



INTERNATIONAL JOURNAL OF SCIENCE FOR GLOBAL SUSTAINABILITY

Comparative Phytochemical Studies of *Ficus Sycomorus*, *Khaya Senegalese*, And *Azadirachta Indica* Leaves ExtractN. Muhammad^{1*} B.U Bagudo² M.U Dabai³ N.S. Mathias⁴ M. lawal⁵ ***^{*} School of Science Laboratory Technology Chemistry, Federal Polytechnic, Kaura-Namoda, Nigeria.^{2,3}Department of pure and applied chemistry Usmanu Danfodiyo university, Sokoto Nigeria^{3,4}Department of Pharmacognosy and Ethnomedicine, Usmanu Danfodiyo University Teaching HospitalCorresponding Author's Email & Phone No.: najeem36@gmail.com; 08030748667.

Received on: August, 2023

Revised and Accepted on: September, 2023

Published on: October, 2023

ABSTRACT

The phytochemical content of three medicinal plants *Ficus sycomorus*, *Khaya senegalensis*, and *Azadirachta indica* which are considered as a major source of new antibiotics was determined. The goal of our research is to evaluate the phytochemicals of *Ficus sycomorus*, *khaya senegalensis*, and *Azadirachta indica* leaves extracts. The methanol, ethyl acetate and n-hexane, extracts of these plants were subjected to phytochemical test, the result of the phytochemical analysis for different solvent revealed the presence of Tannins, Alkaloids, and Flavonoids. Quantitative estimation of phytoconstituent revealed that saponins were present in great amounts in all the extracts screened, (p-value 0.005 less than the alpha 0.05) while Flavonoids, and Alkaloids were present in sufficient amounts with (p-value 0.000 less than the alpha 0.05). The results showed that all the plant samples were rich source of phytochemicals. It could be suggested that this plant has a potential as a source of therapeutic agents. This supports the traditional use of the plant in curing human diseases. It is therefore suggested that further studies be carried out using different solvents as well as to isolate, purify and identify the active compounds present in the extracts with a view to justifying these claims.

Keywords: Phytochemical; medicinal; therapeutic measures and solvents

1.0 INTRODUCTION

The use of plants as source of remedies for the treatment of diseases dates back to prehistory and people of all continents have this old tradition. Despite the remarkable progress in synthetic organic chemistry of the twentieth century, over 25% of prescribed medicines in industrialized countries are derived directly or indirectly from plants (Kankia and Zainab 2020). *Ficus sycomorus* (*F. sycomorus*) is one of the ancient trees belonging to the family *Moraceae*. This fruit tree, a native of Africa, is widely distributed in the Mediterranean basin of Egypt. The fruit, known as fig, is used as food and for other medicinal properties. The *Moraceae* family consists of approximately 40 genera and over 1000 species of flowering plants, most of which are widely distributed in tropical and subtropical regions (Hamad, et al., 2021)

Sumengen et al., (2020). Reported that leaf extracts of *F. sycomorus* was active. The inhibition zone diameters ranged from 1.8mm to 13.00 mm. Fruit extracts and methanol controls showed no

inhibitory effect on strains. However, bacteriostatic activity against *Enterococcus faecalis* was observed in fruit-water extract. The highest antimicrobial activity was shown against *Staphylococcus aureus* (13 mm) for ethanolic extracts at 100 mg/mL concentration. Minimal inhibition concentration (MIC) for ethanolic extract was observed starting at 25 mg/mL concentration against *S. aureus*.

Song (2017) work on in vitro antimycobacterial screening of *Ficus sycomorus* extracts on susceptible strain of mycobacterium tuberculosis. The author reported that the anti-mycobacterial activity of *Ficus sycomorus* (stem bark, root bark, leaves and fruits) was studied in vitro using standard assay techniques against susceptible strain of mycobacterium tuberculosis. Phytochemical analysis of the n-hexane fruit extract was done using standard test methods. In their research they discovered: n-hexane leaves extract showed activity against the tested. This activity was observed between 100-400 µg/mL against the

susceptible strain to standard TB drugs. The crude n-hexane, leaves, root bark and stem bark extracts lacked activity against the susceptible M-Tb strain. The methanol and aqueous extracts of fruit, leaves, stem bark and root bark also lacked activity against the tested susceptible M-Tb strain.

Similar studies by Celestine *et al.*, (2017) Both aromatic and aliphatic compounds were identified. *K. senegalensis* contains alkaloid, saponin, tannins and flavonoids.

Itelima *et al.* (2016). Reported both plant extracts had antimicrobial effects against the test organisms, the aqueous extracts were found to show greater anti-microbial effect than ethanolic extract. Thus, the mean diameter zones of inhibition ranged from 0.03 mm-40.00 mm for aqueous extract and 0.50 mm-21.00 mm for ethanolic extract at the highest concentration of 50mg/mL. The finding of this study supports the use of neem leaf in the treatment of various microbial infections by alternative systems of medicine.

1.1 Aims and Objectives

This research is aimed at investigating comparatively, the phytochemical and antibacterial activities of three plants extracts, *Ficus sycomorus*, *Khaya senegalense*, and *Azadirachta indica*.

The specific objectives are:

Extraction of plant material in *Ficus sycomorus*, *Khaya senegalense*, and *Azadirachta indica*.

- i. Qualitative phytochemical screenings for five class of secondary metabolites
- ii. Quantitative phytochemical determination of total flavonoids, total alkaloids and total saponins.
- iii. Comparative phytochemicals and antibacterial activities of *Ficus sycomorus*, *Khaya senegalense*, and *Azadirachta indica* extracts, using one-way Anova.

2.0 MATERIAL AND METHODS

2.1 Sample Collection

Samples of FKA Leaves were collected from river side in Maru local government area of Zamfara state. The leaves sample were washed using tap water. They were air dried for two week and pounded into a paste using pestle and mortar. The paste of the leaves extracts was allowed to dry in

the sun for five days. It was then ground into powder, and stored in a tied container for future use. The taxonomy of the plant was authenticated, at Usmanu Danfodiyo university sokoto teaching hospital herbarium school of pharmacognosy and ethnomedicine.

2.2 Methods

2.2.1 Preparation of plant extracts

Exactly 150 g of powdered of each plant sample was macerated with 500 cm³ of methanol, n-Hexane, and ethyl acetate each separately. The mixture was concentrated in hot air oven at 40°C for 48 hr. After the incubation period was over, the mixture was filtered and concentrated on water bath. The extracts were concentrated to dryness in rotary evaporator (IKA-RV 10 Control) and were stored for used.

2.2.2 Phytochemicals Analysis

Phytochemical analysis of the test sample was carried out according to standard methods adopted with slightly modification.

i. Detection of Alkaloids

One milliliter of aqueous extract was stirred and placed in 1% aqueous hydrochloric acid on a steam bath. Then, 1 cm³ of the filtrate was treated with Dragendoff's reagent. Turbidity or precipitation with this reagent was considered as evidence for the presence of alkaloids.

ii. Detection of Saponins

About 2 g of the powdered sample was boiled in 20 cm³ of distilled water in a water bath and filtered. 10 cm³ of the filtrate was mixed with 5 cm³ of distilled water and shaken vigorously for a stable persistent froth. The frothing was mixed with 3 drops of olive oil and shaken vigorously, then observed for the formation of emulsion.

iii. Detection of Phenols

Extracts were treated with 3-4 drops of ferric chloride solution. Formation of bluish black colour indicates the presence of phenols.

iv. Detection of flavonoids

A portion of the powdered plant sample was in each case heated with 10 cm³ of ethyl acetate over a steam bath for 3 min. The mixture was filtered and

4 cm³ of the filtrate was shaken with 1 cm³ of dilute ammonia solution. A yellow coloration was observed indicating a positive test for flavonoids becomes colorless on addition of dilute acid, indicates the presence of flavonoids.

v. Detection of Tannins

About 0.5 g of the extract was boiled in 10 cm³ of water in a test tube and then filtered. A few drops of 0.1% ferric chloride was added and observed for brownish green or a blue-black coloration.

vi. Detection of Terpenoids

About 5 cm³ of each extract were mixed in 2 cm³ of Chloroform and 3 cm³ Concentrated sulphuric acid was carefully added to form a layer. A reddish-brown color at the interface indicates the presence of terpenoids.

2.3 Quantitative Phytochemical Screening of the Ficus Sycomorus Leave s Extracts of Different

2.3.2 Determination of Total Alkaloids

About 5 g of the sample was weighted and transferred into a 250 cm³ beaker. About 200 cm³ of 10 % acetic acid in ethanol & cover the beaker with aluminum foil and Allow to stand for 4 hour. The extract was filter & concentrated on a water bath to one-quarter of the original volume, a drop wise of concentrated ammonium hydroxide was added to the extract until the precipitation was complete. The whole solution was allowed to settle and the precipitates were collected and wash with dilute ammonium hydroxide and then filter. The

Solvent s used for the Extraction of the Secondary Metabolites

2.3.1 Determination of Total Flavonoid

Exactly 0.5 g of the plant sample extracts was weight and placed in 250 cm³ conical flask, 100 cm³ of dilute hydrochloric acid was added and boil in water bath for 35 mints, after it was filter while hot to recover the extracts. The filtrate was treated with ethyl acetate in drop wise twice. The precipitate recovered was filtrated and weight which give the percentage of the flavonoids presents.

% flavonoids.

$$\frac{W3 - W1}{W2} \times 100$$

$$= \% \text{flavonoid presents} \dots (2.1)$$

Where W1 is the weight of the empty filter paper
W2 is the weight of the extract = 0.5 g for each sample

W3 is the weight of empty filter paper + the flavonoids precipitate
residue is the alkaloid, which was dried and weighed.

$$\frac{W3 - W1}{W2} \times 100 =$$

% alkaloids presents (2.2)

Where W1 is the weight of the empty filter paper
W2 is the weight of the extract = 0.5g for each sample

W3 is the weight of empty filter paper + the alkaloids precipitate

3.0 RESULTS

Table 3.1 Percentage of *Ficus sycomorus*, *Khaya senegalese*, and *Azadirachta indica*

S/No.	Extracts	Weight (g)	Percentage Yield % (w/w)
1.	FME	12.23	8.12
2.	FEE	10.72	7.14
3.	FHE	7.28	4.85
4.	KME	13.21	8.81
5.	KEE	11.94	7.96
6	KHE	6.35	4.23
7.	AME	12.04	8.02
8.	AEE	10.57	7.05
9.	AHE	6.62	4.41

Key: FME =Ficus sycomorus methanol extracts, FEE =Ficus sycomorus ethyl acetate extract, FHE=Ficus sycomorus hexane extracts, KME=khaya senegalese methanol extracts KEE= khaya senegalese ethyl acetate extracts KHE =Khaya senegalese hexane extracts, AME =Azadirachta indica methanol extracts AEE =Azadirachta indica ethyl acetate extracts AHE= Azadirachta indica hexane extracts

Table 3.2. Preliminary Phytochemical Screening of *Ficus sycomorus*, *Khaya senegalese*, and *Azadirachta indica* Extracts

Plant Extracts Type	Metabolites Tested							
	Alkaloids		C GI	Flavo noid	Saponins	Steroids	Tannins	Terpen oids
	M	D						
<i>F. sycomorus</i> (F)								
FHE	+	+	-	+	-	-	+	-
FEE	+	-	+	+	-	+	+	+
FME	-	+	+	-	+	-	+	-
<i>K. senegalensis</i> (K)								
KHX	+	+	-	+	+	-	+	-
KEE	-	+	+	+	-	-	+	-
KME	+	+	-	-	-	+	+	+
<i>A. indica</i> (A)								
AHX	+	+	-	-	+	-	-	-
AEE	+	+	-	-	-	+	-	-
AME	-	+	-	+	+	+	+	+

Key= FME =Ficus sycomorus methanol extracts, FEE =Ficus sycomorus ethyl acetate extract, FHE=Ficus sycomorus hexane extracts, KME=khaya senegalese methanol extracts KEE= khaya senegalese ethyl acetate extracts KHE =Khaya senegalese hexane extracts, AME =Azadirachta indica methanol extracts AEE =Azadirachta indica ethyl acetate extracts AHE= Azadirachta indica hexane extracts **M= Mayer, D= Dragendoff's reagents**

Table 3.3 Quantitative evaluation of the secondary metabolites

S	Extrac / ts	Alkaloid	Flavonoids	Saponins
1	FME	2.81±0.01	4.52±0.03	5.35±2.2
2	FEE	4.13±0.01	3.40±0.02	0.60±0.05
3	FHE	1.62±0.02	7.93±0.05	5.32±0.08
4	KME	1.77±0.01	6.93±0.02	11.80±0.02
5	KEE	4.02±0.01	10.33±0.01	3.49±0.02
6	KHE	2.21±0.01	4.35±0.01	9.61±0.03
7	AME	5.02±0.02	7.23±0.03	8.16±0.02
8	AEE	4.78±0.07	4.78±0.07	3.80±0.05
9	AHE		3.65±0.02	6.31±0.02
		4.09±0.02		

Key: All the values are represented in Mean ±SE, FME = *Ficus sycomorus* Methanol extract, FEE= *Ficus sycomorus* ethyl acetate extract, KME *Khaya senegalensis* methanol extract KHE *Khaya senegalensis* Hexane extract, KEE *Khaya senegalensis* ethyl acetate extract, AME *Azadirachta indica* methanol extract, AEE *Azadirachta indica* ethyl acetate extract AHE *Azadirachta indica* Hexane extract.

4.0 DISCUSSION

The secondary metabolites we screened from *Ficus sycomorus* *Khaya senegalese* and *Azadirachta indica*, Phytoconstituents are active ingredients for the therapeutics activities are found in some while other not detected. Table 3.1 methanol extracts of all the plants extracts Saponins is present only in the *Azadirachta indica* and *Ficus sycomorus* leaves but it's absent in the *Khaya Senegalese* of the methanol extract. Also, alkaloids are presents in both extract *Ficus sycomorus* *Khaya senegalese* and *Azadirachta indica*. Steroids are found in the

Khaya Senegalese and *Azadirachta indica* and absent in the *Ficus sycomorus* leaves extract.

From table 3.3 the Results of quantitative evaluation indicate highest Saponins content in *Khaya senegalensis* methanol extracts, which comply to the statement that methanol, is undoubtedly considered the best solvent for extraction of phenolic compounds due to better solubility and polarity of the solvent. However, the total Saponins founds in the plants extracts the p-value 0.005 which is less than the (α -value 0.05) in this case it shows that there is relation between the two solvents methanol and Hexane extracts of the *Ficus sycomorus* extracts are significantly the same but ethyl acetate extract are statistically difference due to the facts that methanol is polar solvents and the hexane is very low polar solvents. The total flavonoids contents of *Azadirachta indica* methanol extract, *Azadirachta indica* ethyl acetate extracts, and *Azadirachta indica* hexane extract, indicates that statistically, there is no significant difference between them, P-value is 0.00 compared to (α -value 0.05).

5.0 CONCLUSION

Findings of this study confirmed the presence of Saponins, Flavonoids, alkaloids, tannins, steroids, terpenoids and cardiac glycosides in various extracts of the plant leaves *Ficus sycomorus* *Khaya senegalese* and *Azadirachta indica*. The biological activity of the individual and or synergetic activity of its various phytochemical constituents.

In the present study, we conclude that flavonoids are a chemical class most often correlated with antimicrobial efficacy of herbal extracts.

Our study showed *Khaya senegalensis* ethyl acetate extracts contain the highest flavonoids contents in addition to highest Flavonoids contents, data obtain from ANOVA it indicates that there is no significant difference between the three solvent of extraction with the P-value (0.00)

REFERENCES

Celestine, U. A, Christopher G. B. and Innocent O. O., (2017) Phytochemical profile of stem bark extracts of *Khaya senegalensis* by Gas Chromatography-Mass Spectrometry (GC-MS) analysis *Journal of Pharmacognosy and Phytotherapy* Vol. **9(3)**, pp. 35-43, DOI:

10.5897/JPP2016.0416 Article Number: 5858D3063028 ISSN 2141-2502

Dawod, A.; Fathalla, S.I.; Elkhatam, A.; Osman, N.; Sheraiba, N.; Hammad, M.A.; El-Seedi, H.R.; Shehata, A.A.; Anis, A. (2021) UPLC-QToF Nanospray MS and NMR Analysis of *Ficus sycomorus* Stem Bark and Its Effects on Rabbit. *Processes*, 9, 1201. <https://doi.org/10.3390/pr9071201>

Itelima J.U, Nwokedi V C, Ogbonna AI, Nyam MA., (2016). Phytochemical screening and antimicrobial activity evaluation of aqueous and ethanolic extracts of the leaf of *Azadirachta indica* Juss (neem) on some microorganisms. *world journal of bourgaud, f., a. gravot, s. milesi, and e.gontier.* (2001). Production of plant secondary metabolites: a historical perspective. *Plant Science*, vol. 161, pp.839–851.

Kankia H. I and Zainab S.A (2020). Phytochemical Analysis and Antimicrobial Activity of Methanolic and Ethanolic Leaves, Barks and Roots Crude Extracts of *Khaya Senegalensis* *International Journal of Scientific and Research Publications*, Volume 5, Issue 1,

Sumengen Ozdenefe M, Tanoglu F, Suer K, Guler E, Mercimek Takci HA. (2020). Antioxidant and antimicrobial activity of *Ficus sycomorus* fruit and leaf extracts. *Marmara Med J*;33(3): 133-140, doi: 10.5472/marumj.816301

Song, M. A. Abarshi, M. M. Ameh, D. A. Aliyu, M. S. Mamuda, K. Nicolas, E. Isiyaku, A. Meshak, P. Mosunmola, I. Abba K. Mikailu S., (2017). In vitro Antimycobacterial Screening of *Ficussycomorus* Extracts on Susceptible Strain of *Mycobacterium tuberculosis*. *Journal of Advances in Medical and Pharmaceutical Sciences* 15(4): 1-7.