.18
(1-pentylhexyl)-Benzene	hydrocarbon	$C_{17}H_{28}$	38.4	31.57	232	0.21
(1-butyloctyl)-Benzene	hydrocarbon	$C_{18}H_{30}$	67.3	31.70	246	0.47
(1-propylheptadecyl)-Benzene	hydrocarbon	$C_{26}H_{46}$	55	32.12	358	0.38
(1-ethyldecyl)-Benzene	hydrocarbon	$C_{18}H_{30}$	58	33.02	246	0.40
2-phenyl-Pentadecane	hydrocarbon	$C_{21}H_{36}$	63.4	34.62	288	0.45
3,7,11-trimethyl-1-Dodecanol	fatty alcohol	$C_{15}H_{32}O$	12.7	35.33	228	0.21
(1-hexyltetradecyl)-Benzene	hydrocarbon	$C_{26}H_{46}$	75.6	35.68	358	0.38
(1-propylnonyl)-Benzene	hydrocarbon	$C_{18}H_{30}$	82.6	35.94	246	0.37
(1-methylnonadecyl)-Benzene	hydrocarbon	$C_{26}H_{46}$	60.7	39.27	358	0.43
13-phenyl-Pentacosane	hydrocarbon	$C_{31}H_{56}$	20.9	39.95	428	0.32
(1-butylnonyl)-Benzene	hydrocarbon	$C_{19}H_{32}$	15.3	40.23	260	0.15
2-Pentadecanone, 6,10,14-trimethy	terpene	**$C_{18}H_{36}O$**	86.2	40.40	268	2.33
3-acetoxy-7,8-Epoxylanostan-11-ol	Sterol	$C_{32}H_{54}O_4$	8.8	45.01	502	0.15
Phytol	**terpene**	**$C_{20}H_{40}O$**	**76.1**	**48.58**	**296**	**43.62**
Ethyl iso-allocholate	Sterol	$C_{26}H_{44}O_5$	31.2	51.95	436	0.10
cyclic 1,2-ethanediyl aetal, (5á)-cholestan-3-one	**Sterol**	**$C_{29}H_{50}O_2$**	**10.9**	**58.09**	**430**	**1.20**
Lycopene	terpene	$C_{40}H_{56}$	10.3	67.51	536	0.14

TABLE II - Results of GC/MS analysis of the unsaponifiable matter of *Latania verschaffeltii* Lem. leaves

Component name	Classification of compounds	Molecular Formula	Similarity (%)	RT (min)	Molecular ion peak (m/z)	PA (%)
(3á,22*E*)-Ergosta-5,22-dien-3-ol, acetate	Sterol	$C_{30}H_{48}O_2$	12.6	72.33	440	0.73
Squalene	**terpene**	$\mathbf{C_{30}H_{50}}$	**39.6**	**75.78**	**410**	**39.27**
Total hydrocarbons						**5.66**
Fatty alcohols				**0.96**		
Total terpenes				**85.97**		
Total sterols				**2.18**		
Total identified compound				**94.77**		
Unidentified compounds				**5.23**		

RT: Retention time; **PA**: Peak area; **m/z**: mass to charge ratio.

DISCUSSION

The preliminary phytochemical profiling of *Latania verschaffeltii* Lem. leaves revealed a high composition of saponins, tannins, phenolic acids, flavonoids, carbohydrate and/or glycosides, unsaturated sterols and/or triterpenes. Lipoidal matter investigation of *Latania verschaffeltii* Lem. by GC/MS analysis revealed that the most abundant terpenes are phytol (43.62%) and squalene (39.27%), and the major fatty acid methyl ester was palmitic acid methyl ester (hexadecanoic acid methyl ester) (41.68 %).

Many biological activities have been reported for palmitic acids, such as antibacterial, antifungal, antioxidant, anti-inflammatory, hypocholesterolemic activities, and hemolytic properties (Kamal *et al*., 2017; Starlin *et al*.,2019). Palmitic acid methyl ester was proven to be a hemolytic, 5-alpha-reductase inhibitor, and nematicide agent (Rajeswari, Murugan, Mohan,2012). It decreases blood cholesterol and exhibits selective anti-inflammatory action by inhibiting the cyclooxygenase 2 enzyme (Belakhdar, Benjouad, Abdennebi,2015). Phytol, a cyclic diterpenoid, was reported to have neuroprotective, antimicrobial, anti-inflammatory, and anti-diuretic activities (Kumar, Kumaravel, Lalitha, 2010; Banjare *et al*.,2017). Phytol has been documented to demonstrate anti-tumor and antioxidant properties. Since phytol is a branching chain of unsaturated alcohol, its antioxidant properties can be attributed to the hydroxyl group present in molecules (Serafini *et al*., 2011; Oyugi *et al*., 2011). Squalene was reported to have antibacterial, immunostimulant, anti-tumor, cancer preventive, chemopreventive, lipoxygenase-inhibitor, antioxidant, pesticide, and diuretic activities (Rajeswari, Murugan, Mohan, 2012; Quesada *et al*.,2018).

CONCLUSION

The qualitative preliminary phytochemical screening of *Latania verschaffeltii* Lem. leaves have demonstrated that they contain a diverse range of bioactive secondary metabolites, including phenolic acids, saponins, tannins, flavonoids, carbohydrates and/or glycosides, as well as unsaturated sterols and/or triterpenes. GC/MS analysis showed that the percentage of saturated fatty acids (83.82%) is higher than that of unsaturated ones (9.42%). Palmitic acid methyl ester was the major saturated fatty acid methyl ester (41.68%), while phytol (43.62%) and squalene (39.27%) represented the major terpenes. The presence of these valuable compounds in the leaves suggests the potential for medicinal applications of this palm. Consistent with the worldwide imperative to explore bioactive metabolites derived from natural origins, the plant

currently under investigation can serve as a potential source of compounds with medicinal properties.

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