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Original Article

GC-MS Analysis and Assessment of the Anthelmintic and Antioxidant Potential of the Aerial Parts of Common Indian Vegetative Plant *Lagenaria siceraria* (Molina) Standley (LS)

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ABSTRACT

Objectives: In this work, the photo components were investigated utilising GC-MS analysis and *in vitro* antioxidant activity, and the anthelmintic potential of methanolic extract of aerial parts of the *Lagenaria siceraria* (MEALS). By using the soxhlation method. **Materials and Methods:** MEALS were made from aerial components, and phytochemical analysis was carried out for a qualitative evaluation. The *in vitro* antioxidant activity was measured using the ABTS technique, and the current extract was utilised to analyse phytocomponents by GC-MS and study anthelmintic activity on *Pheretima posthuma*. The extract of *Lagenaria siceraria* included 59 components, according to the GC-MS study's phytochemical analysis. **Results:** Results from anthelmintic research reveal that MEALS had paralysis times between 4.76 and 2.17 min and death times between 6.18 and 2.34 min when compared to the medicine Albendazole, which is the gold standard (paralysis time 4.76 min to 2.17 min and death time 5.87 min to 1.96 min on *Peritima posthuma* in increasing order of concentration). The percentage of scavenging ranged from 33.31% to 82.33% (IC_{50} 143) and by standard medicine (ascorbic acid) from 49.47% to 94.73% (IC_{50} 103) using the ABTS technique in the evaluation of an antioxidant activity. **Conclusion:** Due to the presence of physiologically active phytocomponents, aerial sections of the *Lagenaria siceraria* (MEALS) were shown to be potent anthelmintic and antioxidant agents.

Keywords: *Lagenaria siceraria*, GC-MS study, Extraction, Antioxidant, Anthelmintic.

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INTRODUCTION

Traditional medical systems have historically been crucial in meeting the world's healthcare demands. They continue to do so today and will do so in the future. The term "Indian Systems of Medicine" refers to medical systems that have been assimilated into Indian culture and are believed to have Indian origins or to have come to India from other nations (ISM). Ayurveda, Yoga, and Naturopathy all have variations, as do Unani, Siddha, and homoeopathy. India has six recognised medical systems, which is a distinction in this area[1]. In order to develop the best new plant-based medications, it is crucial to use a rigorous and scientific method for biologically evaluating plant products based on their use in conventional medicine. *Lagenaria siceraria* (Molina) standley (LS) is one such plant (Family: Cucurbitaceae). This huge, annular, softly pubescent, climbing or trailing herb is native to India.[2] *Lagenaria siceraria*, also referred to as bottle gourd, is a significant food plant that contributes between 5 and 6 per cent of all vegetables produced globally [Figure 1]. The fruits of this plant species are frequently used in cooking in India and its subcontinents. The fruit possesses benefits that are cardioprotective, antihyperlipidemic, and antihyperglycemic. The primary bioactive components of fruit are phenolic glycosides, phenolic acids, flavonoids, flavonoids, flavonoids, flavon-C-glycosides like isovitexin, isoorientin, saponarin, and sterols such fucosterol, campesterol, cucurbitacin B, cucurbitacin D, and cucurbitacin E. The *Lagenaria siceraria*, family Cucurbitaceae, a literature review found that only a small number of studies have used the areal sections for diverse activities including anti-inflammatory, analgesic, antibacterial,[3] antihyperlipidemic, antidiabetic,[4] antioxidants,[5] anticancer,[6] and anthelmintic[7] action. Researchers are becoming more interested in this plant because of its medicinal effects on conditions like diabetes, obesity, and related metabolic disorders. According to the results of the ethnobotanical study, raw leaf juice has been used to cure helminthiasis by removing worms from the gastrointestinal tract. The current research effort has been created to carry out the

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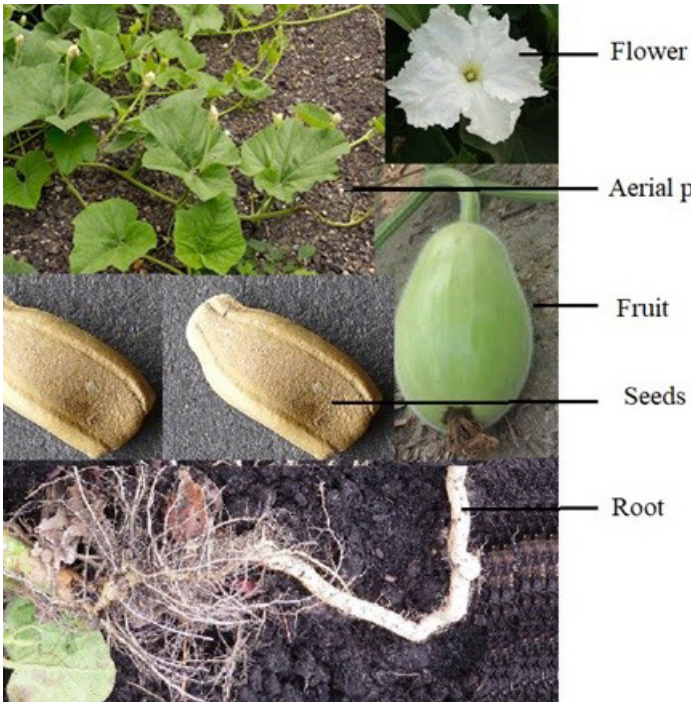

Figure 1: Different parts of the *Lagenaria siceraria* Plant.

photochemical study, GC-MS study, and anthelmintic activity of the methanolic extract of the *Lagenaria siceraria* aerial parts after gathering the aforementioned scientific data. Future applications of this work include HPTLC analysis employing potential markers, quantitative estimate of phytoconstituent presence, isolating the active ingredients from various extracts, and other pharmacological activities.

MATERIALS AND METHODS

Plant materials

Dr. Suchandra Samanta Mandal, a botanist from Krishnanagar B.Ed College in Nadia, West Bengal, India, authenticated the disease-free area parts of *Lagenaria siceraria* (excluding fruits and flowers) in the month of March from a local area at Barasat, Kolkata, and assigned the reference number Cert/02/2022. The various components of a fresh plant are thoroughly cleaned before being dried in the shade until all water content has been removed. The plant's dried aerial parts are collected and ground till a gritty texture is produced. The plant specimen in the herbarium according to protocol.

Preparation of methanolic extract

Lagenaria siceraria's aerial components were removed using the hot soxhlation process. The aerial components underwent shade drying. For 72 hr, shade drying was done in an environment with natural airflow and a temperature of 25°C. The arial components were manually chopped into small pieces and processed into a coarse powder. For the extraction, 1200 ml of 100% methanol (Merck, Mumbai, India) was combined with 200 g of powdered *Lagenaria siceraria* Arial sections. The mixture was filtered, the filtrate was heated to between 45 and 50 degrees Celsius in a rotary evaporator, and the residue was kept in a refrigerator until it was needed.

Chemicals and instruments

The Soxhlet apparatus and distillation unit (Borosil) was used, for GC-MS analysis of the studied extract GCMS-QP 2010 plus a single quadrupole gas chromatograph-mass spectrometer (Shimadzu, Japan) was used. The UV-visible spectrophotometer UV-1900, manufactured by Shimadzu in Japan, was employed. The chemicals are from Mumbai's Sigma Aldrich.

Phytochemical evaluation

Glycosides, alkaloids, volatile oils, saponins, and many more chemicals with physiological effects can be found in plants and can be thought of as a biosynthetic laboratory. These chemical compounds include those used as food by humans, such as carbohydrates, proteins, and lipids. Secondary metabolites are typically the substances in charge of therapeutic effects. A thorough investigation of crude medicine includes both main and secondary metabolites produced by plant metabolism. The methanolic extract of the *Lagenaria siceraria* aerial parts was subjected to preliminary phytochemical screening[8] in accordance with the published technique for the detection of a number of phytoconstituents.

GC-MS analysis of phytoconstituents

The optimised conditions for the GC-MS instrument during the analysis of a methanolic extract of the aerial parts of the *Lagenaria siceraria* were performed on GCMS-QP 2010 plus single quadrupole gas chromatograph-mass spectrometer (Shimadzu, Japan). The following were the GC-MS analysis's experimental conditions: TR 5-MS standard non-polar capillary column, 30 Mts, 0.25 mm ID, 0.25 m Film thickness. Helium (He), the mobile phase carrier gas, was pumped at a rate of 1.0 mL/min. The temperature programme (oven temperature) for gas chromatography was set at an injection temperature of 250°C and an increased temperature of 60°C. The ion source temperature was maintained 220°C. The column flow rate was maintained at 3mL/min. The injection volume was 1 µl. Samples dissolved in chloroform were run at a range of 50–650 m/z and the results were compared by using Wiley Spectral library search programme.

Anthelmintic activity

The assessment of the anthelmintic activity of methanolic extracts of the aerial portions of *Lagenaria siceraria* was conducted on adult Indian earthworms (*Pheretima posthuma*) for the examination of this activity.[9,10] (Molina). The earthworms were gathered from the wet soil of Banamalipur, Barasat, in West Bengal's north 24 pargana. Worms were initially kept in Tyrode solution, after

being cleansed in saline water to remove the faeces, composed of sodium chloride 8g, potassium chloride 0.2g, calcium chloride 0.2g, sodium-di-hydrogen phosphate 0.1g, magnesium chloride 0.1g, glucose 1g and sodium bicarbonate 1g in 1000 ml distilled water. For the experiment, worms with measurements of 9 cm in length and 0.2–0.3 cm in width were used. According to the recognised protocol, the adult Indian earthworm *Pheretima posthuma* was utilised to test the anthelmintic activity. After being diluted with sterile saline solution, three quantities of the standard drug sample albendazole (99.60%, bought from Cadila Pharmaceutical Ltd., Ahmedabad, India) were applied to Petri plates. To produce concentrations of 25, 50, and 100 mg/mL, the methanolic extracts of the aerial portions of *Lagenaria siceraria* (Molina) were diluted with saline solution (0.90% w/v of NaCl). As the negative control, saline solution (0.9% NaCl) was utilised only. For testing, all dilutions were added to the Petri dishes. We took seven petri dish sets and numbered them. Each petri dish contained six earthworms (n=6) that were the same size (8 cm), and they were kept at ambient temperature. The paralysis and death (lethal) times were then seen, reported, and recorded in minutes for each petri dish. The tests were carried out three times. The earthworm's paralysis (lack of movement) and death (no movement) times were observed to determine the anthelmintic property. Using a regular saline solution will allow you to verify that the worm has lost its ability to move. Dip the worm in warm water that is 50°C to determine when it will die. Additionally, the colour was assessed, and any fading of the worm's colour was noted.

In vitro antioxidant activity

The 2, 2' azino bis (3- ethylbenzthiazoline- 6- sulfonic acid) diammonium salt radical is scavenged using the ABTS radical scavenging method.[11]. The reaction between ABTS and potassium persulfate that produces the ABTS radical, a blue-green chromogen. In the presence of an antioxidant reductant, the coloured radical is converted back into colourless ABTS, and the absorbance was measured at 734 nm. A stock solution containing 1 mg of dried extract per millilitre was generated by mixing 100 mg of a dried extract with 100 ml of ethanol or distilled water to make the test sample. To get the necessary concentration, aliquots from this stock solution were then further diluted with ethanol or distilled water. Accurately 0.238 grammes of disodium hydrogen phosphate, 0.019 grammes of potassium di-hydrogen phosphate, and 0.8 grammes of sodium chloride were dissolved in 100 millilitres of distilled water to create the phosphate buffer, which has a pH of 7.4. ABTS 2mM (0.0274g in 25ml) was created in distilled water. 70 mM of potassium per sulphate (0.018g in 1 ml) was generated in distilled water. After two hours, 25ml of ABTS and 0.1ml of potassium per sulphate were mixed and used. It was necessary to use this test solution, also known as ABTS radical cation. 1 ml of extracts was combined with 3.4 ml of phosphate buffer pH 7.4 and 0.6 ml of ABTS radical cation at several concentrations (100-200 g/ml). Instead of the test, ethanol was used as the control. The absorbance was measured at 734 nm. The experiment was performed in triplicate.[12]

% Scavenging = (Control-Test/ Control) × 100

RESULTS

Preliminary phytochemical test

Lagenaria siceraria's aerial parts were subjected to preliminary phytochemical analysis, which revealed the presence of phytoconstituents in the classes of carbohydrates, polyphenols, flavonoids, and glycosides but the lack of alkaloids, proteins, and amino acids.

Molecular weight and molecular formula determination of the phytocomponents by GC-MS

The various compounds discovered in the methanolic extract of *Lagenaria siceraria's* aerial parts were identified using mass spectrometry and GC (GC-MS). The GC-MS chromatogram (Figure 2) demonstrates the presence of a variety of components with various retention times. The mass spectrometer's determination of the components' various elution times indicates that the components' structures and physiochemical properties differ. Peaks may appear at different *m/z* ratios as a result of a large chemical disintegrating into smaller components (as shown in Figures 3A and B). The compounds that matched the peaks obtained from the components were identified using the data library. The molecular weight and formula of 59 biomolecules were detected in the aerial portions of *Lagenaria siceraria* extracts. Table 1 summarises the list of phytoconstituents, and Figures 3A and 3B depict the chemical make-up.

Results of anthelmintic potential

On *Pheritima posthuma* (adult Indian earthworms), three different doses of the methanolic extract of *Lagenaria siceraria's* aerial parts were evaluated for *in vitro* anthelmintic action. The relationship between the duration of paralysis and the duration of death and conventional medicine albendazole The paralysis and death periods of earthworms were 3.02 and 3.49 min, respectively, when aerial portions of *Lagenaria siceraria* were present in a solution at a concentration of 100 mg/mL. When the extract concentration is increased to 150 mg/mL, earthworm paralysis and death periods are revealed to be 2.17 and 2.34 min, respectively, as opposed to 1.25 and 1.96 min for normal albendazole. The anthelminthic potential of the investigated plant was evaluated using various doses of the methanolic extracts. Table 2 presents the outcomes. In Figure 4, it was depicted visually.

Results of *In vitro* antioxidant activity

At two distinct concentration levels, the methanolic extract of *Lagenaria siceraria's* aerial portions was tested for its *in vitro* antioxidant activity. The concentration range of the produced

Table 1: GC-MS analysis report of the aerial parts of the *Lagenaria siceraria*.

Sl. No	Compound Name	Molecular Formula	Molecular weight	Retention time (minute)	Peak area (%)	Compound Nature
1.	Propanoic acid, 2-methyl-, methyl ester	$C_5H_{10}O_2$	102	3.540	0.25	Ester
2.	dl-Glyceraldehyde dimer	$C_6H_{12}O_6$	180	3.699	0.37	Aldehyde
3.	1,2-Cyclopentanedione	$C_5H_6O_2$	98	4.162	0.62	Ketone
4.	Glycerin	$C_3H_8O_3$	92	4.791	5.72	Polyphenols
5.	1,3,5-Triazine-2,4,6-triamine	$C_3H_6N_6$	126	6.100	0.36	Amines
6.	dl-Glyceraldehyde dimer	$C_6H_{12}O_6$	180	6.985	0.27	Aldehyde
7.	4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-	$C_6H_8O_4$	144	7.118	0.34	Polyphenols
8.	Glutamine	$C_5H_{10}N_2O_3$	146	7.568	0.11	Amines
9.	3-Cyclohexene-1-methanol,. alpha.,.alpha.4-trimethyl-	$C_{10}H_{18}O$	154	7.805	0.16	Non aromatic
10.	Benzofuran, 2,3-dihydro-	C_8H_8O	120	8.103	0.15	Aromatic
11.	1,2,3-Propanetriol, diacetate	$C_7H_{12}O_5$	176	8.445	0.63	Polyphenols
12.	2,6-Octadien-1-ol, 3,7-dimethyl-,	$C_{10}H_{18}O$	154	8.598	0.12	polyphenols
13.	4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-	$C_6H_8O_4$	144	8.945	0.17	Aromatic polyphenls
14.	Nonane, 3-methyl-5-propyl-	$C_{13}H_{28}$	184	9.164	0.27	Alkane
15.	2-Methoxy-4-vinylphenol	$C_9H_{10}O_2$	150	9.516	0.29	Aliphatic alcohol
16.	Butanamide, 2-hydroxy-N,2,3,3-tetramethyl-	$C_8H_{17}NO_2$	159	10.722	0.24	Amide
17.	Phenol, 2-methoxy-4-(tetrazol-1-yliminomethyl)-	$C_9H_9N_5O_2$	219	11.105	0.28	Heterocyclic aromatic
18.	1H-Benzimidazole	$C_7H_6N_2$	118	11.698	0.64	Heterocyclic aromatic
19.	Ribitol	$C_5H_{12}O_5$	152	12.155	0.22	Polyphenols
20.	2(4H)-Benzofuranone, 5,6,7,7a-tetrahydro-4,4,7a-trimethyl-, (R)-	$C_{11}H_{16}O_2$	180	12.455	0.14	Ketone
21.	3-Buten-2-one, 4-(4-hydroxy-2,2,6-trimethyl-7-oxa bicyclo[4.1.0]hept-1-yl)-	$C_{13}H_{20}O_3$	224	14.154	0.21	Polyphenols
22.	Tetradecanoic acid	$C_{14}H_{28}O_2$	228	14.740	0.31	Carboxylic acid
23.	Acetic acid, 2-(2,2,6-trimethyl-7-oxa-bicyclo[4.1.0]hept-1-yl)-propenyl ester	$C_{14}H_{22}O_3$	238	15.130	0.38	Ester
24.	Cyclohexanol, 5-methyl-2-(1-methylethyl)-, benzoate, [1R(1. alpha.,2.beta.,5.alpha.)]-	$C_{17}H_{24}O_2$	260	15.606	0.12	Alcohol
25.	Pentadecanoic acid	$C_{15}H_{30}O_2$	242	15.805	0.24	Carboxylic acid
26.	1,2-Benzenedicarboxylic acid, bis(2-methylpropyl) ester	$C_{16}H_{22}O_4$	278	16.028	0.19	Ester
27.	Hexadecanoic acid, methyl ester	$C_{17}H_{34}O_2$	270	16.484	0.73	Ester
28.	9-Tetradecenal, (Z)-	$C_{14}H_{26}O$	210	16.659	0.21	Aldehye
29.	l-(+)-Ascorbic acid 2,6-dihexadecanoate	$C_{38}H_{68}O_8$	652	16.848	13.93	Ester

Sl. No	Compound Name	Molecular Formula	Molecular weight	Retention time (minute)	Peak area (%)	Compound Nature
30.	4'-(.beta.-Chloroethyl)acetophenone $$ 1-[4-(2-Chloroethyl)phenyl]ethanone	$C_{11}H_{14}O_4$	210	17.308	0.21	Ketone
31.	7,10,13-Hexadecatrienal	$C_{16}H_{26}O$	234	17.617	0.36	Aldehyde
32.	Heptadecanoic acid	$C_{17}H_{34}O_2$	270	17.787	0.11	Heptadecanoic acid
33.	9,12,15-Octadecatrienoic acid, ethyl ester,	$C_{20}H_{34}O_2$	306	18.212	1.52	Ester
34.	Phytol	$C_{20}H_{40}O$	296	18.312	1.88	Alcohols
35.	9,12,15-Octadecatrienoic acid, ethyl ester,	$C_{20}H_{34}O_2$	306	18.598	33.94	Ester
36.	Octadecanoic acid	$C_{18}H_{36}O_2$	284	18.722	9.32	Octadecanoic acid
37.	Hexadecanamide	$C_{16}H_{33}NO$	255	18.953	3.42	Amide
38.	Benzyl.beta.-d-glucoside	$C_{13}H_{18}O_6$	270	19.629	0.93	Glycoside
39.	1,8-Diazacyclotetradecane-2,7-dione	$C_{12}H_{22}N_2O_2$	226	19.813	0.22	Ketone
40.	9-Octadecenoic acid, 1,2,3-propanetriyl ester,	$C_{57}H_{104}O_6$	884	20.281	0.64	Ester
41.	9-Octadecenamide,	$C_{18}H_{35}NO$	281	20.537	9.26	Amide
42.	Octadecanamide	$C_{18}H_{37}NO$	283	20.713	0.16	Amide
43.	Ethanamine, 2,2'-oxybis[N,N-dimethy	$C_8H_{20}N_2O$	160	21.316	0.23	Amine
44.	Hexadecanoic acid, 2-hydroxy-1-(hydroxymethyl)ethyl ester	$C_{19}H_{38}O_4$	330	21.682	0.51	Carboxylic acid
45.	Quinoxaline, 2,3-diphenyl-	$C_{20}H_{14}N_2$	282	22.216	0.27	Heterocyclic
46.	9,12-Octadecadienoic acid (Z,Z)-, 2,3-dihydroxypropyl ester	$C_{21}H_{38}O_4$	354	23.077	0.24	Carboxylic acid
47.	9,12,15-Octadecatrienoic acid, ethyl ester, (Z,Z,Z)-	$C_{20}H_{34}O_2$	306	23.149	0.50	Carboxylic acid
48.	13-Docosenamide, (Z)-	$C_{22}H_{43}NO$	337	23.720	0.94	Amide
49.	2,6,10,14,18,22-Tetracosahexaene, 2,6,10,15,19,23-hexamethyl-, (all-E)-	$C_{30}H_{50}$	410	24.025	0.18	Alkene
50.	1-Pentacosanol	$C_{25}H_{52}O$	368	24.479	0.37	Alcohol
51.	2H-1-Benzopyran-6-ol, 3,4-dihydro-2,8-dimethyl-2-(4,8,12-trimethyltridecyl)-, [2R-[2R*]	$C_{27}H_{46}O_2$	402	25.021	0.19	Polyphenol
52.	Vitamin E	$C_{29}H_{50}O_2$	430	26.778	0.25	Phenolic
53.	Ergosterol $$ Ergosta-5,7,22-trien-3-ol, (3.beta.,22E)- Ergosterin	$C_{28}H_{44}O$	396	27.894	0.14	Steroid
54.	L-Phenylalanine, N-cyclopentylcarbonyl-, methyl ester	$C_{16}H_{21}NO_3$	275	28.449	0.16	Ester
55.	.gamma.-Ergostenol	$C_{28}H_{48}O$	400	28.904	0.34	Steroid
56.	Stigmasta-7,25-dien-3-ol, (3.beta.,5.alpha.)	$C_{29}H_{48}O$	412	29.340	2.67	Steroid
57.	Stigmast-7-en-3-ol, (3.beta.,5.alpha.,24S)-	$C_{29}H_{50}O$	414	30.229	2.99	Steroid
58.	17-.alpha.-Acetoxypregnenolone	$C_{23}H_{34}O_4$	374	30.491	0.23	Steroid
59.	Vitamin E acetate	$C_{31}H_{52}O_3$	472	30.859	0.16	Ester

Table 2: Result of *in vitro* anthelmintic effect of methanolic extract of aerial parts of *Lagenaria siceraria*.

Treatment	Concentration (mg/ml)	Paralysis time (min)	Death Time (min)
Albendazole (Standard)	25	3.28±0.34	5.87±0.78
	50	2.41± 0.65	3.47±0.47
	100	2.03±1.32	2.98±1.30
	150	1.25±0.32	1.96±1.32
methanolic extract of aerial parts of *Lagenaria siceraria*	25	4.76±1.64*	6.18±0.29*
	50	4.13±0.96^{ns}	4.32±0.98*
	100	3.02±0.29***	3.49±0.48**
	150	2.17±0.37***	2.34±1.32***
Control (Saline solution)	0.9% sodium chloride	No paralysis	No death

#average of 3 replicates, SEM: Standard error mean. n = 3, Significant at P < 0.05*, 0.01** and 0.001***, ns = not significant

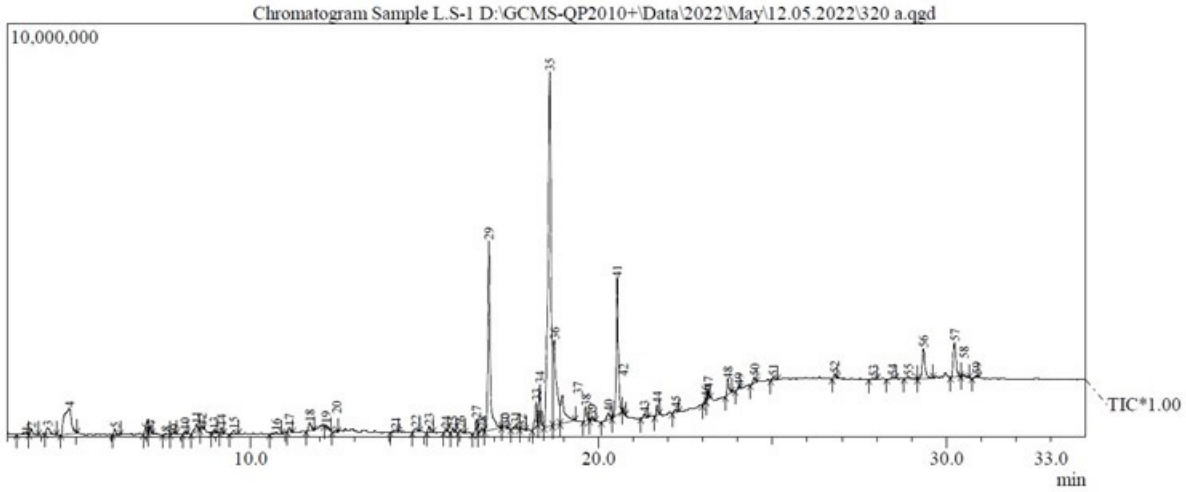

Figure 2: GC-MS chromatogram of the methanolic extracts of the aerial parts of the *Lagenaria sciceraria.*

extract was evaluated at 100 µg/ml, 200 µg/ml, and 500 µg/ml in order to determine the antioxidant activity by percentage scavenging. Following are the percentages of scavenging: The IC_{50} value for the standard was 103 ±2.17, and the percentage of scavenging ranged from 33.31 to 82.33% for the 100 µg/mL to 500 µg/ml range (with the IC_{50} value of 143±1.32). Rapidly occurring free radical scavengers in the test sample cause ABTS+ to react with them. This reaction is measured by watching for a drop in sample absorbance at 734 nm. The findings are displayed visually in Figure 5 and tabulated in Table 3.

Table 3: Results for *in vitro* antioxidant activity of methanolic extract of the aerial parts of the *Lagenaria siceraria.*

Concentration (µg/ml)	% Scavenging of the methanolic extract	% Scavenging of Standard (ascorbic acid)
100	33.31±0.58	49.47±1.42
200	68.43±1.57	73.64±1.01
500	82.33±1.16	94.73±1.21
IC_{50}	143±1.32	103±2.17

Std- Ascorbic acid. Readings are calculated ± S.E.M, n = 3.

DISCUSSION

In addition to therapeutic substances, medicinal plants are a great source of knowledge for a wide range of chemical components that might be created as medications with perfect selectivity. These are the sources of perhaps valuable chemical compounds that might provide fresh leads and hints for contemporary medication design.[13] The methanolic extracts of *Lagenaria siceraria*'s aerial parts claim to include carbohydrates, polyphenols, flavonoids, and glycosides; this important information may afterwards help in the discovery and development of new medications. In the study of the GC-MS analysis 59 compounds were obtained from the methanolic extracts of the aerial parts of *Lagenaria siceraria.* The obtained compounds were in the classes of polyphenols, carbohydrates, glycosides, and flavonoids as it was initially detected during the phytochemical

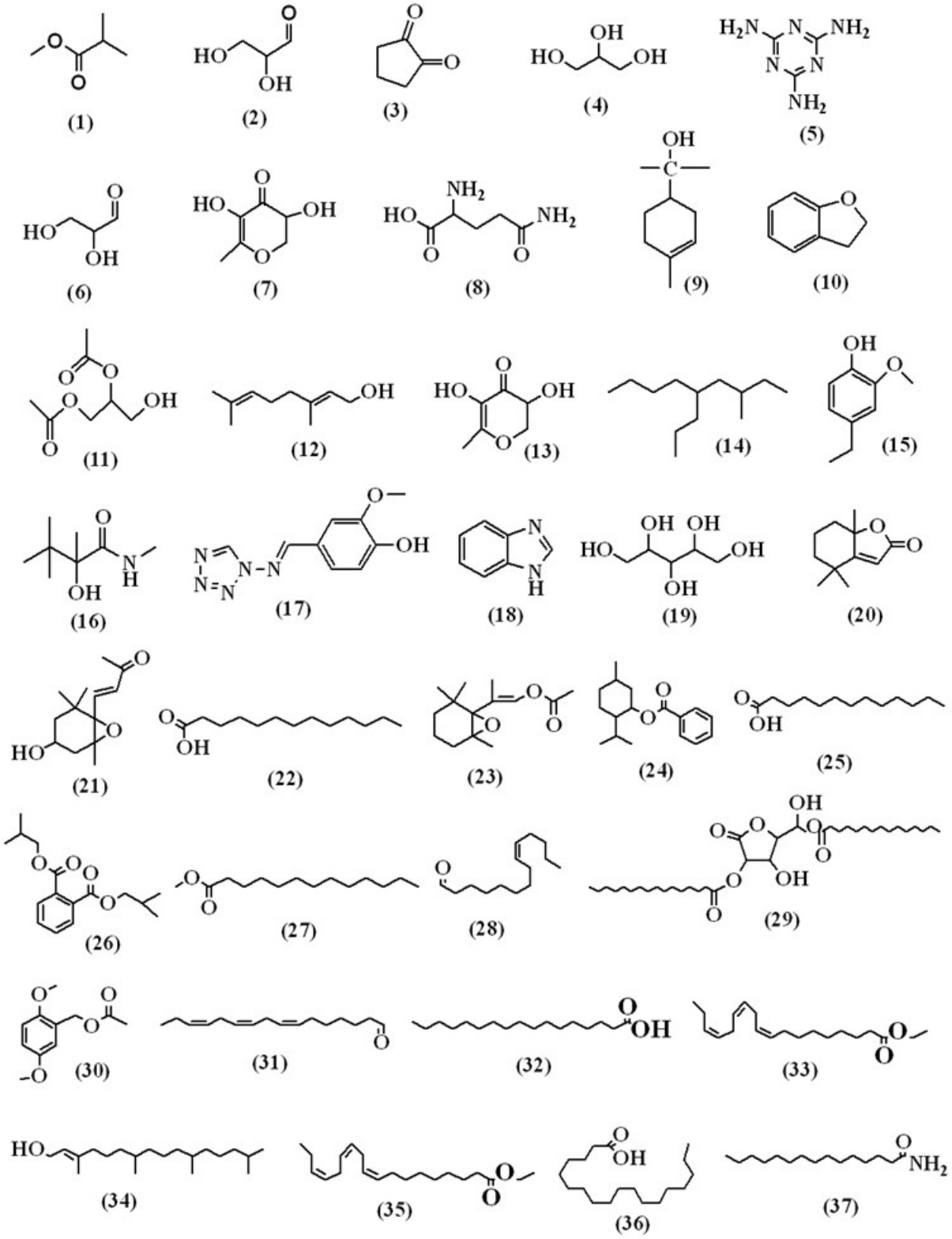

Figure 3A: Structural representation of the compounds identified in the MEALS.

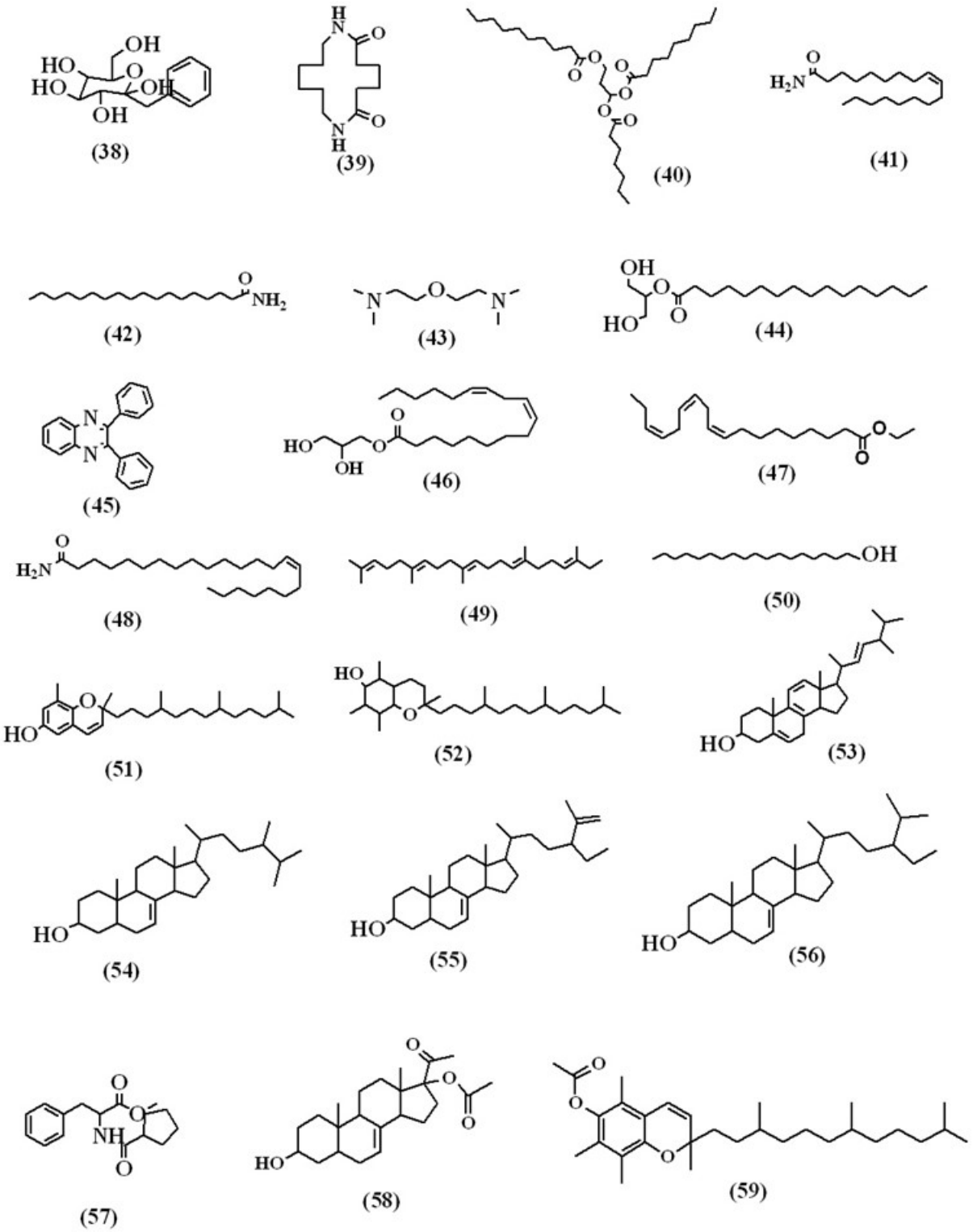

Figure 3B: Structural representation of the compounds identified in the MEALS.

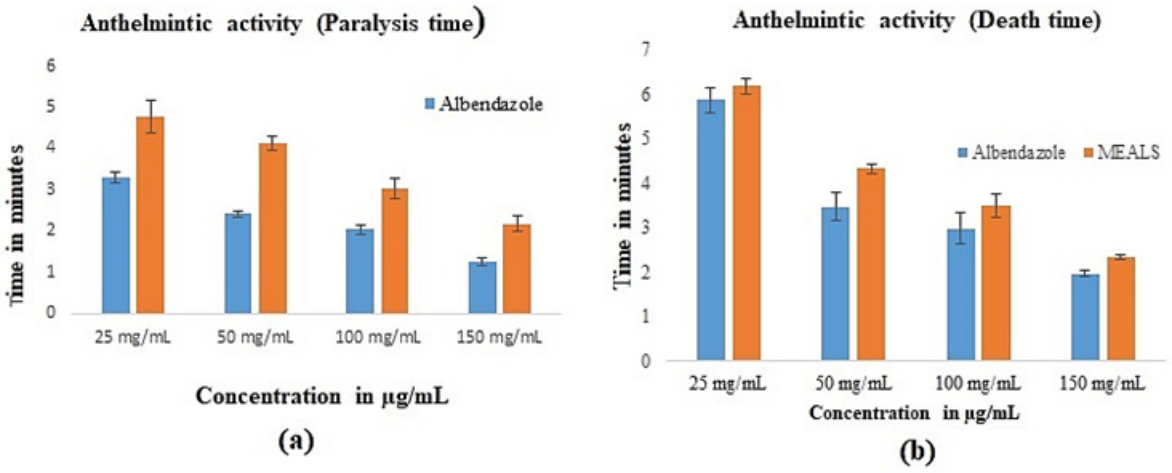

Figure 4: Graphical representation of the anthelminthic potential of the MEALS.

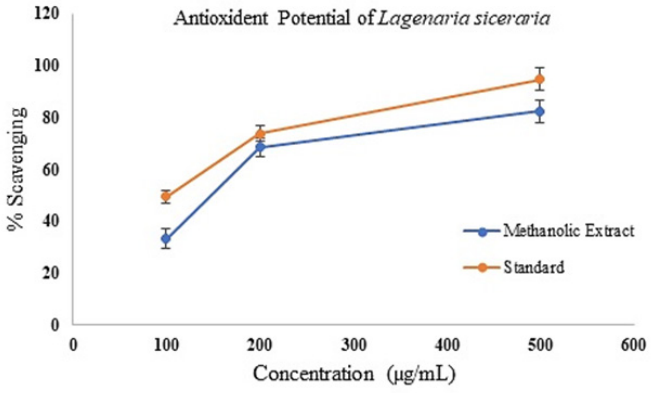

Figure 5: Graphical representation of the antioxidant potential of the MEALS.

studies. In the class of polyphenols the detected compounds were 1,2,3-Propanetrio(3), dl-Glyceraldehyde dimer(6), 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl(7) 1,2,3-Propanetriol, diacetate(11), Ascorbic acid 2,6-dihexadecanoate(29),1,2,3,4,5-Pentanepentol(19). Hexadecanoic acid, 2-hydroxy-1-(hydroxymethyl)ethyl ester(44), 9,12-Octadecadienoic acid (Z,Z)-, 2,3-dihydroxypropyl ester(46). In the class of flavonoids the detected compounds were 2H-1-Benzopyran-6-ol, 3,4-dihydro-2,8-dimethyl-2-(4,8,12-trimethyltridecyl)(51), 2H-1-Benzopyran-6-ol, 3,4-dihydro-2,5,7,8-tetramethyl-2-(4,8,12-trimethyltridecyl) (52), 2H-1-Benzopyran-6-ol, 3,4-dihydro-2,5,7,8-tetramethyl-2-(4,8,12-trimethyltridecyl)-, acetate (59). Therefore it was quite justified to test the sample for its antioxidant potential and the empirical evidence on antioxidant activity also proves the same. The chemical structures of the other types of components like steroids, glycosides, carbohydrates obtained were cited in the figure and table. Other investigations may result in the extraction of additional phytocomponents, and understanding their structures will aid in future medication development. When compared to the standard ascorbic acid (94.73%), the methanolic extract's percent scavenging activity (82.33%) was deemed satisfactory. The methanolic extract shows a strong antioxidant activity, which may be related to the abundance of phenolics, according to the obtained IC_{50} value for the investigated extract when compared with the standard ascorbic acid. Common plant metabolites include flavonoids, tannins, and other phenolics. The studied extract, when tested for the anthelmintic activity, shows effective dose dependent potential with the death time 2.34 min, and paralysis time, 2.17 min, in comparison with the standard albendazole 1.96 min and 1.25 min as a death and paralysis time. As the concentration of the extracts and the common medicine albendazole were increased against *Pheretima posthuma*, it was noticed that the values of paralysis time and death times significantly decreased.

CONCLUSION

Due to the undesirable side effects of synthetic pharmaceuticals, the phytocomponents of medicinal plants that are extracted in the form of extract may be useful for drug discovery and development against various diseases. The presence of phytoconstituents in the plant extract was confirmed by GC-MS analysis. Due to the presence of a substantial number of polyphenols and nitrogenous components, the methanolic extracts of *Lagenaria siceraria's* aerial portions demonstrated high anthelmintic activity and antioxidant activity. As a result, the anthelmintic activity may be regarded as a phytopharmaceutical benefit of a natural antioxidant and anthelmintic agent, and there is room to conduct a number of other studies, such as HPTLC fingerprint analysis, for the further confirmation of phytoconstituents before taking the next step to isolate and Characterize them.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

MEALS: methanolic extract of aerial parts of the Lagenaria siceraria. **HPTLC:** High performance thin layer chromatography, **GC-MS:** Gas chromatography mass spectrophotometry. **UV:** Ultraviolet, **ABTS:** (2,2'-azino-bis (3-ethylbenzothiazoline-6 -sulfonic acid), **IC_{50} :** Half-maximal inhibitory concentration .

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