6th International Electronic Conference on Medicinal Chemistry
1-30 November 2020
sciforum.net/conference/ECMC2020
sponsored by pharmaceuticals

Antimicrobial, antioxidant, and GC-MS analysis of hexane extract of the leaves of *Solanum erianthum*

By

Taye Alawode[1,2*], Labunmi Lajide[2], Bodunde Owolabi[2] and Mary Olaleye[3]

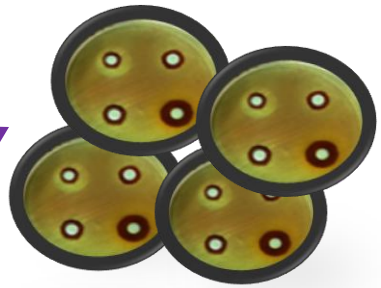
[1]Department of Chemistry, Federal University Otuoke, Nigeria
[2]Department of Chemistry, Federal University of Technology Akure, Nigeria
[3]Department of Biochemistry, Federal University of Technology Akure , Nigeria

***Corresponding email**: onatop2003@yahoo.com

Antimicrobial, Antioxidant and GC-MS Analysis of Hexane Extract of the Leaves of *Solanum erianthum*

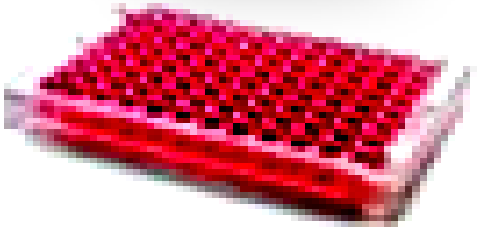
Solanum erianthum

Hexane Extract



Antimicrobial Assay

GC-MS Analysis



Antioxidant Assay

ABSTRACT

Solanum erianthum is used in ethnomedicine for the treatment of various diseases. In the study, the hexane extract of the plant was screened for antimicrobial and antioxidant activities. Dried leaves samples were extracted with hexane. The extract was screened for activity against *Staphylococcus aureus*, *Escherichia coli*, *Bacillus subtilis*, *Pseudomonas aeruginosa*, *Salmonella typhi*, *Klebisidlae pneumonae*, *Candida albicans*, *Aspergillus niger*, *Penicillium notatum* and *Rhizopus stolonifer* at concentrations ranging between 6.25 mg/ml and 200 mg/ml using the agar diffusion method. The extract was screened for antioxidant activities using the DPPH free radical scavenging assay at concentrations between 0.0625 mg/ml and 1 mg/ml. All results were compared with those of the standard drugs. GC-MS analysis of the extract was thereafter carried out. Activities generally increased with the concentration in the antimicrobial assay. The highest zone of inhibition (28 mm) was obtained against *S. aureus* at 200 mg/ml. The extract, however, did not show a zone of inhibition as high as that of the standard drug (gentamycin and tioconazole) against any of the test organisms. IC_{50} value of 0.729 was obtained in the DPPH assay which is higher than the IC_{50} value (of 0.017) got for the standard Ascorbic acid. Some of the major compounds observed in extract include 1-octadecene (23.59 %), 9,12-Octadecadienoic acid (Z,Z) (14.01 %) and hexadecanoic acid ethyl ester (8.06 %). These compounds could have contributed to the bioactivities demonstrated by the extract.

Keywords: *Solanum erianthum*, hexane, antimicrobial, antioxidant, GC-MS

Introduction

- Medicinal plants are widely employed as alternative form of treatment in many countries. Most often, however, the ethnobotanical uses of the plants are not backed up with scientific evidence.

- Presently, research efforts are often directed at validating these claims. Where the medicinal properties are established, the biologically-active organic molecules responsible for the observed medicinal properties of the plants are isolated in pure form.

- The present study investigates the leaves of *S. erianthum* for antimicrobial and antioxidant activities. The plant is used for the treatment of skin infections by traditional medical practitioners in south-western Nigeria.

Results and Discussion

Phytoconstituents in Hexane Extracts of leaves of *S. erianthum*

Tests	Extract
Tannins	-
Glycosides	-
Resin	-
Saponins	+
Phlobatanins	-
Flavonoids	+
Sterols	-
Phenols	+
Carbohydrate	-
Alkaloids	+
Terpenoids	-

Several compounds from these phytochemical groups have been reported to possess antibacterial, antifungal and antioxidant properties (Othman *et al.*, 2019)

Results and Discussion (Cont'd)

Antibacterial activity

	Mean Zone of Inhibition (mm)					
Conc. (mg/ml)	**SA**	**EC**	**BS**	**PA**	**ST**	**KP**
200	28	26	26	24	20	24
100	24	22	22	22	18	20
50	20	18	20	20	16	18
25	18	14	16	18	14	14
12.5	14	12	14	12	12	12
6.25	10	10	12	10	10	10
MIC (mg/ml)	1.25	2.50	2.50	2.50	2.50	2.50
Gentamicin (10 µg/ml)	40	40	40	38	40	40

SA- *S. aureus*, EC – *E. coli*, BS – *B. subtilis*, PA – *P. aeruginosa*, ST – *S. typhi*, KP – *K. pneumonia*

Results and Discussion (Cont'd)

Antifungal activity

	Zone of Inhibition (mm)			
Conc. (mg/ml)	**CA**	**AN**	**PN**	**RS**
200	22	20	20	18
100	20	18	18	16
50	18	14	16	14
25	14	12	14	12
12.5	12	10	12	10
6.25	10	-	10	-
MIC (mg/ml)	2.50	5.00	2.50	5.00
Tioconazole(10 µg/ml)	26	28	28	28

CA – *C. albicans*, AN – *A. niger*, PN – *P. notatum*, RS – *R. stolonifer*

Results and Discussion (Cont'd)

- Generally, it can be observed that the zones of inhibition increased with increasing concentrations of the extracts. This is in agreement with previous reports (Homaida *et al*., 2019).

- *S. aureus* is most susceptible to the extract with MIC value of 1.25 mg/ml

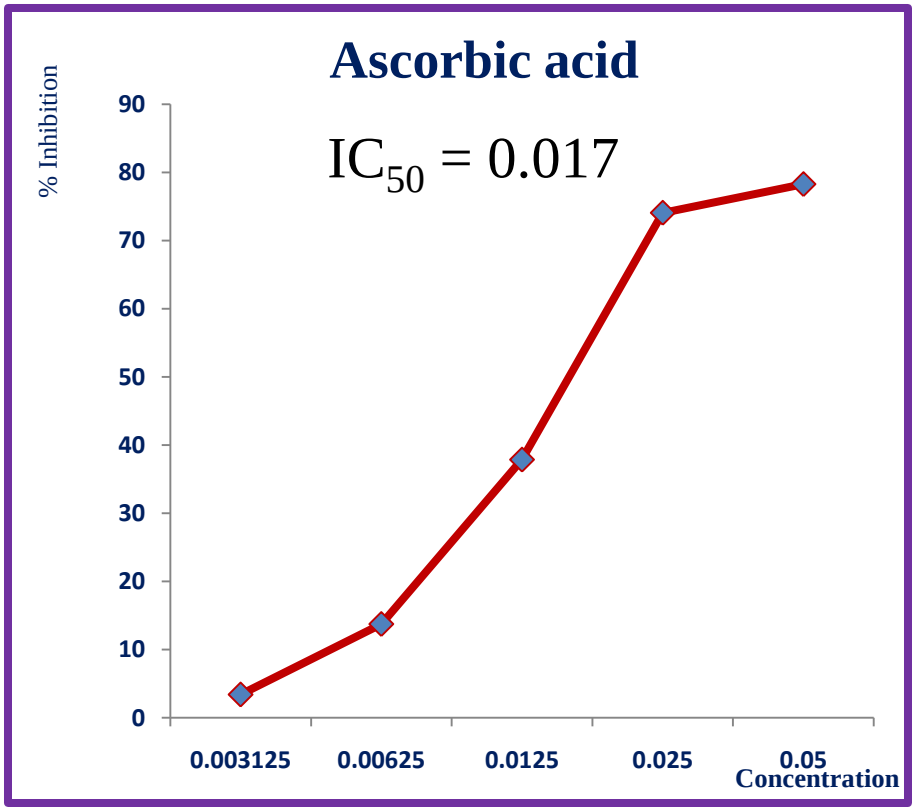
•*Escherichia coli*, *Klebsiella pneumoniae* and *Staphylococcus aureus are gram negative bacteria.* Gram-negative bacteria which are known for their ability to restrict the diffusion of hydrophobic compounds through their membranes. Antifungal resistance by *C. albicans* has also been reported to occur with long-term antifungal use and with recurrent infections (Arendrup and Patterson, 2017).

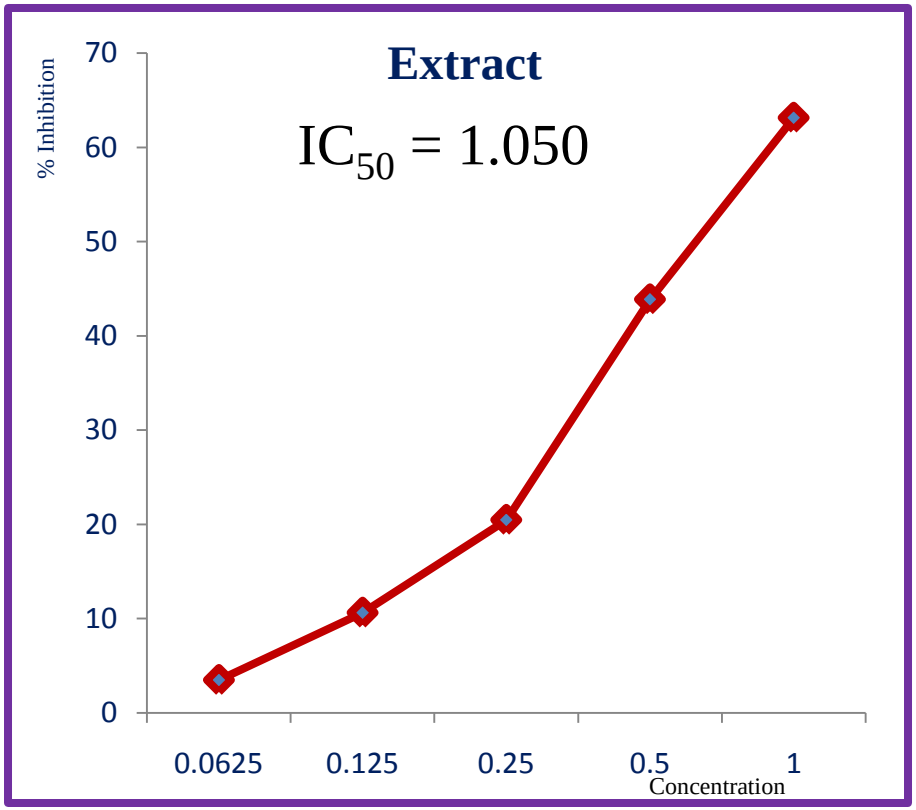
Results and Discussion (Cont'd)

The antimicrobial activity observed against the test organisms could be due to the interactions of the plant active metabolites with the organism's cytoplasmic membrane leading to the leakage of intracellular components and precipitation of cytoplasmic contents (Thangamani *et al*., 2016).

Results and Discussion (Cont'd)

DPPH Scavenging Activity: Standard versus Extract





✓The DPPH scavenging properties increased with the concentration of the extracts. Similar trends have been observed in previous studies (Pavithra and Vadivukkarasi, 2015).

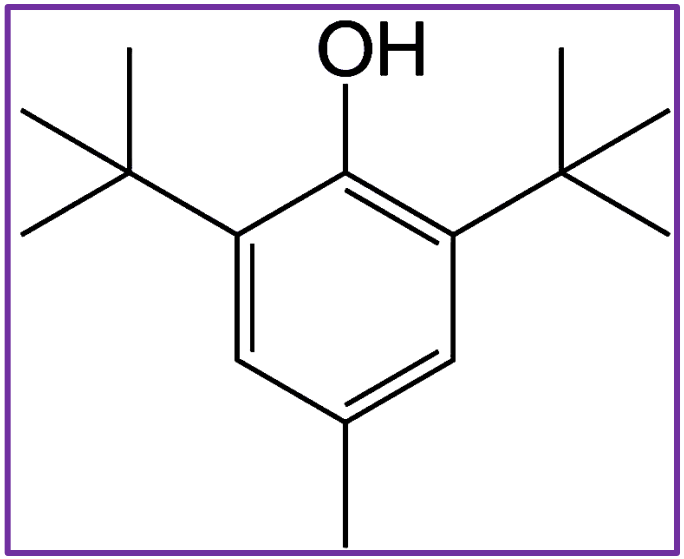
Results and Discussion (Cont'd)

GC-MS Analysis: Some Compounds detected in the hexane extract of the leaves

t_R(min.)	Area (%)	Name of Compound	Quality (%)
11.816	1.35	Butylated Hydroxytoluene	98
14.162	1.23	Heptadecane	95
15.318	1.34	Octadecane	93
15.409	1.19	Hexadecane,1,1'-oxybis	81
15.787	2.28	Cyclotetradecane, 1,7, 11-trimethyl-4-(1-methylethyl)-	91
17.401	8.06	Hexadecanoic acid, ethyl ester	91
17.876	1.71	Ethanol, 2-(Octadecyloxy)-	93
18.551	2.33	Eicosane	95
18.608	0.58	1-Docosene	90
19.060	14.01	9,12-Octadecadienoic acid (Z,Z)	96
19.123	8.54	Cyclohexene, 4-(4-ethylcyclohexyl)-1-pentyl	95

Results and Discussion (Cont'd)

Biological activities of some of the detected compounds (Cont'd)

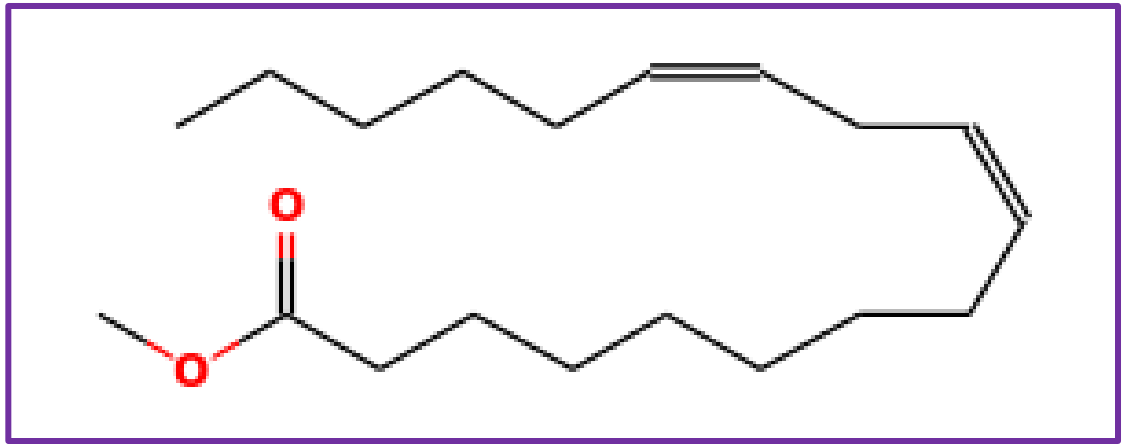


Butylated Hydroxytoluene

-Butylated hydroxytoluene (BHT) is a most commonly used antioxidant recognized as safe for use in foods containing fats, pharmaceuticals, petroleum products, rubber and oil industries (Yehye *et al*., 2015).

Results and Discussion (Cont'd)

Biological activities of some of the detected compounds (Cont'd)

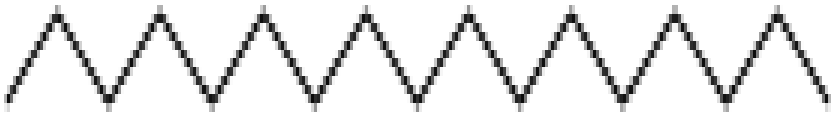


9,12-Octadecadienoic acid (Z,Z)

Antiinflammatory, hypocholesterolemic, cancer preventive, hepatoprotective, nematicide, insectifuge(cide), anti histaminic, antieczemic, antiacne, 5-α reductase inhibitor, antiandrogenic, antiarthritic, anti coronary, antimicrobial (Adeoye-Isijola *et al*., 2018).

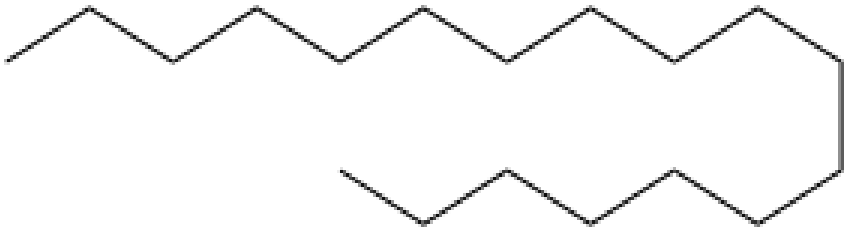
Results and Discussion (Cont'd)

Biological activities of some of the detected compounds (Cont'd)



Heptadecane

Anticancer, antioxidant and antimicrobial activity (Mishra and Sree, 2007; Uma and Parvathavarthini, 2010)

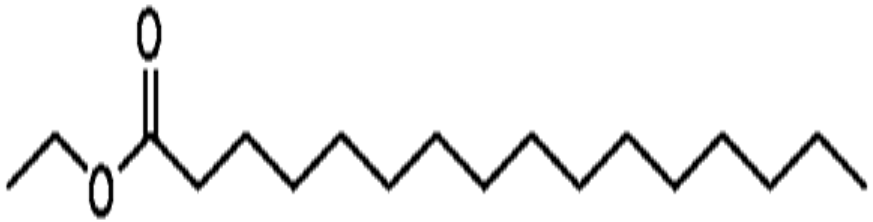


Octadecane

Anticancer, antioxidant and antimicrobial activity (Mishra and Sree, 2007; Uma and Parvathavarthini, 2010)

Results and Discussion (Cont'd)

Biological activities of some of the detected compounds (Cont'd)



Hexadecanoic acid, ethyl ester

Antioxidant, Hemolytic, Hypocholesterolemic, Nematicide (Tyagi and Agarwal, 2017)

Conclusion

The hexane extract of the leaves of *S. erianthum* demonstrated antimicrobial and antioxidant activities. While the activities obtained is not as high as those of the standard drugs, the extract has shown some potential as a source of antimicrobial and antioxidant compounds.