IOSR Journal Of Pharmacy And Biological Sciences (IOSR-JPBS)
e-ISSN:2278-3008, p-ISSN:2319-7676. Volume 14, Issue 3 Ser. II (May – June 2019), PP 71-78
www.Iosrjournals.Org

Investigation of the Phytochemicals and some Biological Parameters of *Ficus sycomorus* Leaf Extracts

[1]Ayuk Eugene L., [1]Nwochi Samson P., [1]Ogugor Juliet C.,
[1]Simon Godwin I. and [2]Ebiem- Kenechukwu Peace C.
[1]Department of Chemical Sciences, Godfrey Okoye University, Thinkers Corner, Enugu, Nigeria
[2]Material and Energy Technology Department, Projects Development Institute (PRODA) Enugu
Corresponding author: Ayuk, Eugene L.

Abstract: *The presence of phytochemicals in plants is responsible for their medicinal values. This work is aimed at investigating the phytochemicals and antimicrobial activity of Ficus sycamorus leaf extracts. Ficus sycamorus leaf extracts of five different solvents namely; distilled water, ethanol, methanol, n-hexane, petroleum ether were screened for the presence of phytochemicals. The result of the phytochemical analysis revealed the presence of alkaloids, flavonoids steroid, glycosides and tannins. The above extracts were also subjected to antimicrobial analysis. The antimicrobial analyses of the Ficus sycamorus leaf extracts for the five solvents revealed different levels of biological activity against the microorganisms; Staphylococcus aerus, Escherichia coli, Pseudomonas aeruginosa, Penicillin chrysogenum, Aspergillus fumigatuss chrysogenum and Aspergillus fumigatuss respectively. Various zones of inhibition were observed when the extracts were administered against the microorganisms and their activity indices were determined by dividing the zones of inhibition of the extracts by the zones of inhibition of the standard drugs; amoxicillin for the bacteria and fluconazole for the fungi respectively. The results of the minimum inhibitory concentration (MIC) for the bacteria strands revealed that, the aqueous and n-hexane extracts have the same inhibitory concentrations of 500mg/ml respectively for Staph- aerus. Methanol and petroleum extracts showed MIC of 250mg/ml respectively for the above microorganism while the MIC for the ethanol extract against Staph- aerus was observed to be 125mg/ml. For the E. coil, the n-hexane and petroleum ether extracts showed MIC of 500mg/ml respectively, aqueous and ethanol extracts revealed MIC of 250mg/ml respectively while the MIC obtained for the methanol extract was 125mg/ml.In the case of P. aerusginosa, aqueous, n-hexane and petroleum ether extracts showed the same MIC of 500mg/ml respectively, methanol extract gave MIC of 250mg/ml while ethanol extract showed MIC of 125mg/ml. The MIC results for the fungi revealed thus; for P. chrysogenum, aqueous extract gave MIC of 500mg/ml and n-hexane showed MIC of 250mg/ml respectively. The values of MIC for methanol, ethanol and petroleum ether extracts respectively for P. chrysogenum were not observed at concentrations of 500mg/ml, 250mg/ml, 125mg/ml and 62.5mg/ml respectively. The presence of this microorganism was not notice. This implies that their MICs are lower than 62.5mg/ml. Also for A. fumigatus, its presence was not notice at concentrations of 500mg/ml, 250mg/ml, 125mg/ml and 62.5mg/ml in all the extracts. This also implies that their MICs for all the extracts are lower than 62.5mg/ml.*

Keywords: *Investigation, Phytochemicals, Biological-Parameters, Minimum inhibitory concentration, Ficus sycamores,*

Date of Submission: 02-06-2019 Date of acceptance: 17-06-2019

I. Introductions

Plants are rich in several secondary metabolites and are good sources of valuable medicinal materials for the production of new drugs to control the menace of disease proliferations. It has been estimated that there are more than 500,000 plant species known but only a small fraction have been scientifically investigated for the presence active metabolites while only about 10% of the plants are used by humans according to (Borris, 1996).

The use of plant materials to treat infectious diseases by man is dated from the ancient times even when there was no knowledge about the causative organisms (Rios and Recio 2005). However, nowadays, a great deal of knowledge about disease causing microorganisms has been made available by systematic and scientific investigations as well the biological effects of herbal plants on these organisms. Consequently, the use of traditional medicine to treat various disease conditions in many developing countries, including Nigeria is gaining more attention.

It cannot be over emphasized that the plant kingdom is a treasure house of potential drugs and recently there is an increasing awareness about the importance of medicinal plants (Sofowora, A. 1993). The apparent reasons for this awareness stem from the fact that medicinal materials obtained from the plants are easily available and accessible, less expensive, safe, efficient and have little or no side effects.

Ficus sycomorus belongs to the family called *Moraceae*. It can be found in the Middle East, South West Africa, Egypt, Ethiopia, Israel, and Kenya. It grows very well in areas which receive mean annual rainfall ranging from 500-1800 mm per year and a mean annual temperature range from 0-40°C (Orwa et al, 2009). The best sites for the plant include drainage lines, streams, rivers, springs or dams.

The plant can grow up to 20m tall and 6 m wide with a dense round crown of spread branches. The leaves are heart-shaped and deep green in colour with round apex of about 14 cm long by 10 cm wide (Keay, 1989, and Buckill H.M, 1970). The tree can bear several fruits in a year and the growth rate is fairly fast at about 1-1.5 m per year in frost-free areas (Orwa, et al, 2009).The fruits contain hundred to thousand delicious seeds.

According to World Health Organization (W.H.O.), medicinal plants are the best sources to obtain variety of drugs and about 80% of the population from developing countries depends majorly on traditional medicines, which are derivatives of medicinal plants (Okwu and Josiah, 2006). However, there is a need for such plants to be properly investigated for better understanding of their properties, safety, and efficacy (Arunkuma and Muthusel 2009). This necessitated this study on *Ficus sycomorus* leaf extracts with interest in finding out the chemical compounds present as well as their antimicrobial activities.

II. Material and Methods

The regents used for this work were of analytical grade obtained from supplier without further purification. Their preparation was carried out according to the specified standards.

The research was carried out in the Industrial Chemistry laboratory of the Chemical Sciences Department and Microbiology laboratory of the Biological Sciences Department respectively at Godfrey Okoye University, Thinkers Corner, Enugu, Nigeria.

Fresh leaves of *Ficus sycamorus* were collected from the sycamore tree found in Akama-Oghe in Eziagu Local Government area of Enugu state, Nigeria and were identified to be *Ficus sycamores* leaves at Godfrey Okoye University, Thinkers Corner, Enugu Nigeria

2.1 Preparation of Plants Material

The fresh leaves of *Ficus sycamorus* were removed from their stalks, washed with tap water, raised with distilled water and air dried at room temperature for 4 weeks. The dried leaves were pulverized to fine powder using laboratory electric blender sterilized with 70% ethanol. The pulverized leaves were stored in air tight containers for extraction.

2.2 Extraction of the Plant Material

The crude extracts were obtained by cooled extraction method as described thus;

400g respectively of the dried blended leaves of *Ficus sycamores* were packed into 800 ml conical flasks and extracted with 500 ml of the following solvents methanol, ethanol, distilled water, *n*-hexane and petroleum ether respectively. The extracts obtained were concentrated with the help of a rotary evaporator to obtain semi solid crude extracts. These were put into sterile sample bottles and kept for both phytochemical and antimicrobial analyses.

2.3 Phytochemical Screening

The extracts obtained above were screened for the presence of alkaloids, flavonoids, glycosides tannins and steroids according to standard procedures given by (Harbon , 1998, Sofowora and Odebiyi, 1978). 1g of each of the crude extracts obtained was dissolved in 100ml of its solvent and was subjected to the qualitative screening as described below.

2.3.1 Test for the presence of alkaloids

To 2ml of each of the filtrates of the crude extracts, a drop of Mayer's reagent was added. A creamy white precipitate was formed which indicates the presence of alkaloids.

2.3.2 Test for the presence of flavonoids

5ml of dilute ammonia solution were added to 5ml of the aqueous extract, followed by the addition two drops of concentrated H_2SO_4. The appearance of a yellow coloration indicates the presence of flavonoids.

2.3.3 Test for the presence of glycosides

0.5 g of each of the extracts was dissolved in 5.0 cm^3 of distilled water, and 2.0 cm^3 of glacial acetic acid containing 1.0 cm^3 of ferric chloride solution was added, followed by the addition of 1.0 cm^3 of concentrated tetraoxosulphate (VI) acid, H_2SO_4. A brown ring at the interface of the two solutions was observed which indicates the presence of glycoside.

2.3.4 Test for the presence of tannins

0.5g of the dried powdered sample was poured into a test tube and boiled in 20ml of distilled water. This was later filtered and few drops of 0.1% ferric chloride solution were added. A brownish green coloration formed indicates the presence of tannins.

2.3.5 Test for the presence of steroids

2.0 cm^3 of acetic anhydride was added to 0.5g of each of the extracts containing 5% H_2SO_4 (2.0cm^3). The colour change from violet to blue or green indicates the presence of steroids.

2.4 Antimicrobial Screening

2.4.1 Test organisms

The microorganisms used for the antimicrobial screening were obtained from the Microbiology laboratory, Department of Biological Sciences, Godfrey okoye university, Enugu, Nigeria. These include one gram-positive bacterium (*Staphylococcus aureus*) and two gram-negative bacteria (*Escherichia coli* and *Pseudomonas aeruginosa*) and two fungi: *Aspergillus fumigatus and penicillium chrysogenum* respectively.

2.4.2 Antimicrobial Sensitivity Test

The antimicrobial analyses of the aqueous, ethanol, n-haxane, methanol and petroleum ether extracts respectively were carried out using agar well diffusion method according to (Vincent, 2005).

2.4.3 Preparation of Culture Media

Nutrient agar (28 g) was dissolved in of distilled water (1000cm^3). The prepared nutrient agar was distributed into 15 cm^3 portion using Mac Conkey bottles capped and then sterilized in an autoclave at 121 ^oC for 15 min. The seeded agar plates were prepared by pouring 15 cm^3 of the molten nutrient agar into sterile Petri-dish which 1cm^3 of the test microorganisms was added.

2.4.4 Preparation of the Standard drugs used

The materials used for the preparation of the standard drug were the same as those of the stock solution of the extracts. However, their concentrations were not the same. The standard drug used for the bacteria was *amoxicillin* while that of the fungi was *fluconazole* (Ogugor et al, 2018)

Since one capsule of *amoxicillin* contains 500.0 mg of the drug, the conversion factor below was used to obtain the concentration thus;

500mg/ml = 50000µg/ml

x = 1000µg/ml

$$x = \frac{500\text{mg/ml} \times 1000\ \mu\text{g/ml}}{500000\mu\text{g/ml}}$$

x = 1mg/ml

1.0 mg/ml of the *amoxicilin* was dissolved in 1.0 ml of DMSO to give 1000µg/ml concentration.

For the *fluconazole*, one capsule contains 150.0mg, employing the same formula as described above;

150mg/ml = 150000µg/ml

x = 1000µg/ml

$$x = \frac{150\text{ mg/ml} \times 1000\ \mu\text{g/ml}}{150000\mu\text{g/ml}}$$

x = 1.mg/ml

1.0mg/ml of the *fluconazole* was dissolve in 1.0ml of DMSO to give 1000ug/ml concentration.

2.4.5 Preparation of Stock solution of the extract

0.2 g of each extract was carefully weighed and transferred into the sterilized test-tube. DMSO (2.0cm^3) was added to each of the test-tubes containing the extract and was dissolved completely to get the stock.

2.4.6 Sensitivity Test

The procedure used for sensitivity test was carried as described by (Cameron et al, 2011). The seeded agar plates of various test organisms were prepared as discussed above. Wells were made at the respective plates using the Cork-borer. Each plate contains five (5) wells. Three drops of each of the five extract respectively

were put into their respective wells, and three drops of stock solution of the drugs respectively were also put into each of the wells respectively. The extracts and the drugs were allowed to diffuse for 30min; these were then incubated at 37 ^{o}C for 24h. Thereafter, the zones of inhibition were then calculated. The activity indices of the extracts were determined by dividing the diameter (zones) of inhibition of the extracts by the diameter (zones) of inhibition of the standard drugs (Ayuk et al, 2015) thus;

2.5 Determination of Minimum Inhibitory Concentration (MIC)

Nutrient broth (5ml) was dispensed into well labeled separate test-tubes, according to the following concentrations, 500, 250, 125, and 62.5 mg/ml. Each of the five extracts (1.0ml) respectively, was then transferred into test-tubes containing the different concentrations of nutrient broth above. 1 ml of each of the later was then transferred to four different test-tube serially and were allowed to stand for 30 min before incubation. After the incubation, the lowest concentration which showed no turbidity in the test-tube was recorded as the minimum inhibitory concentration (MIC). The extracts without the microorganisms served as control.

III. Results and Discussion

The phytochemical screening of *Ficus sycamorus* leaf extracts showed the presence of alkaloids and flavonoids in all the extracts namely; aqueous, ethanol, n-haxane, methanol and petroleum ether respectively. Glycosides were found to be present in the aqueous extract only and absent in the rest of the extracts. The presence of tannins was indicated in ethanol, n-hexane, methanol and petroleum ether extracts respectively and absent in the aqueous extract while steroids were found to be present in aqueous, ethanol, methanol respectively and absent in the n-hexane and petroleum ether extracts respectively. The result of the phytochemical screening of the extracts is shown in table 1 below.

Table 1: Phytochemical screening of *Ficus sycamorus* leaf extracts

S/No	Compound	Distilled water	Ethanol	n-Haxane	Methanol	Petroleum ether
1	Alkaloids	++	++	++	++	++
2	Flavonoids	++	+	++	++	++
3	Glycosides	++	--	--	--	--
4	Tannins	--	++	++	++	++
5	Steroids	++	++	--	++	--

Keys: (+++) Abundantly present, (++) moderately present, (+) present, (-) absent

The antimicrobial analyses of the *Ficus sycamorus* leaf extracts for the five solvents used for extraction, namely; distilled water, ethanol, n-hexane, methanol and petroleum ether respectively revealed some levels of biological activity against the microorganisms. The results are presented in table 2 -7 showing the diameter (zones) of inhibition and the activity indices of the extracts.

Table 2: Diameter (zones) of inhibition (mm) and the activity indices of methanol extract

S/No	**Organism**	**Concentration of extract(mg/ml)**					
		500	250	125	62.5	Amoxicillin 500mg/ml	Flucomazole 150mg/ml
1	*Staph-aerus* (mm)	15.20 (0.80)	9.00 (0.47)	8.00 (0.42)	7.80 (0.41)	19.10	
2	*E.coil* (mm)	20.00 (1.05)	18.10 (0.95)	12.20(0.64)	10.00 (0.52)	20.00	-
3	*P. aerusginosa* (mm)	16.10 (0.89)	14.20 (0.79)	12.10 (0.67)	9.00 (0.50)	18.00	-
4	*P.chrysogenum* (mm)	22.10 (0.91)	18.10 (0.75)	15.00(0.62)	8.00 (0.33)	-	24.20
5	*A .fumigatus* (mm)	24.00 (0.81)	20.20 (0.68)	18.1 (0.61)	12.20 (0.41)	-	29.50

Key: 0 = no inhibition, 0 −10 = moderate sensitivity, 10 − 20 = sensitive 20 and above = very sensitive.

From table 2, it could be observed that *E.coil* was the most susceptible bacterium in the presence of methanol extract compared to *Staph-aerus* and *P. aerusginosa* at concentrations of 500mg/ml, 250mg/ml, 125mg/ml and 62.5mg/ml of the extract respectively. The activity of the extract on the bacterium, *E.coil* at 500mg/ml was found to be exactly the same with that of the standard drug, *amoxicillin*. On the other hand,

amongst the two fungi screened, *P.chrysogenum* was more inhibited than *A .fumigatus* at the same concentrations respectively.

Table 3: Diameter (zones) of inhibition (mm) and the activity indices for ethanol extract

S/No	Organisms	Concentration of extract(mg/ml)					
		500	250	125	62.5	Amoxicillin 500mg/ml	Flucomazole 150mg/ml
1	*Staph-aerus(mm)*	20.20 (0.91)	18.00 (0.81)	15.10 (0.68)	11.10 (0.50)	22.10	-
2	*E.coil(mm)*	24.1 (1.21)	15.0 (0.75)	12.0 (0.60)	10.0 (0.50)	20.00	-
3	*P. aerusginosa(mm)*	19.10 (1.06)	15.20 (0.84)	13.10 (0.72)	12.00 (0.67)	18.00	-
4	*P.chrysogenum(mm)*	21.0 (0.95)	20.1 (0.91)	15.0 (0.68)	12.2 (0.55)	-	22.2
5	*A fumigatus (mm)*	20.0 (1.00)	19.1 (0.96)	15.1 (0.76)	12.0 (0.60)	-	20.0

Key: 0 = no inhibition, 0 −10 = moderate sensitivity, 10 − 20 = sensitive 20 and above = very sensitive.

For the results presented in table 3 above, ethanol extract showed the same trend of inhibitory action for the bacterial strands similar to those obtained in table 2, however, for the fungi, *A. fumigatus* was more susceptible than *P.chrysogenum* in ethanol extract.

Table 4: Diameter (zones) of inhibition (mm) and the activity indices for *n*-hexane extract

	Organisms	Concentration of extract(mg/ml)					
		500	250	125	62.5	Amoxicillin 500mg/ml	Flucomazole 150mg/ml
1	*Staph-aerus(mm)*	20.20 (0.91)	15.00 (0.68)	12.10 (0.55)	11.00 (0.50)	22.1	-
2	*E.coil(mm)*	24.10 (0.96)	12.10 (0.48)	10.10 (0.40)	9.00 (0.36)	25.0	-
3	*P. aerusginosa (mm)*	20.00(0.91)	15.20 (0.69)	13.10 (0.60)	11.10 (0.50)	22.0	-
4	*P.chrysogenum(mm)*	21.00 (0.83)	20.10 (0.78)	15.00 (0.60)	13.20 (0.52)	-	25.2
5	*A .fumigatus (mm)*	24.10(1.09)	19.10 (0.86)	15.10 (0.68)	11.00	-	22.1

Key: 0 = no inhibition, 0 −10 = moderate sensitivity, 10 − 20 = sensitive 20 and above = very sensitive.

A careful observation in table 4 above showed a decline in the activity of n-hexane extract on *E.coil* as one moves from 500mg/ml to 62.5mg/ml of the extract when compared with that of *Staph-aerus* and *P. aerusginosa* but the activity of the *n*-hexane extract on the later appeared to be similar, while the fungus, *A .fumigatus* was more inhibited than *P.chrysogenum* as one moves from 62.5mg/ml to 500mg/ml respectively.

Table 5: Diameter (zones) of inhibition (mm) and the activity indices for petroleum ether extract

	organisms	Concentration of extract(mg/ml)					
		500	250	125	62.5	Amoxicillin 500mg/ml	Flucomazole 150mg/ml
1	*Staph-aerus(mm)*	15.20 (0.80)	13.00 (0.68)	11.00 (0.58)	9.10 (0.48)	19.10	-
2	*E.coil(mm)*	20.00 (0.91)	18.10 (0.82)	15.20 (0.69)	10.00 (0.45)	22.00	-
3	*P.aerusginosa (mm)*	18.10 (1.01)	15.20 (0.84)	13.10 (0.72)	11.00 (0.61)	18.00	-
4	*P.chrysogenum(mm)*	24.10(0.96)	20.50 (0.81)	18.00 (0.71)	15.40 (0.61)	-	25.2
5	*A. fumigatus(mm)*	18.00(0.90)	10.10 (0.50)	9.00 (0.45)	7.10 (0.35)	-	20.1

Key: 0 = no inhibition, 0 −10 = moderate sensitivity, 10 − 20 = sensitive 20 and above = very sensitive.

For the petroleum ether extract results shown in table 5, *P. aerusginosa* was the most highly inhibited bacterium amongst *Staph-aerus* and *E.coil* at concentrations of 500mg/ml, 250mg/ml, 125mg/ml and 62.5mg/ml of the extract respectively while *P.chrysogenum* showed higher inhibitory results than *A. fumigatus* for the fungi strands.

Table 6: Diameter (zones) of inhibition (mm) and the activity indices for aqueous extract

S/No	**Organisms**	**Concentration of extract(mg/ml)**					
		500	250	125	62.5	Amoxicillin 500mg/ml	Flucomazole 150mg/ml
1	*Staph-aerus*	29.10 (1.07)	25.00 (0.93)	23.00 (0.85)	18.20 (0.67)	27.10	-
2	*E.coil*	20.00 (0.91)	18.10 (0.82)	15.20 (0.69)	11.00 (0.50)	22.00	-
3	*P. aerusginosa(mm)*	18.10 (1.21)	15.20 (1.01)	13.10 (0.87)	10.00 (0.67)	15.00	-
4	*P.chrysogenum(mmm)*	21.00 (1.16)	19.00 (1.05)	17.50 (0.97)	16.10 (0.89)	-	18.10
5	*A. fumigatus(mm)*	20.10 (1.12)	19.00 (1.06)	15.00 (0.83)	13.10 (0.73)	-	18.00

Key: 0 = no inhibition, 0 −10 = moderate sensitivity, 10 − 20 = sensitive 20 and above = very sensitive.

For the aqueous extract results shown in table 6, *P. aerusginosa* and *Staph-aerus* showed higher zones of inhibition than the *E.coil* at concentrations of 500mg/ml, 250mg/ml, 125mg/ml and 62.5mg/ml of the extract respectively while *P.chrysogenum* and *A. fumigatus* showed similar inhibition results for the fungi strands.

Generally, the results for the antimicrobial activity shown above in table 2-6, revealed that aqueous, ethanol, methanol, n-hexane and petroleum ether extracts of *Ficus sycamorus* leaves exhibited some very high measure of activity on both bacteria and fungi and therefore they represent good source of traditional medicine and a potent starting material for the production of drugs.

Minimum inhibitory concentration (MIC) is the lowest concentration of a chemical substance (usually a drug) which prevents visible growth of microorganism. MIC depends on the microorganism, the affected host and the antibiotic itself (Mac Kinnon and Davids, 2005, Ayuk et al, 2017). The MIC is determined by preparing solutions of the chemical invitro at increasing concentration, incubating the solutions with the separate batches of cultures bacteria and measuring the results using agar dilutions or broth microdilution. It is the first step in drug discovery. It involves the screening of a library drug candidates against bacterial of interest (Andrew, 2001 and O'Neill and Chopra, 2004)

While MIC is the lowest concentration of antibacterial agent necessary to inhibit visible growth, minimum bacterial concentration (MBC) is the minimum concentration of an antibacterial agent that results in bacterial death. The closer the MIC is to the MBC, the more bacterial the compound (O'Neill and Chopra, 2004).

The results of the MIC for ***Ficus sycamorus*** leaf extracts carried out in this study are given below in table 7 below;

Table 7: Minimum inhibitory concentration of all extracts of *Ficus sycamorus*

Microorganism	**Turbidity at various concentration of the extracts (mg/ml)**				
	500	250	125	62.5	Extract
Staph- aerus	-	-	+	+	Methanol
	-	-	-	++	Ethanol
	-	+	+	+++	Aqueous
	-	+	++	++	n-hexane
	-	-	+	++	Petroleum ether
E. coil	-	-	-	+	Methanol
	-	-	+	++	Ethanol
	-	-	+	++	Aqueous
	-	+	++	+++	n-hexane
	-	+	+	++	Petroleum ether
P. aerusginosa	-	-	+	+	Methanol
	-	-	-	+	Ethanol
	-	+	++	+++	Aqueous
	-	++	+	+++	n-hexane
	-	+	+	++	Petroleum ether
P. chrysogenum	+	+	+++	++	Methanol
	+	+	++	+++	Ethanol
	-	++	++	+++	Aqueous
	-	-	++	++	n-hexane
	+	++	++	+++	Petroleum ether
A. fumigatus					Methanol
					Ethanol
					Aqueous

					n-hexane Petroleum ether

Key: (-) no growth, (+) slight turbidity, (++) moderate turbidity, (+++) very turbid

The results of the MIC for the bacteria strands as shown in table 7 revealed that, the aqueous and *n*-hexane extracts gave the same inhibitory concentrations of 500mg/ml respectively for *Staph- aerus*. Methanol and petroleum extract also showed the same MIC of 250mg/ml respectively for the above microorganism while the MIC for the ethanol extract against *Staph- aerus* appeared to the lowest of all the extracts at 125mg/ml.

For the *E. coil*, the n-hexane and petroleum ether extracts showed MIC of 500mg/ml respectively, aqueous and ethanol extracts revealed MIC of 250mg/ml respectively while the MIC obtained for the methanol extract is 125mg/ml.

In the case of *P. aerusginosa*, aqueous, n-hexane and petroleum ether extracts showed the same MIC of 500mg/ml respectively, methanol extract gave and MIC of 250mg/ml while ethanol extract showed an MIC of 125mg/ml.

The following was observed from the MIC results of the fungi; for *P. chrysogenum*, aqueous extract gave MIC of 500mg/ml and n-hexane showed MIC of 250mg/ml respectively. The MIC for methanol, ethanol and petroleum extracts respectively could not be obtained at these prepared concentrations of 500mg/ml, 250mg/ml, 125mg/ml and 62.5mg/ml respectively. The presence of this microorganism was not notice. This implies the MIC should be lower than 62.5mg/ml.

However for *A. fumigatus*, MIC was not obtained for all the extracts used. The presence of this microorganism was also not notice at concentrations 500mg/ml, 250mg/ml, 125mg/ml and 62.5mg/ml respectively. This implies the MIC for all the extracts should be lower than 62.5mg/ml.

IV. Conclusion

The results obtained above from the phytochemical screening, antimicrobial and MIC analyses of ***Ficus sycamorus*** leaf extracts, justify its usage as a medicinal plant. The high antimicrobial activity of the extracts is probably due to the presence of the secondary metabolites identified and therefore the plant can serve as a good source of medicinal material. This is because the presence of phytochemicals in a plant determines its medicinal value. On a general notes, it can be observed from the above results that if properly harnessed and formulated with acceptable dosage, medicinal mixtures obtained from extracts of *Ficus sycamorus* leaves could serve as good starting materials for the production of antibacterial and antifungal drugs respectively.

Acknowledgement

The authors are very grateful to the Vice Chancellor of Godfrey Okoye University, , Thinkers Corner, Enugu, Nigeria, Prof Christian Anieke for creating an enabling environment for research by making funds available for the procurement of reagents and equipment in the laboratories. We also extend our sincere gratitude to the staff of Chemistry and Microbiology laboratories of the above University for their technical assistance.

References

[1]. Borris R. P. (1996) Natural products research: Perspectives from a major pharmaceutical company. *Journal of Ethnopharmacol*; 51:29–38.
[2]. Ríos J. L, and Recio M. C. (2005); Medicinal plants and antimicrobial activity. *Journal of Ethnopharmacol;* 100: 80–84.
[3]. Sofowora, A. (1993); Medicinal Plants and Traditional Medicine in Africa, Spectrum Books Ltd., Ibadan, Nigeria, 1993, 130
[4]. Orwa C, Mutua A, Kindt R, Jamnadass R and Anthony S (2009); Agro forestry database: A tree reference and selection guide version 4.0.
[5]. Keay R.W (1989) Trees in Nigeria, Clarendon press, Great Britain pp 240
[6]. Buckill H.M. (1970). The useful plant of West Tropical Africa (Vol 1 Fomilar A – D) 2nd Ed. Royal Botanical Garden pp 457.
[7]. Arunkumar S and Muthusel Vam (2009). Analysis of phytochemical constituents and antimicrobial activities of *Aloevera L*. against clinical pathogens. *World Journal of Agric. Science;* 5(5): 572-576
[8]. Okwu, D. E. and Josiah, C. (2006). Evaluation of the chemical composition of two Nigerian Medicinal plants *Afri. J. Biotechnol.* 5(4): 357-361.
[9]. Harbon J.B (1998). Phytochemical Methods: A guide to Modern Techniques of Plant Analysis Chapman and Hall int. Ed. New York; 488 - 493.
[10]. Sofowora E.A and Odebiyi O; (1978). Phytochemical Screening; Nigeria Medicinal Plants, Loydia; 41-234.
[11]. OgugorJuliet C; Ayuk Eugene L; Osuji Amara S; Ugwu Mariagorretti O; Unaegbu Marcellus E. (2018); Phytochemical, antimicrobial, proximate and heavy metals analysis of extracts of the bark of *Tetrapleura tetraptera fruit*; *Global Scientific Journal*; 6(12); 1-16.
[12]. C. O. Vincent, (2005) Pharmaceutical Microbiology: Principles of the Pharmaceutical Applications of Antimicrobial Agents, El 'Demak Publishers, Enugu, Nigeria,
[13]. Cameron, D. R.; Howden, B. P.; Peleg, A. Y. (2011). "The Interface between Antibiotic Resistance and Virulence in Staphylococcus aureus and Its Impact upon Clinical Outcomes". *Clinical Infectious Diseases.* 53 (6): 576–582
[14]. E. L. Ayuk, A. N. Njokunwogbu, S. U. Ilo, G. A. Engwa, T. O. Oni (2015). Screening of Phytochemicals and Biological Potential of Aqueous, Methanol and Hexane Extracts of *Cylicodiscus gabunensis* Stem Bark; *American Journal of Biochemistry*, 5(2): 30-34

[15]. McKinnon, PS and Davis, SL. Pharmokinetic and pharmacodynamic issues in the treatment of bacterial infectious diseases. in: VL Yu, G Edwards, PS McKinnon, C Peloquin, G Morse (Eds.) Antimicrobial therapy and vaccines, volume II: antimicrobial agents. ESun Technologies, Pittsburgh, PA; 2005: 5–19
[16]. Ayuk Eugene L, Oforji Chizoba F, Aronimo Samuel B, Ugwu Francis C, Njokunwaogbu Ambrose N (2017); Determination of Secondary Metabolites and Biological Potential of *Gnetun africanum* (Okazi) Leaves; *The Pharmaceutical and Chemical Journal*, , 4(4):115-122
[17]. Andrews, J. M. (2001). "Determination of minimum inhibitory concentrations". Journal of *Antimicrobial Chemotherapy*. 48 (1): 5–16
[18]. O'Neill, AJ; Chopra, I (2004). "Preclinical evaluation of novel antibacterial agents by microbiological and molecular techniques". *Expert Opinion on Investigational Drugs*; 13 (8): 1045–63.

IOSR Journal of Pharmacy and Biological Sciences (IOSR-JPBS) is UGC approved Journal with Sl. No. 5012, Journal no. 49063.

Ayuk, Eugene L. "Investigation of Phytochemicals and Biological Parameters of Ficus sycomorus Leaf Extracts" IOSR Journal of Pharmacy and Biological Sciences (IOSR-JPBS) 14.3 (2019): 71-78.