Original Research paper

Antimicrobial Properties of the African Locust Bean (*Parkia biglobosa*) Efflents with the chaff and without its chaff.

Abstract

Aim: The aim of this study is to determine the antimicrobial properties of the *Parkia biglobosa* effluent. The effluents were tested against some pathogenic microorganisms for their antimicrobial properties using the conventional antibiotics as the control.
Study Design: Effluent with and without chaff is to serve as agents used to determine whether it has antimicrobial properties on the clinical and typed isolates.
Place and Duration of Study: This study was carried out between November, 2015 and July, 2016 at the Department of Microbiology Laboratory, Federal University of Technology Akure, Ondo State, Nigeria.
Methodology: Locust beans bought from "Oja Oba" market, Ikare-Akoko, Ondo state were cooked until the coat was soft and the effluent was decanted, cooked again and the effluent with chaffs was also decanted. Both effluents (with and without chaffs) were used against the test and clinical microorganisms using agar well diffusion method. The Minimum inhibitory concentration was carried out using tube dilution method using Mueller Hinton broth
Results: When the pathogenic microorganisms were subjected to antimicrobial tests using the effluents at 100mg/ml; the effluents were able to inhibit *Staphylococcus aureus* (ATCC 43300), *Salmonella typhi* (ATCC 35240), *Escherichia coli* (ATCC 35218) while *Pseudomonas aeruginosa* (ATCC 27853) and *Klebsiella pneumonia* (ATCC 48891) were resistant to the effluent. The clinical isolates were more resistant to the effluents. However, the effluents were able to inhibit *Staphylococcus aureus*, *Salmonella typhi, Streptococcus pyogenes* and *Escherichia coli*, while *Pseudomonas aeruginosa* and *Klebsiella pneumoniae* were resistant to the effluent at 100mg/ml. The effluent without chaffs was found to possess more bactericidal effect on the test microorganisms when compared with the effluent containing chaffs. The highest antibacterial activity of the locust beans effluent without chaffs was recorded for *Salmonella typhi* with 18.00±0.00 inhibition zones and 14.00±0.00 with chaffs respectively. The lowest activity was observed on *Pseudomonas aeruginosa* with the zones of inhibition ranging from 9.67±0.58 and 7.67±0.58 respectively. However, there was no antibacterial activity observed on *Staphylococcus aureus* and *Klebsiella pneumoniae*. **Conclusion:** This study has provided useful information on the antimicrobial activities of the effluents against clinical and typed microorganisms used in this study.

Keyword: *Parkia biglobosa*, Effluent, Antimicrobial, Antibiotics, Bactericidal.

INTRODUCTION

Parkia biglobosa, also known as the African locust beans or néré, is a deciduous perennial tree of the Fabaceae family [1]It is popularly known as the Africa locust beans, Dadawa (Hausa), Origili (Ibo) and Iru (Yoruba) [2] It is found in a wide range of environments in Africa and is primarily grown for its pods that contain both a sweet pulp and valuable seeds. Processing of locust beans fruits to food condiment, involves different unit operations after harvesting; such unit operations include depodding, and removal of the yellowish pulp to produce locust beans seeds. Other processing operations are cleaning, boiling, dehulling, washing, recooking, and then fermentation to produce the food condiment which is used as soup seasoning/spices [3].

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Plate 1: Africa Locust Beans Seeds Used for this Study

The quest for solutions to the global problems of antibiotic resistance in pathogenic bacteria has often focused on the isolation and characterization of new antimicrobial compounds from a variety of sources including medicinal plants [4]. This is probably because the efficacies of these plant products have been confirmed in different disease situations in different parts of the world and that their little or no known side effects have made them succeed where most synthetic or conventional agents have failed. It may also be because scientists have established that crude extracts of some plants and some pure compounds from such plants can potentiate the activity of antibiotics *in-vitro* [5]. In Africa, medicinal preparations from plants have been used over a long period for the treatment of ailments. This is because orthodox medicine is not available in some places due to a wide range of reasons, among which includes that the first line drugs which are cheap and affordable have become ineffective because of resistance. However, these plant preparations are becoming more widely used by people all over the world as they understand the strength in them and the fact that most of them can be used safely without any known side effect which is not the case in drug or pills [6] This plant has been used extensively for medicinal purposes by the Hausa people of Northern Nigeria and other parts of West Africa. A decoction of the stem bark is used as a mouthwash to steam, relieve toothache as well as a bath for fever and tonic for diarrhoea and as an enema [7, 8, 9]. The leaves are also active against bronchitis, pile, cough, amoebiasis, dental carries and conjunctivitis [10]. The aqueous and acetone extract of *Parkia biglobosa* raw beans have also demonstrated termicidal properties [11]. There is little or no study on the effluents of *Parkia biglobosa* as a medium of treatment of ailment, for this reason this study is to determine the antimicrobial properties of the locust beans effluents (with or without chaffs).

2. METHODOLOGY

2.1 Sample Source

The locust beans seeds were purchased at Oja Oba, (King's market) Ikare Akoko, Ondo state, Nigeria and washed thoroughly, they were cooked until the coats were soft enough to be removed with hands. The effluent (with chaff) was decanted and kept in an air tight container, while the coats (chaffs) of the cooked seeds were removed; re-washed and re-cooked until it was very soft. Then the effluent (without chaff) was also decanted and kept in separate air tight container. The samples were transported to Microbiology Laboratory of the Federal University of Technology, Akure, Nigeria for additional analyses.

2.2 Source and Preservation of Bacterial Isolates Used

Pure clinical isolates (*Escherichia coli*, *Salmonella typhi*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Streptococcus pneumoniae*) were obtained from the stock culture of States Specialists Hospital, Akure, Ondo State, Nigeria and typed isolates (*Eschericia coli:* ATCC 35218, *Salmonella typhi*: ATCC 35240, *Pseudomonas aeruginosa*: ATCC 27853, *Klebsiella pneumoniae*: ATCC 48891, *Staphylococcus aureus*: ATCC 43300, *Streptococus pneumoniae*) were obtained from Pathological and Clinical Laboratory of Lagos State University Teaching Hospital (Pathcare), Lagos State, Nigeria. Pure isolates were maintained on Nutrient agar slants in the refrigerator at 4^{o}C until further investigative procedure.

2.3 Antibiotic Sensitivity Profile

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The antibiotic sensitivity profile was investigated in order to compare the sensitivity of the microorganisms to the different conventional antibiotics. The disc diffusion method was used to determine the susceptibility and resistance of the microorganisms to the antimicrobial drugs. Twenty milliliter of sterile Mueller-Hilton agar was aseptically poured into sterile Petri dishes and allowed to gel. Each plate was seeded with the test organism before aseptically introducing the antibiotic disc with sterile forceps onto the surface of the solidified Mueller Hilton agar plate and incubated at 37^{o}C for 24 hours. After incubation, clear zones around the disk were measured in millimeter and recorded as the zones of inhibition. Diameters of zone of inhibition was measured with a calibrated ruler and then compared with clinical and laboratory standards for their sensitivity or resistance. Seeded plates without antibiotic disk served as the control. The antibiotic sensitivity profile was carried out in triplicates.

2.4 Standardization of Test Microorganism

A loopful of the bacterial culture was aseptically inoculated into freshly prepared sterile nutrient broth and incubated for 24 hours. 0.2 ml was pipetted from the 24 hours broth culture of the test organism and was dispensed into 20 ml sterile nutrient broth and incubated for another 4 hours to standardize the culture to 0.5 McFarland's standard (10^{6}cfu/ml) before use as described by [12].

2.5 Reconstitution of *Parkia biglobosa* Effluent

The *Parkia biglobosa* effluent was filtered with 0.2 µm pore filter membrane and 1ml of the *Parkia biglobosa* effluent were dissolved in 10 ml of Dimethyl Sulfoxide and the concentration was subjected to antimicrobial activities.

2.6 Determination of Antimicrobial activities of *Parkia biglobosa* Effluent

Parkia biglobosa effluent (100mg/ml) without chaffs and *Parkia biglobosa* effluent with chaffs were used against the test microorganisms using agar well diffusion method. Mueller-Hinton and Sabouraud dextrose agar plates were used for bacterial and fungal isolates respectively. Observation and determination of zones of inhibition (ZI) were preceded with an aerobic overnight incubation at 37°C for 24 hours and at 27°C for 48 hours for bacteria and fungi respectively.

2.7 Minimum Inhibitory Concentration (MIC)

The Minimum inhibitory concentration was carried out using tube dilution method using Mueller Hinton broth. The tube dilution susceptibility test was used to determine the MIC values for the locust beans effluent, a series of Mueller-Hinton broth tubes containing varying two fold concentrations of the various *Parkia biglobosa* effluent samples in the range of 6.25mg/ml to 100mg/ml was prepared and incubated with a previously standardized density of the test microorganisms (0.5ml). The lowest concentration of the *Parkia biglobosa* effluent samples resulting in no growth following visual inspection after 18-24 hours of incubation for bacteria and 24-72 hours for yeast and mould using spectrophotometer was recorded as the MIC.

2.8 Statistical Analysis

Numerical data obtained from this study were subjected to analysis of variance; (ANOVA) and the means were separated by using New Duncan's Multiple Range Tests in SPSS 16.0 computer-aided programme. Errors were calculated as standard error.

3.0 RESULTS

The Antibiotics sensitivity pattern of the clinical bacteria used for the antimicrobial test against the effluent are shown in Table 1. The clinical bacteria; *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Salmonella typhi*, *Escherichia coli* and *Streptococcus pyogenes* were tested against some conventional antibiotics using an antibiotics sensitivity disc. The antibiotics used were Septrin (30ug), Ciprofloxacin (10ug), Amoxicillin (10ug), Gentamycin (10ug), Pefloxacin (30ug), Streptomycin (30ug), Ampiclox (30ug), Zinnacef (20ug), Rocephin (25ug), Erythromycin (10ug), Chloramphenicol (30ug), Sparfloxacin (10ug), Augmentin (30ug), and Tarivid (10ug).

The results show that *Staphylococcus aureus* was susceptible to Septrin, Amoxicillin, Ampiclox, Zinnacef, Rocephin , Chloramphenicol, and Tarivid, with Septrin and Zinnacef having the lowest and

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highest zones of inhibition at 4.33 ± 0.58[b] and 12.67 ± 0.58[b] respectively, and it was resistant to the remaining antibiotics; *Pseudomonas aeruginosa* was inhibited by Rocephin and Tarivid at 4.33 ± 0.58[b] and 6.67 ± 0.58[b] respectively, which were the lowest and highest zones of inhibition and it was resistant to other antibiotics; *Klebsiella pneumonia* was susceptible to Chloramphenicol, Gentamycin, and Tarivid. Gentamycin and Chloramphenicol had the lowest and highest zones of inhibition with 6.00 ± 0.00[a] and 8.67 ± 0.58[c] respectively.

Table 1: Antibiotics sensitivity pattern of the clinical bacteria

Antibiotics	*Staphylococcus aureus*	*Pseudomonas aeruginosa*	*Klebsiella pneumoniae*	*Salmonella typhi*	*Escherichia coli*	*Streptococcus pyogenes*
SXT	4.33±0.58[b]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	16.00±0.00[e]
CPX	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	10.33±0.58[c]	14.33±0.58[d]	0.00±0.00[a]
AM	8.33±0.58[c]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	10.00±0.00[c]	0.00±0.00[a]
CN	0.00±0.00[a]	0.00±0.00[a]	6.00±0.00[b]	4.33±0.58[b]	10.33±0.58[c]	10.33±0.58[c]
PEF	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	4.67±0.58[b]
S	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]
APX	13.00±1.00[d]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	4.33±0.58[b]	10.33±0.58[c]
Z	13.33±0.58[d]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]
R	7.67±1.15[c]	4.33±0.58[b]	0.00±0.00[a]	0.00±0.00[a]	10.00±0.00[c]	0.00±0.00[a]
E	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	14.33±0.58[d]
CH	8.33±0.58[c]	0.00±0.00[a]	8.67±0.58[c]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]
SP	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	20.33±0.58[e]	0.00±0.00[a]
AU	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]
OFX	12.67±0.58[d]	6.67±0.58[c]	8.33±0.58[c]	12.33±0.58[d]	14.33±0.58[d]	10.67±0.58[c]

Data are presented as Mean±S.D (n=3). Values with the same superscript letter(s) along the same column are not significantly different (P<0.05).

Legend:

SXT = Septrin (30ug), CPX = Ciprofloxacin (10ug), AM = Amoxicillin (10ug), CN = Gentamycin (10ug), PEF = Pefloxacin (30ug), S = Streptomycin (30ug), APX = Ampiclox (30ug), Z = Zinnacef (20ug), R = Rocephin (25ug), E = Erythromycin (10ug), CH = Chloramphenicol (30ug), SP = Sparfloxacin (10ug), AU = Augmentin (30ug), OFX = Tarivid (10ug)

The antibiotics sensitivity pattern of the typed bacteria used for the antimicrobial test against the effluent is shown in Table 2. The typed bacteria; *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Salmonella typhi*, *Escherichia coli* and *Streptococcus pyogenes* show almost the same susceptibility to the sensitivity disc as clinical bacteria.

Table 2: **Antibiotics sensitivity pattern of the typed bacteria**

Antibiotics	*Staphylococcus aureus*	*Pseudomonas aeruginosa*	*Klebsiella pneumonia*	*Salmonella typhi*	*Escherichia coli*	*Streptococcus pyogenes*
SXT	4.33±0.58[b]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	16.00±0.00[e]
CPX	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	10.33±0.58[c]	14.33±0.58[d]	0.00±0.00[a]
AM	8.33±0.58[C]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	10.00±0.00[c]	0.00±0.00[a]
CN	0.00±0.00[a]	0.00±0.00[a]	6.00±0.00[b]	4.33±0.58[b]	10.33±0.58[c]	10.33±0.58[c]
PEF	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	4.67±0.58[b]
S	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]
APX	13.00±1.00[d]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	4.33±0.58[b]	10.33±0.58[c]
Z	13.33±0.58[d]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a]

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R	7.67±1.15^{c}	4.33±0.58^{b}	0.00±0.00^{a}	0.00±0.00^{a}	10.00±0.00^{c}	0.00±0.00^{a}
E	0.00±0.00^{a}	0.00±0.00^{a}	0.00±0.00^{a}	0.00±0.00^{a}	0.00±0.00^{a}	14.33±0.58^{d}
CH	8.33±0.58^{c}	0.00±0.00^{a}	8.67±0.58^{c}	0.00±0.00^{a}	0.00±0.00^{a}	0.00±0.00^{a}
S P	0.00±0.00^{a}	0.00±0.00^{a}	0.00±0.00^{a}	0.00±0.00^{a}	20.33±0.58^{e}	0.00±0.00^{a}
AU	0.00±0.00^{a}	0.00±0.00^{a}	0.00±0.00^{a}	0.00±0.00^{a}	0.00±0.00^{a}	0.00±0.00^{a}
OFX	12.67±0.58^{d}	6.67±0.58^{c}	8.33±0.58^{c}	12.33±0.58^{d}	14.33±0.58^{d}	10.67±0.58^{c}

Data are presented as Mean±S.D (n=3). Values with the same superscript letter(s) along the same column are not significantly different (P<0.05).

Legend:

SXT = Septrin (30ug), CPX = Ciprofloxacin (10ug), AM = Amoxicillin (10ug), CN = Gentamycin (10ug), PEF = Pefloxacin (30ug), S = Streptomycin (30ug), APX = Ampiclox (30ug), Z = Zinnacef (20ug), R = Rocephin (25ug), E = Erythromycin (10ug), CH = Chloramphenicol (30ug), SP = Sparfloxacin (10ug), AU = Augmentin (30ug), OFX = Tarivid (10ug).

Antimicrobial activities of locust beans effluent with chaffs and without chaffs, on typed microorganisms at 100mg/ml are presented in Table 3. For the typed isolates, at 100mg/ml the effluent of the *Parkia biglobosa* effluent with chaffs and without chaffs were able to inhibit *Staphylococcus aureus* (ATCC 43300), *Salmonella typhi* (ATCC 35240), *Escherichia coli* (ATCC 35218) and *Streptococcus pyogenes* (ATCC 29212)while *Pseudomonas aeruginosa* (ATCC 27853) and *Klebsiella pneumoniae* (ATCC 48891) were resistant to the effluent. *Escherichia coli* (ATCC 35218) had the lowest susceptibility at 6.33 ± 0.58^{b} and *Streptococcus pyogenes* (ATCC 29212) had highest susceptibility with 13.00 ± 1.73^{a} zones of inhibition for effluent without chaffs. While for effluent with chaffs *Escherichia coli* (ATCC 35218) and *Streptococcus pyogenes* (ATCC 29212) had the lowest and highest zones of inhibition at 4.33 ± 0.58^{a} and 11.33 ± 0.58^{a} respectively while *Pseudomonas aeruginosa* (ATCC 27853) and *Streptococcus pyogenes* (ATCC 29212) had the lowest and highest zones of inhibition at 18.67 ± 0.58^{b} and 24.33 ± 0.58^{c} respectively when tested against Chloramphenicol (control).

Table 3: **Antimicrobial activities of locust beans effluent with chaffs and without chaffs on typed microorganisms at 100mg/ml**

Microorganisms	EFWOS	EFWS	C
Staphylococcus aureus (ATCC 43300)	8.67±0.58^{b}	6.00±0.00^{a}	20.33±0.58^{c}
Pseudomonas aeruginosa (ATCC 27853)	0.00±0.00^{a}	0.00±0.00^{a}	18.67±0.58^{b}
Klebsiella pneumoniae (ATCC 48891)	0.00±0.00^{a}	0.00±0.00^{a}	19.33±0.58^{b}
Salmonella typhi(ATCC 35240)	12.67±0.58^{b}	9.67±1.15^{a}	24.00±0.00^{c}
Escherichia coli (ATCC 35218)	6.33±0.58^{b}	4.33±0.58^{a}	21.33±0.58^{c}
Streptococcus pyogenes (ATCC 29212)	13.00±1.73^{a}	11.33±0.58^{a}	24.33±0.58^{c}

Data are presented as Mean ± S.D (n=3). Values with the same superscript letter(s) along the same row are not significantly different (P≤0.05).

Legend:

EFWOS- Effluent without chaffs,

EFWS- Effluent with chaffs,

C- Chloramphenicol.

Antimicrobial activities of locust beans effluent with chaffs and without chaffs, on clinical bacteria at 100mg/ml are presented in Table 4. For the clinical isolates, *Parkia biglobosa* effluent with chaffs and without chaffs at 100mg/ml inhibited *Staphylococcus aureus*, *Salmonella typhi, Escherichia coli*, and *Streptococcus pyogenes* while *Pseudomonas aeruginosa* and *Klebsiella pneumonia* were resistant to both effluents. *Escherichia coli* and *Streptococcus pyogenes* had the lowest and highest susceptibility at 4.00 ± 0.00^{b} and 12.33 ± 0.58^{a} respectively for the effluent without chaffs; while *Staphylococcus aureus*, and *Streptococcus pyogenes* had the lowest and highest susceptibility at 2.33 ± 0.58^{a} and 9.33 ± 0.58^{a} respectively for effluent with chaffs while *Pseudomonas aeruginosa* and *Klebsiella pneumoniae* isolates were resistant to both effluents. *Staphylococcus aureus* and *Streptococcus pyogenes* had the lowest and highest susceptibility at 16.67 ± 0.58^{c} and 21.33 ± 0.58^{c} respectively when tested against Chloramphenicol (control).

Table 4: Antimicrobial activities of locust beans effluent with chaffs and without chaffs on clinical microorganisms at 100mg/ml

Microorganisms	EFWOS	EFWS	C
Staphylococcus aureus	4.00 ± 0.00^{b}	2.33 ± 0.58^{a}	16.67 ± 0.58^{c}
Pseudomonas aeruginosa	0.00 ± 0.00^{a}	0.00 ± 0.00^{a}	17.33 ± 0.58^{b}
Klebsiella pneumoniae	0.00 ± 0.00^{a}	0.00 ± 0.00^{a}	18.67 ± 0.58^{b}
Salmonella typhi	$10.67\pm.1.15^{b}$	8.33 ± 0.58^{a}	20.33 ± 0.58^{c}
Escherichia coli	4.00 ± 0.00^{b}	2.33 ± 0.58^{a}	18.67 ± 0.58^{c}
Streptococcus pyogenes	12.33 ± 0.58^{b}	9.33 ± 0.58^{a}	21.33 ± 0.58^{c}

Data are presented as Mean±S.D (n=3). Values with the same superscript letter(s) along the same row are not significantly different (P≤0.05).

Legend:
EFWOS- Effluent without chaffs,
EFWS- Effluent with chaffs,
C- Chloramphenicol.

Minimum inhibitory concentration of *Parkia biglobosa* effluent without chaffs and effluent with chaffs in mg/ml is shown in Table 5. When effluents were tested against the typed and clinical isolates, the result showed the MIC of *Staphylococcus aureus* and *Escherichia coli* (Clinical) was 100mg/ml for both effluents. The MIC of *Salmonella typhi* (ATCC 35240) (Typed) was 50mg/ml for both effluents. The MIC of *Staphylococcus aureus* (ATCC 43300) (Typed) was 25mg/ml for effluent without chaffs and 50mg/ml for effluent with chaffs. *Pseudomonas aeruginosa*, *Klebsiella pneumoniae* (Clinical and typed cultured) and *Salmonella typhi* (Clinical) showed no zone of inhibition.

Table 5: Minimum inhibitory concentration of *Parkia Biglobosa* effluent without chaffs and effluent with chaffs in Mg/Ml

Microorganisms	EFWOS	EFWS
Staphylococcus aureus	100	100
Staphylococcus aureus (ATCC 43300)	25	50
Pseudomonas aeruginosa	NI	NI
Pseudomonas aeruginosa (ATCC 2853)	NI	NI
Klebsiella pneumoniaee	NI	NI
Klebsiella pneumoniae (ATCC 48891)	NI	NI
Salmonella typhi	50	25
Salmonella typhi (ATCC 35240)	50	50
Escherichia coli	100	100
Escherichia coli (ATCC 35218)	50	100

Streptococcus pyogenes	100	50
Streptococcus pyogenes (ATCC 29212)	100	50

Legend:
EFWOS: Effluent without chaffs,
EFWS: Effluent with chaffs.

DISCUSSION

It was discovered that most microorganisms obtained in this study were susceptible to these effluents which implies that the effluents can be used in the treatment of the diseases caused by those microorganisms. The antimicrobial activities of the *Parkia biglobosa* effluent with chaffs and without the chaffs were tested against clinical and typed microorganisms. The effluent without chaffs had higher zone of inhibition on the test microorganisms than the effluent with chaffs; this might be as a result of the phytochemical component present in the effluents which could be detrimental to the isolates.The presence of tannins in *Parkia biglobosa* was confirmed by [7] after studying the phytochemical and antibacterial properties of *Parkia biglobosa* and its leaf extracts.The clinical isolates were more resistant compared with the typed microorganisms to the *Parkia biglobosa* effluents. Though it was able to inhibit *Staphylococcus aureus*, *Salmonella typhi* and *Escherichia coli*, but *Pseudomonas aeruginosa* and *Klebsiella pneumoniae* were resistant to the effluent at 100mg/ml, this may be due to the fact that the patients from which the clinical isolates were obtained from had probably been introduced to one antibiotics or the other which is not effective in inhibiting their growth and as a result, have become more resistant. Generally, it was discovered that microorganisms obtained in this study, are susceptible to these effluents which implies that the effluents can be used in the treatment of the diseases caused by those microorganisms.[13] reported that phytochemical screening of the root bark of the plant contains a lot of glycosides and tannins, appreciable amounts of saponins and traces of alkaloids. The presence of such bioactive compounds has been linked to the antibacterial activity such as inhibition of growth [14] and offering some protection to the plant against microbial infections [15]. This findings also correlate with the report of [16] who reported that *Parkia biglobosa* has been reported to be rich in tannins, flavonoids and saponins among others which are secondary metabolites known to have antibacterial activities.

For the typed isolates at 100mg/ml, the effluents of the *Parkia biglobosa* were resistant to *Pseudomonas aeruginosa* (ATCC 27853) and *Klebsiella pneumoniae* (ATCC 48891). This correlates with the report of [13] who reported that *Pseudomonas aeruginosa* is however less susceptible, it was observed that the leaves and seeds of *Parkia biglobosa* (Jacq.) were active against *Staphylococcus aureus*, *Bacillus cereus*, *Pseudomonas aeruginosa*, *Aspergillus niger and C. utilis*. [7] also reported that *Bacillus cereus* was more susceptible while *Pseudomonas aeruginosa* was not susceptible to *Parkia biglobosa* (Jacq.) extract.

CONCLUSION

This study has provided useful information on the antibacterial activity of the effluents against both the typed and clinical microorganisms used in this study. Further work can be carried out on the effluent such as determining the toxic dose and extraction of the bioactive component for use in production of drugs.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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