Editor's Note:

Due errors of correspondence, this article replaces the article **"Chemical composition, antimicrobial and free radical scavenging activities of extracts of the leaves of *Desmodium adscendens"*** which was published by error and should be disregarded. We apologise for this grevious error.

GC-MS analysis, antioxidant and antimicrobial activities of extracts from *Ficus mucoso* leaves

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ABSTRACT

The phytochemical screening of n-hexane, ethyl acetate and methanol extracts of Ficus mucoso leaves confirmed the presence of alkaloids, steroids, terpenoids, flavonoids, saponins, anthraquinones, tannins, glycosides, carbohydrates and fats and oils. The ethyl acetate extract of the leaves had minimal antioxidant activity, exhibiting DPPH free radical scavenging property with IC_{50} of 701.6 μM, using DPPH antioxidant assay. Six bacteria strains namely; Staphylococcus aureus, Escherichia coli, Bacillus subtilis, Pseudomona aeruginosa, Salmonella typhii and Klebsiellae pneumonae and four fungal strains namely; Candida albicans, Aspergillus niger, penicillium notatum and Rhizopus stolonifer were tested against the three extracts and they showed good inhibitory activities against the tested strains. Gas chromatography-Mass spectroscopy (GC-MS) characterization of the extracts revealed the presence of sixteen (16), fifteen (15) and fifteen (15) compounds in n-hexane, ethyl acetate and methanol extracts of Ficus mucoso leaves respectively. The principal constituent in the n-hexane extract was phytol with a relative abundance of 29.7% while the main constituents of the ethyl acetate and methanol extracts were phytol acetate and Naphthalene-1,2,3,5,6,7,8,8a-octahydro-1,8a-dimethyl-7-(1-methylethenyl) with relative abundance of 29.1% and 24.48% respectively.

Keywords: GC-MS analysis, antimicrobial, antioxidant, phytol, Naphthalene, 1,2,3,5,6,7,8,8a-octahydro-1,8a-dimethyl-7-(1-methylethenyl

INTRODUCTION

Medicinal plants have been mentioned as an outstanding source of therapeutic phytochemicals which may lead to the improvement of novel and efficient drugs and are currently of considerable significance[1]. Most of the phytochemicals from plant sources such as phenolics and flavonoids have been reported to have pharmacological activities against helminthes[2] and in the prevention of deadly diseases such as cancer[3]. The increasing interests in research and industrial applications of medicinal plants as alternative to conventional drugs and synthetic products, have contributed to the development and formulation of some cosmetic products and novel drugs[4, 5].

Ficus mucoso belongs to the family Moraceae with about 150 species worldwide[6]. Most members are large trees of about 30-40 m high with a spreading open crown in the rain forest, often on river banks. Some species of *Ficus mucoso* are used as foods and medicines in China and Cameroon[7]. The young leaves and fruits are edible and have a pleasing aroma. The local use of the plant include: treatment of insanity,

generalized edemas and leprosy, .diarrhea and dysmenorrheal can be cured by taking the bark and leaf decoctions of the plant[8].

MATERIALS AND METHODS

Ficus mucoso was collected in Ilorin, Kwara State, Nigeria. The plant was identified and authenticated by Mr Bolu Ajayi of Herbarium section, department of Plant Biology, University of Ilorin with a reference number of (UILH/004/1234) and voucher specimens were deposited in the herbarium.

Sample preparation and extraction

The plant was extracted using standard procedure according to Das *et al.*, (2010)[9]. The leaves of *F. mucoso* were air dried and crushed into smaller pieces using mortar and pestle. The plant was weighed and extracted using serial exhaustive extraction method with solvents of different polarities moving from a non-polar solvent (n-hexane), to a medium polar solvent (ethyl acetate) and then to a polar solvent (methanol).

Phytochemical screening

Preliminary phytochemical screening of the crude extract was carried out using the modified method described by Pranshant, *et al.*, (2011)[10].

Antimicrobial assay

Organisms*:* Cultures of six human pathogenic bacteria made up of four gram negative and two gram positive bacteria were used for the antibacterial assay. These include: *Salmonella typhii, Escherichia coli, Pseudomonas aeruginosa and Klebsiellae pneumonae* which are gram-negative, while *Bacillus subtilis and Staphylococcus aureus* are gram-positive bacteria used. Four fungi were also utilized for the antifungal assay. They include; *Candida albicans, Aspergillus niger, Rhizopus stolon and Penicillum notatum*. All the microorganisms used were clinical strains from the Medical Microbiology laboratory (University College Hospital, Ibadan) and screened in the Laboratory of Pharmaceutical Microbiology Department, University of Ibadan, Ibadan, Nigeria.

Media used: Nutrient agar, Sabouraud dextrose agar, nutrient broth and tryptone soya agar were used in this study. N-hexane, ethyl acetate and methanol were also used in solubilizing the extracts and act as negative controls in the assays.

Antimicrobial agents used*:* Gentamycin (10 µg/mL) and Tioconazole (0.7 mg/mL) were employed as standard reference drugs in the study.

Determination of Antimicrobial activity

Agar diffusion-Ditch method (bacteria): An overnight culture of each organism was prepared by taking two wire-loop of the organism from the stock, each inoculated into 5ml of sterile nutrient broth and incubated for 24 hrs at 37^{o}C. 0.1 mL of each organism was taken from the overnight culture and put into 9.9 mL of sterile distilled water to obtained 10^{-2} inoculum concentration of the test organism. 0.2 mL was taken from the diluted test organism (10^{-2}) into the prepared sterile nutrient agar cooled to about 45^{o}C, then poured into sterile petri dishes and allowed to solidify for about 60 mins. A sterile cork borer of 8mm diameter was used to make 8 wells on the media according to the number of the diluted extracts for the experiment. The graded concentrations (6.25 – 200 mg/mL) of the extracts were put into each well and separated from the controls. The studies were done in duplicates to ascertain the results obtained. The plates were left on the bench for about 2 hr to allow the extract diffuse properly into the nutrient agar i.e. pre-diffusion. The plates were incubated for 24 hrs at 37^{o}C.

Agar diffusion-Surface method (fungi): A sterile sabouraud dextrose agar was prepared accordingly and aseptically poured into the sterile plates in triplicates and was left to solidify properly. 0.2 mL of the 10^{-2} inoculum

concentration of the test organism was spread on the surface of the agar using a sterile Petridish to cover all the surface of the agar. Eight wells were bored using a sterile cork borer of 8mm diameter. The graded concentrations of the extracts were put into each well separately with the controls. All the plates were left on the bench for 2 hrs to allow the extract diffuse properly into the agar i.e. pre-diffusion. The plates were incubated at 25^{o}C for 72 hrs.

Antioxidant Activity: The ability of the samples to trap DPPH free radicals was assessed by the standard method which was adopted with slight modifications[11, 12]. The stock solutions of extracts were prepared in methanol to achieve the concentration of 1 mg/mL. Dilutions were made to obtain concentrations of 1000, 500, 250, 125, 62.5, 31.25, 15.62, 7.81, 3.90 and 1.99 µg/mL. The absorbance was measured in triplicate at varying concentrations and the mean absorbance was determined. Parallel to examination of the antioxidant activity of the plant's extracts, the absorbance values for the standard compound (Ascorbic acid) was obtained (Table 8) and compared to the values of the antioxidant activity, the percentage inhibitions of the serial concentrations of the methanol DPPH extracts and that of the standard which was determined at different concentrations using the expression as shown below.

$$\%inhibition = \frac{A\ of\ control - A\ of\ sample}{A\ of\ control} \times 100$$

The IC_{50} values (Inhibition Concentration at 50%) were estimated from the % inhibition versus concentration plot, using a non-linear regression algorithm.

GC-MS analysis

GC-MS was performed with Agilent 19091GC plus automatic sampler system coupled with a quadruple mass spectrometer 433HP-5MS. Compounds were separated in HP5MS column fused with phenyl methyl silox, (length; 30m x 250µm; film thickness 0.25µm). Samples were injected at a temperature of about 250^{o}C with a split ratio of 10:1 with a flow rate of helium 1ml/min. The molecules are eluted at different retention time and are characterized by the mass spectrometer downstream to capture, ionize, accelerate, deflect and detect the ionized molecules separately. The mass spectrometer breaks each molecule down to its fragments and these fragments detected by their mass to charge (m/z) ratio.

RESULTS AND DISCUSSION

Phytochemical screening

The phytochemical screening of the extracts of *F.mucosa* revealed the presence of bioactive compounds which are of therapeutic importance. The phytochemicals present in n-hexane extract of *F. mucoso* leaves revealed the presence of steroids, glycosides, terpenoids, carbohydrates and fat and oil. Ethylacetate extract of *F. mucoso* leaves showed the presence of steroids, flavonoids and glycosides, while methanol extract confirmed the presence of saponins, terpenoids, steroids, flavonoids, alkaloids, glycosides, anthraquinone and tannins (Table 1).

Antimicrobial activity

The antimicrobial result obtained in the study of the extracts of *F. mucoso* leaves indicated antimicrobial activity against the test organisms. For n-Hexane extract, there was a higher inhibition of bacteria and fungi growth at concentrations of 200 µg/mL, 100 µg/mL and 50 µg/mL. At a concentration of 25 µg/ml, moderate inhibition of bacteria growth and fungi was observed. However, only *Rhizophus stoloniter* (fungi) showed no inhibition at this concentration. At 12.5 µg/mL, a low inhibition in the growth of bacteria and fungi was observed, except for *Klebsiellae pneumonae* which showed no inhibition. No zone of inhibition was observed for all the fungi tested at this concentration i.e

12.5μg/mL. At 6.25 μg/mL, only two bacteria showed little inhibition while the rest bacteria and all the fungi showed no inhibition at this particular concentration (Table 2). The ethylacetate extracts have higher bacteria inhibition of all the extracts tested at concentrations between 12.25 – 200 mg/mL. The extract also exhibited antifungal properties on all the fungi tested at concentrations between 25 – 200 mg/mL (Table 3).

The methanol extract have higher bacteria inhibition at concentration between 50 – 200 mg/mL, moderate bacteria inhibition at 12.5 – 25 mg/mL and low bacteria inhibition at concentration 6.25 mg/mL. The extract also exhibited antifungal activity on all the fungi at all concentrations (Table 4).

Antioxidant activity

Hexane, ethyl acetate and methanol extracts of *F. mucoso* leaves exhibited antioxidant activity on DPPH radicals at different concentrations, using Ascorbic acid as standard antioxidant (Tables; 5, 6, 7 and 8). Ethylacetate extract of the plant showed more ability in the inhibition of DPPH radicals, by scavenging the free radical at IC_{50} of 701.63 μg/mL, (fig. 1) the activity was comparable with that of the standard control, ascorbic acid (IC_{50} of 5.68 μg/mL).

GC-MS Analysis

The GC-MS analysis of n-hexane, ethyl acetate and methanol extracts of *F. mucoso* leaves afforded sixteen, fifteen and fifteen compounds respectively. The GC-MS characterization of the constituents of n-hexane extract afforded Phytol, menthol, linolenic acid, squalene and palmitic acid with relative abundance of 29.7%, 18.45%, 14.28%, 11.33% and 8.14% respectively. Phytol being the principal constituent of the extract had fragment ions of 296, 126, 71 and 57 which confirmed the molecular formula $C_{20}H_{40}O$ (296) for phytol (Table 9). The ethylacetate extract gave phytol acetate, linolenic acid, stigmast-5-en-3-beta-ol and phytol with relative abundance of 29.1%, 9.98% 9.96% and 9.54% respectively as the major constituents (Table 10). The methanol extract afforded Naphthalene, 1,2,3,5,6,7,8,8a-octahydro-1,8a-dimethyl-7-(1-methylethenyl), Stigmast-5-en-3.beta.-ol, 5-(7a-Isopropenyl-4,5-dimethyl-octahydroinden-4-yl)-3-methyl-pent-2-en-1-ol and phytol with relative abundance of (24.48%, 19.91%, 10.08% and 4.69%, respectively as the principal constituents (Table 11).

Table 1: Phytochemical screening of the extracts of *F. mucoso*leaves

Chemical constituents	Hexane extract	Ethylacetate extract	Methanol extract
Alkaloids	-	+	+
Cardiac glycoside	+	+	+
Carbohydarate	+	-	-
Flavonoids	-	+	+
Tannins	-	-	+
Saponins	-	-	+
Terpenoids	+	-	+
Steroids	+	+	+
Anthraquinone	-	-	+
Fat & Oils	+	-	-
Phenols	-	-	-
Protein	-	-	-

KEY: + = (Present)**;** - = (Absent)

Table 2: Antimicrobial activity of hexane extract of *F. mucoso* leaves

Microorganism	Mean zone of Inhibition (mm)							
S. aureus	23	20	18	15	13	10	-	38
E. coli	21	18	16	14	12	10	-	36
B. subtilis	19	17	14	12	10	-	-	40
P. aeruginosa	19	17	14	12	10	-	-	38
K. pneumonae	18	14	12	10	-	-	-	38
S. typhi	17	16	14	12	10	-	-	36
C. ablicans	17	14	12	10	-	-	-	26
A. Niger	17	14	12	10	-	-	-	26
P. notatum	17	14	12	10	-	-	-	28
R. stolonifera	17	14	10	-	-	-	-	26
Conc of extracts (mg/ml)	200	100	50	25	12.5	6.25	-ve	+ve

+ve = Gentamycin 10 µg/mL (bacteria), Tioconazole 70% (fungi); -ve = Solvent of dilution

Table 3: Antimicrobial activity of ethyl acetate extract of *F. mucosa* leaves

Microorganism	Mean zone of Inhibition (mm)							
S. aureus	23	20	18	15	13	10	-	36
E. coli	21	18	16	14	12	10	-	38
B. subtilis	23	19	16	14	12	10	-	36
P. aeruginosa	21	18	16	14	12	10	-	36
K. pneumonae	19	16	14	12	10	-	-	38
S. typhi	18	16	14	12	10	-	-	40
C. ablicans	20	18	16	14	12	10	-	28
A. Niger	20	18	16	14	11	-	-	26
P. notatum	18	16	14	11	-	-	-	28
R. stolonifer	17	14	12	10	-	-	-	28
Conc of extracts (mg/ml)	200	100	50	25	12.5	6.25	-ve	+ve

+ve = Gentamycin 10 µg/mL (bacteria), Tioconazole 70% (fungi); -ve = Solvent of dilution

Table 4: Antimicrobial activity of methanol extract of *F. mucoso* leaves

Microorganism	Mean zone of Inhibition (mm)							
S. aureus	27	23	20	17	14	10	-	40
E. coli	27	24	20	17	15	11	-	38
B. subtilis	24	20	18	15	12	10	-	38
P. aeruginosa	26	23	20	16	13	10	-	40
K. pneumonae	21	18	14	12	10	10	-	38
S. typhi	21	18	16	14	12	10	-	40
C. ablicans	21	18	16	14	12	10	-	28
A. Niger	20	18	16	14	12	10	-	26
P. notatum	21	18	16	14	12	10	-	28
R. stolonifer	20	10	10	14	12	10	-	28
Conc of extracts (mg/ml)	200	100	50	25	12.5	6.25	-ve	+ve

+ve = Gentamycin 10 µg/mL (bacteria), Tioconazole 70% (fungi); -ve = Solvent of dilution.

Table 5: Absorbance and % Inhibition using Ascorbic Acid as Standard for DPPH Antioxidant Activity of crude extracts of the Leaves of *F. mucoso*. Absorbance of control is 1.265

Conc (µg/mL)	A_1	A_2	A_3	AV±SD	%I of A
1000	0.138	0.138	0.140	0.139±0.0012	89.02
500	0.150	0.150	0.150	0.15±0.0000	88.14
250	1.61	0.162	0.160	0.161±0.001	87.26
125	0.180	0.180	0.180	0.180±0.000	85.79
62.5	0.193	0.1965	0.194	0.194±0.001	84.26
31.25	0.245	0.245	0.245	0.245±0.000	80.67
15.01	0.311	0.311	0.311	0.311±0.000	75.44
7.93	0.453	0.452	0.454	0.453±0.001	64.18
3.81	0.782	0.781	0.781	0.781±0.001	38.26
1.95	0.991	0.991	0.991	0.991±0.000	21.66

Table 6: DPPH Antioxidant activity and %inhibition of *F. mucoso* leaf extract of n-hexane with 0.496 as absorbance of control

Conc (µg/mL)	Absorbnace	Absorbnace	Absorbnace	Mean absorbance	% Inhibition
1000	0.052	0.050	0.052	0.051±0.00094	89.6505
500	0.039	0.038	0.037	0.038±0.00081	92.3387
250	0.088	0.086	0.091	0.088±0.00205	82.19086
125	0.107	0.110	0.111	0.109±0.0017	77.95699
62.5	0.152	0.135	0.139	0.142±0.0073	71.37097
31.25	0.155	0.152	0.155	0.154±0.0014	68.95161
15.01	0.121	0.166	0.118	0.158±0.0278	72.78226
7.93	0.167	0.168	0.165	0.166±0.0012	66.39785
3.81	0.173	0.173	0.175	0.173±0.00094	64.98656
1.95	0.145	0.144	0.145	0.144±0.00047	70.83333

Table 7: DPPH Antioxidant activity and %inhibition of *F. mucoso* leaf extract of ethyl acetate with 0.333 as absorbance of control

Conc (µg/mL)	Absorbnace	Absorbnace	Absorbnace	Mean absorbance	% Inhibition
1000	0.309	0.309	0.308	0.308±0.0005	33.18903
500	0.180	0.181	0.181	0.180±0.0005	60.89466
250	0.177	0.177	0.177	0.177±0000	61.68831
125	0.100	0.100	0.100	0.100±0000	78.35498
62.5	0.400	0.100	0.100	0.200±0.1732	56.70996
31.25	0.167	0.166	0.166	0.166±0.0005	63.99711
15.01	0.167	0.167	0.167	0.167±0000	63.85281
7.93	0.152	0.152	0.154	0.152±0.0011	63.63636
3.81	0.158	0.157	0.158	0.157±0.0005	63.49206
1.95	0.169	0.169	0.169	0.169±0000	63.41991

Table 8: DPPH Antioxidant activity and %inhibition of *F. mucoso* leaf extract of methanol with 0.389 as absorbance of control

Conc (µg/mL)	Absorbnace	Absorbnace	Absorbnace	Mean absorbance	% Inhibition
1000	0.138	0.136	0.132	0.135±0.0030	73.46405
500	0.066	0.069	0.069	0.068±0.0017	86.66667
250	0.050	0.055	0.056	0.0536±0.0032	89.47712
125	0.080	0.086	0.087	0.0843±0.0037	83.46405
62.5	0.132	0.134	0.135	0.133±0.0015	73.99085
31.25	0.163	0.161	0.163	0.1623±0.0011	68.16993
15.01	0.166	0.168	0.167	0.167±0.001	67.25491
7.93	0.190	0.193	0.193	0.192±0.0017	62.35294
3.81	0.204	0.204	0.206	0.204±0.0011	56.86928
1.95	0.211	0.212	0.213	0.212±0.001	58.43137

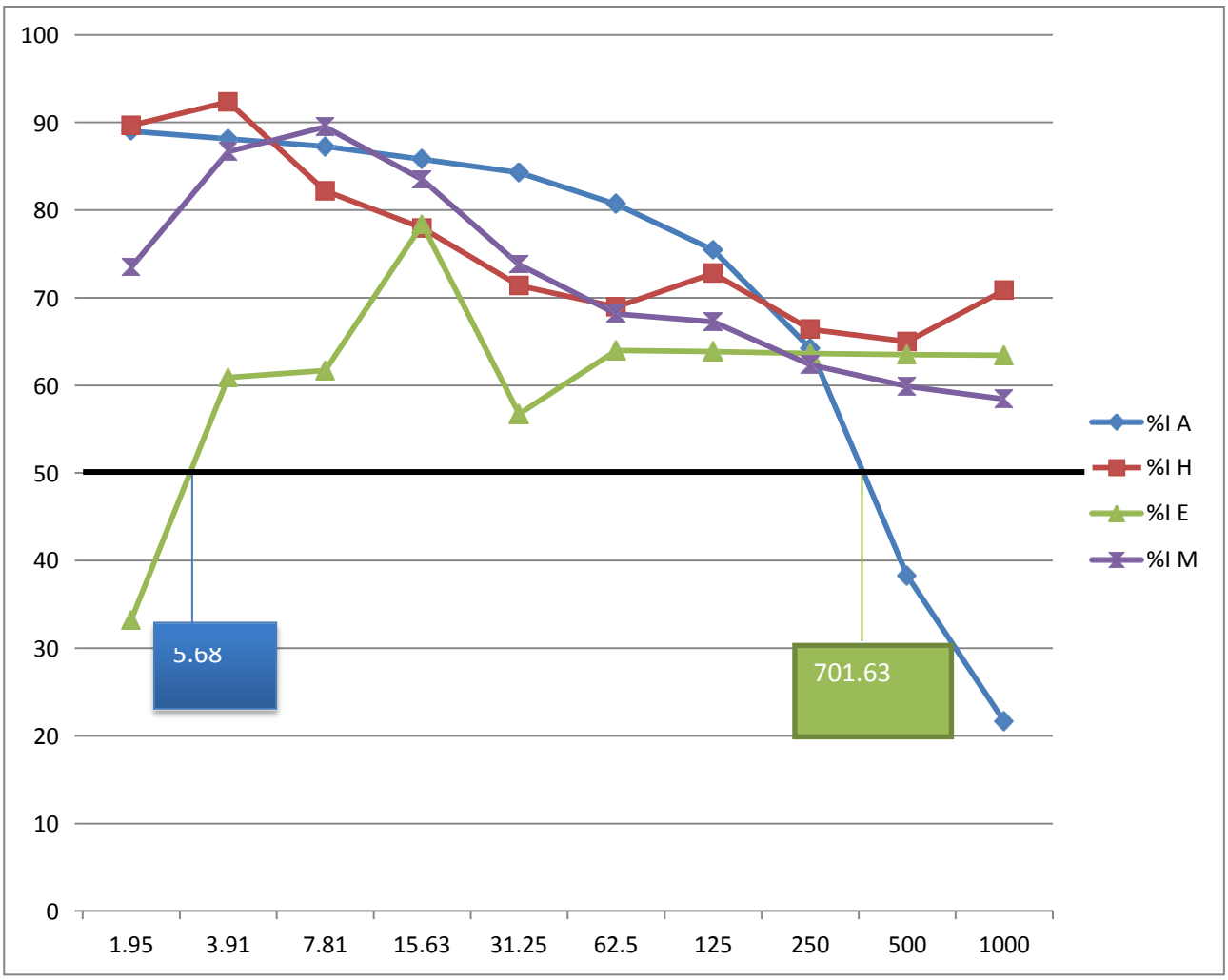

Figure 1: Antioxdant activity of leaf extracts of *F. mucoso*

KEYS: %IA- percentage inhibition of Ascorbic Acid (control)

%IH- percentage inhibition of n-hexane extract

%IE- percentage inhibition of ethyl acetate extract

%IM- percentage inhibition of methanol extract

Table 9: GC-MS analysis and the activity of hexane extract of *F. mucoso* leaves

S/n	Compound	Peak area %	Molecular formula	MW	Mass spectra fragments	Retention time
1.	Menthol	18.45	$C_{10}H_{20}O$	156	156, 95, **71**, 55	5.76
2	Hexadecane	1.81	$C_{16}H_{34}$	2226	226, 99, **57**, 43	11.47
3.	Octadecane	1.36	$C_{18}H_{38}$	254	254, 85, **57**, 43	14.71
4.	6,10,14-Trimethyl-2-pentadecanone	1.67	$C_{18}H_{36}O$	268	268, 71 ,**58**, 55	15.26
5.	Palmitic acid	8.14	$C_{16}H_{32}O_2$	256	256, 129, 85, **73** , 43	16.82
6.	Octadecane	1.14	$C_{18}H_{36}$	252	254, 99, 71, **57**, 43	17.16
7.	Phytol	29.74	$C_{20}H_{40}O$	296	296, 126, **71**, 57	18.36
8.	Linolenic acid	14.28	$C_{20}H_{36}O_2$	308	278, 163, 136, **95**, 79	18.27
9.	1,2-epoxyloctadecane	1.12	$C_{18}H_{36}O$		225, 197, 57	19.32
10.	Oleic acid amide	2.16	$C_{18}H_{35}NO$	268	281, 154, 86, 72, **59**, 55	20.55
11.	Squalene	11.33	$C_{30}H_{50}$	410	410, 137, 95, **69**, 43	24.20
12.	Tetracontane	2.26	$C_{40}H_{82}$	562	562, 169, 141, 71,**57**	24.74
13.	n-Tetradecane	0.90	$C_{14}H_{30}$	198	43,**57**, 71, 99, 141	8.76
14	2,6,10,14-Hexadecatetraen-1-ol	0.63	$C_{20}H_{34}O$	290	69, 137, 247, 205	16.16
15	2-methylhex-acosane	0.93	$C_{27}H_{56}$	380	43, 57, 71, 85, 99, 141, 113	23.26
16	(2,6,6-Trimethyl-2-hydroxycyclohexylidene)acetic acid lactone	0.78	$C_{11}H_{16}O_2$	180	111, 124, 152, 164, 180	10.35

Table 10: GC-MS analysis and the activity of ethyl acetate extract of *F. mucoso* leaves

S/n	Compound	Peak area %	Molecular formula	MW	Mass spectra fragments	Retention time
1	Bicyclo[2.2.1]heptan-2-one, 1,7,7-trimethyl	4.11	$C_{10}H_{16}O$	152	152, **95**,	5.31
2	6,10,14-Trimethyl-2-pentadecanone	1.11	$C_{18}H_{36}O$	268	268, 140, 87, 71, 57, **43**	15.26
3	Hexadecanoic acid	11.18	$C_{16}H_{32}O_2$	256	43, 60, 73, 99, 115, 185	16.77
4	Ethyl hexadecanoate	2.50	$C_{18}H_{36}O_2$	284	284, 101, **87**, 57, 43	17.04
5	Phytol	9.54	$C_{20}H_{40}O$	296	296,126, 71**,** 57, 43	18.31
6	Linolenic acid	9.98	$C_{18}H_{30}O_2$	278	278, 163, 136, 95, **79**	18.61
7	Dichloroacetic acid, tridec-2-ynyl ester	18.81	$C_{15}H_{24}Cl_2O_2$	306	43, 96, 111	5.40
8	Phytol acetate	29.1	$C_{22}H_{42}O_2$	338	338, 278, 236, **43**	19.32
9	Bis(2-ethylhexyl)1,2benzenedicarboxylate	1.16	$C_{24}H_{38}O_4$	390	390, **149**, 113, 57	22.06
10	Stigmast-5-en-3.beta.-ol	9.68	$C_{29}H_{50}O$	414	43,303,314,414	22.72
11	Urs-12-ene	3.52	$C_{30}H_{50}$	410	410, **218,** 272, 69	23.38
12	Squalene	4.63	$C_{30}H_{50}$	410	410, 137, 109, 95, **69,** 43	24.19
13	2-methyloctacosane	2.19	$C_{29}H_{60}$	408	408,141,113,85, 71, **57,** 43	24.73
14	Tetracontane	1.89	$C_{44}H_{90}$	618	43, **57**, 71, 141, 169	26.66
15	Menthol	0.61	$C_{10}H_{20}O$	156	56, **72**, 139, 156	5.72

Table 11: GC-MS analysis and the activity of methanol extract of *F. mucoso* leaves

S/n	Compound	Peak area %	Molecular formula	MW	Mass spectra fragments	Retention time
1	n-Hexadecanoic acid methyl ester	3.35	$C_{17}H_{34}O_2$	270	43, 57, 74, 87, 129	16.251
2	1-Pentadecanecarboxylic acid	3.65	$C_{16}H_{32}O_2$	256	43, 60, 73, 98, 129	16.713
3	Ethyl n-hexadecanoate	0.62	$C_{18}H_{36}O_2$	284	73, 88, 129, 143	17.030
4	Azulene, 1,2,3,5,6,7,8,8a-octahydro-1,4-dimethyl-7-(1-methylethenyl	1.47	$C_{15}H_{24}$	204	67, 107, 204	17.880
5	Methyl linoleate	1.40	$C_{19}H_{34}O_2$	294	123,164,263	18.074
6	Linoleic acid, methyl ester	4.38	$C_{19}H_{32}O_2$	292	95,121,135,163	18.139
7	Phytol	4.69	$C_{20}H_{40}O$	296	43, 71, 126, 140	18.295
8	Methyl stearate	1.19	$C_{19}H_{38}O_2$	298	43, 57, 74, 87, 115	18.412
9	Dichloroacetic acid, tridec-2-ynyl ester	1.96	$C_{15}H_{24}Cl_2O_2$		43, 111, 164, 180	18.553
10	Phytol acetate	1.80	$C_{22}H_{42}O_2$	338	43,236,278	19.297
11	9-Octadecenamide	1.55	$C_{18}H_{35}NO$	281	59,72,86,156	20.532
12	5-(7a-Isopropenyl-4,5-dimethyl-octahydroinden-4-yl)-3-methyl-pent-2-en-1-ol	10.08	$C_{20}H_{34}O$	290	191,245,275	22.053
13	Stigmast-5-en-3.beta.-ol	19.91	$C_{29}H_{50}O$	414	43,303,314,414	22.701
14	Naphthalene-1,2,3,5,6,7,8,8a-octahydro-1,8a-dimethyl-7-(1-methylethenyl	24.48	$C_{15}H_{24}$	204	67,161,189, 204	23.188
15	n-Pentatriacontane	2.28	$C_{35}H_{72}$	492	43,71,57	26.533

CONCLUSIONS

This study revealed that the leaf extracts of *F. mucoso* have bioactive compounds which inhibit pathogenic microbial organisms (bacteria and fungi). The observed antimicrobial activity of this medicinal plant on the tested organisms' strains may be attributed to the presence of the abundant bioactive compounds or in synergy with other compounds present in the plant. This accounts for the use of the plant in folklore for the treatment of liver disorder, respiratory diseases and urinary infections. This plant may be a potential source of novel antimicrobial drugs.

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