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FTIR, BACTERIAL, AND ANTIBIOTICS RESISTANCE PROFILE OF LEAF EXTRACTS AGAINST PATHOGENIC CLINICAL ISOLATES OF *Staphylococcus aureus* FROM THE HUMAN WOUND

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ABSTRACT
In many underdeveloped nations, plant material is still used as therapeutic medicines in primary health care. Thus, the focus of this research is on the discovery of medicinal plants as antibacterial agents that can be used to broaden the range of antibiotics available. Plant extracts of (*Ocimum gratissum*, *Moringa oleifera*, *Momordica charantia*, *Azadirachta indica,* and *Citrus auratifolia)* were screened for antibacterial activities against *Staphylococcusaureus (SA)* isolated from human wounds in two different years (2022 and 2023) at different seasonal weather. The leaves were extracted by hand-crushing while 0.1ml was used against *SA*. The zone of inhibition (ZOI) was recorded after 24 hours of incubation in millimeters (mm). The antibacterial effects of the leaf extracts increase during the rainy seasons (13-24mm) than in the dry season (10-16mm). All the leaf extracts have the highest ZOI (18mm-24mm) than the commercially sold antibiotics at the same concentrations. Antibiotics sensitivity test result shows 100%, 97%, and 93% resistant to *SA*. In the examined extracts, FTIR spectroscopy analyses revealed the presence of compounds that are responsible for the activities found by identifying their groups.
KEYWORDS: Resistance profile, Leaf extracts, Clinical isolates, sensitivity, and *Staphylococcusaureus.*

1. INTRODUCTION

In recent years, there has been an increase in antibiotic-resistant strains of clinically significant pathogens, which had resulted in the creation of new multidrug-resistant bacterial strains. Plants have been used in traditional healthcare delivery systems in Africa and around the world since civilization began [1]. African conventional medicine has recently gained attention and acceptability as a substitute healthcare delivery approach. Herbal medications have been used to treat and cure a variety of diseases and physiological abnormalities among Sub-Saharan Africans [2]. Throughout history, herbal treatments have been used to treat a variety of infectious disorders. In many underdeveloped nations, plant material is still used as therapeutic medicines in primary health care. Thus, the identification of medicinal plants as antibacterial drugs contributes to the broad range of antibiotics accessible [3].

In India, many portions of the neem tree have been employed in traditional Ayurvedic medicine. The leaves, seeds, and bark, for example, provide a broad spectrum of antibacterial effects against Gram-negative and Gram-positive microbes. The leaves, on the other hand, are of concern due to their therapeutic potential for wound healing. Neem leaf is beneficial in the treatment of chronic wounds, diabetic foot, and gangrene [4]. The availability of antibiotics over the counter has led to an increase in the antimicrobial resistance of pathogens to conventional drugs. Due to this increase in resistance, there is a need to research natural products which have therapeutic effects on which plants and their products. This study investigated the antibacterial activities of *Ocimum gratissum, Moringa oleifera, Momordica charantia, Azadirachta indica,* and *Citrus auratifolia* leaf extracts on *Staphylococcus aureus* isolated from a wound with infection.

2. MATERIALS AND METHODS

2.1 Study locale

The research was carried out within Ede, Osun State. Ede is a city with about 159,866 people living in it altogether. Ede is located between 4° 30' and 4° 3' east of the Greenwich Meridian and 7° 40' and 7° 40' north of the equator, respectively.

2.2 Study plan

This study was done to find out the inhibitory effects of *Ocimum gratissum*, *Moringa oleifera*, *Momordica charantia*, *Azadirachta indica* and *Citrus auratifolia*extracts on *Staphylococcus aureus* isolated from infected wounds comparing with commercially sold antibiotics in-respect to weather seasons.

2.3 Collection of plant sample

Fresh leaves of five different plants namely Scent leaf (*Ocimum gratissum*), Moringa leaf (*Moringa oleifera*), Balsam pear leaf (*Momordica charantia*), Neem leaf (*Azadirachta indica*) and Lime leaf (*Citrus auratifolia*) were plucked directly from the federal polytechnic Ede school pavilion surrounding and were collected into a sterile polythene bag. All the leaves were rinsed, weighed, and air-dried at room temperature.

2.4 Collection and Testing for the Viability of the Microorganism

The tested organism was collected from LAUTECH Hospital, Osogbo, Osun State from the microbiology department where identification and characterization of the tested microorganism was done. The stock cultured organism was subcultured onto an agar plate to check for the viability of the organism. A loopful colony of the inoculums was streaked using inoculating wire loop onto the agar plate aseptically and incubated at 37^{0c} for 24 hours.

2.5 Extraction Method

Direct hand extraction was used. The fresh leaves were weighed on an analytical weighing balance, rinsed, and air-dried at room temperature for 5 -10 minutes. The plants were extracted by crushing them with a sterile hand. The resultant extract was dispended into plain covered bottles.

2.6 Testing for the anti-bacteria Potency of the leaf extracts

The viable organism of *Staphylococcus aureus* was swabbed on the solidified agar plate. A sterilized cock borer of an internal diameter of about 5mm was used to drill holes in the solidified media plates and 0.1mls of the plant extract was dispensed into it The plate was incubated at 37^{0}c for 24 hours in an incubator and was observed after 24 hours. This process was repeated for all the leaf extracts used as mentioned above.

2.7 Determination of the anti-bacteria Potency from the leaf extract

The antibacterial efficacy of the leaf extracts was assessed by measuring the zone of inhibition with a laboratory meter and a rule rope. The inhibitory zone was measured in millimeters (mm)

2.8 Antibiotic susceptibility testing (AST)

The antibiotic sensitivity test for each strain of isolated bacteria was determined using Kirby-Bauer's disc diffusion method. McFarland matching standard was used to determine the concentration of isolates as explained below;

i. Getting the test organisms ready for the sensitivity test

ii. For 24 hours at 37^{0} C, 17 colonies of the multidrug-resistant sample were sub-cultured in sterile nutrient broth.

iii. For ten minutes, Isolate broth cultures were centrifuged at 3000 rpm.
iv. Using a spectrophotometer set to 600 nm, the sediments were diluted in sterile phosphate buffer saline (PBS). This was adjusted to a concentration of 10^8 CFU/ml with the McFarland matching standard (0.6 ml of 1% $BaCl_2.H_2O$ and 99.4 ml of 1% concentrated H2SO4).

Testing for antibiotic sensitivity, every aliquot was spread on Mueller Hinton agar medium.
i. Antibiotic sensitivity discs {Gentamycin 10µg, Tetracycline 30µg, Ciprofloxacin 5µg, Doxycycline 30µg, Chloramphenicol 30µg and Erythromycin 15µg}were positioned on the medium's surface through sterile forceps.
ii. The setup underwent a 24-hour aerobic incubation at 37°C.
iii. The diameters of the inhibitory zones were measured using the
meter rule in mm.

2.9 Interpretation of AST result

The results were interpreted using the Clinical and Laboratory Standards (CLSI) Institute's standards in terms of the test antibiotics' ZDI (zone diameter of inhibition) values (2011). According to the CLSI standards, bacteria were divided into three categories depending on how sensitive, intermediate, or resistant they were to a specific antibiotic.

3.0 Results

3.1 The antibacterial analysis of the leave extracts to clinical isolates of *SA* organism from the human wound.

The antibacterial analysis of the leave extracts of Scent leaf (*Ocimum gratissum*), Moringa leaf (*Moringa oleifera*), Balsam pear leaf (*Momordica charantia*), Neem leaf (*Azadirachta indica*), and Lime leaf (*Citrus auratifolia*) against the pathogenic clinical isolate of *Staphylococcus aureus* (SA) was determined in two different years (2022 and 2023) and seasons to confirm if seasonal changes do affect the antiseptic activities of the plant extract. The zone of inhibitions was determined by measuring in millimeters (mm). All the Leaves extracts showed anti-bacteria response against pathogenic clinical isolate of *SA* although the level of reactions was different varying from 14mm to 24mm (Fig. 1). It can be observed that there were no significant differences between the two years but there are great significant differences between the seasonal values. The antibacterial effects of the leaf extracts increase during the rainy seasons (13-24mm) than in the dry season (10-16mm). The plant extract with the highest zone of inhibition (24mm) is Moringa oleifera.

3.2 Response of commercial antibiotics to clinical isolates of *SA* organism from human wound

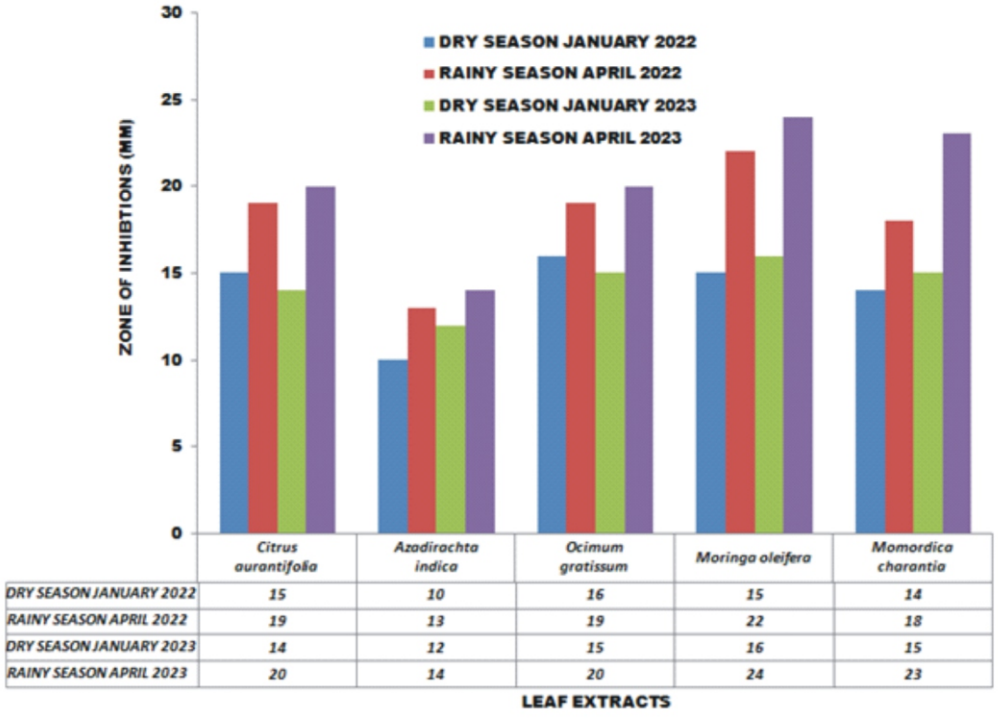
When comparing the result of the commercially sold antibiotics (Gentamycin, Tetracycline, Ciprofloxacin, Doxycyclin, Chloramphenicol, and Erythromycin), the result shows that all the leaf extracts have high zone of inhibition (18mm-23mm) than the commercially sold antibiotics (0.9mm-19.2mm) except doxycyclin and chloramphenicol that had high ZOI of 18.7mm and 19.2mm respectively (figure 2).

3.3 Antibiotics sensitivity testing of commercially sold antibiotics to clinical isolates of *SA* organism from human wound

Table I to Table V shows the profile of antibiotics sensitivity testing results of the antibiotics to *SA*. 100% resistance to *SA* was recorded from tetracycline, ciprofloxacin, and gentamycin while 97% was recorded for both doxycycline and erythromycin while chloramphenicol has the lowest resistant percentage of 93%.

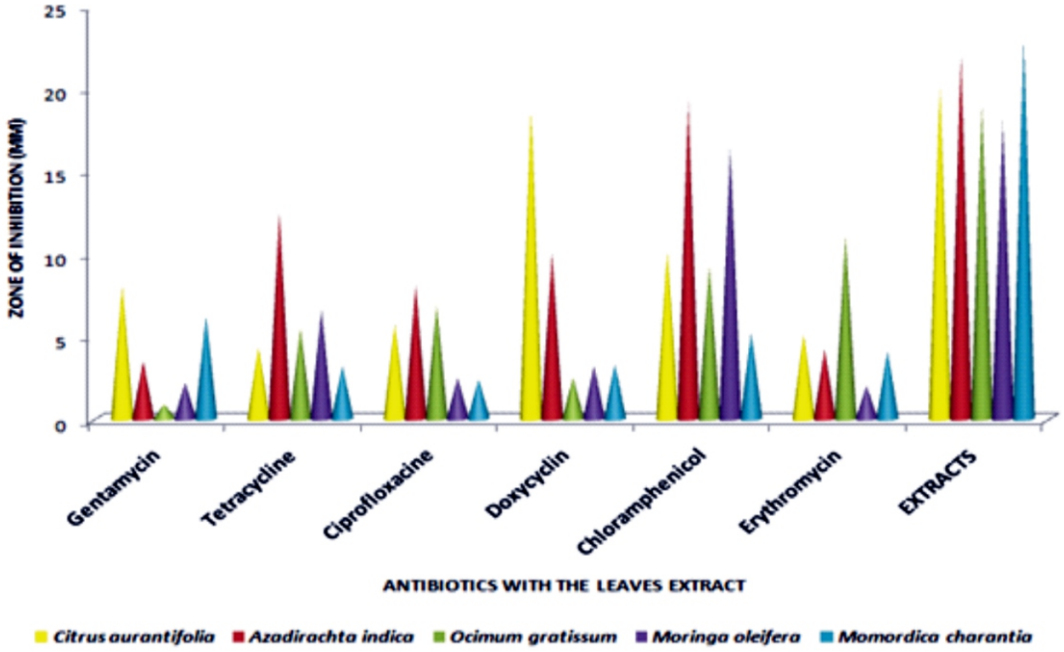
3.4 Spectrum range of FTIR results for theleaf extract

The FTIR peak values and functional groups for each leaf extract {Scent leaf (*Ocimum gratissum*), Moringa leaf (*Moringa oleifera*), Balsam pear leaf (*Momordica charantia*), Neem leaf (*Azadirachta indica*) and Lime leaf (*Citrus auratifolia*)}were represented in Table VI - X. These spectra reveal distinct variances between all functional groups. The presence of alcohols, phenols, alkanes, alkenes, aromatics, carboxylic acids, esters, ethers, and alkyl halides compounds was confirmed by FTIR analysis from five plant leaf extracts (Figures 4-8 and Table VI - X). The existence of alcohols, phenols, alkanes, alkenes, aromatics, carboxylic acids, esters, ethers, and alkyl halides was demonstrated by FTIR analysis of five aqueous leaf extracts. The spikes at 3448-3414cm^{-1} correlate to the frequency of hydrogen-bonded O-H stretching with phenols and alcohols functional groups. Peaks at 2972-2920cm^{-1} correspond to H-C-H asymmetric and symmetric stretching with alkane functional groups. Alkane groups are represented by the band at 2856-2852cm^{-1}. Peaks at 1735-1631 cm^{-1} belong to alkene groups and are ascribed to the C-C=C symmetric stretching frequency. The peaks at 1560-1026cm^{-1} are classified as aromatic rings and are assigned C-C=C asymmetric stretching.



	Citrus aurantifolia	Azadirachta indica	Ocimum gratissum	Moringa oleifera	Momordica charantia
DRY SEASON JANUARY 2022	15	10	16	15	14
RAINY SEASON APRIL 2022	19	13	19	22	18
DRY SEASON JANUARY 2023	14	12	15	16	15
RAINY SEASON APRIL 2023	20	14	20	24	23

Figure 1: Comparative and seasonal effects of leaf extracts on the pathogenic clinical isolates of *Staphylococcus aureus*



. Figure 2: Antibiotics resistance of the leaf extracts against commercially sold Antibiotics

Table I: Antibiotics susceptibility testing of *Citrus aurantifolia* (Lime leaf) to commercially sold antibiotics

	DISC CONTENT (mg)	CLSI S	I	R	VALUE	INTER-PRETATION
GENTAMICIN	10	=15	13-14	=12	8	R
TETRACYCLINE	30	=19	15-18	=14	4.3	R
CIPROFLOXACIN	5	=21	16-20	=15	5.7	R
DOXYCYCLINE	30	=19	15-18	=14	18.7	I
CHLORAMPHENICOL	30	=18	13-17	=12	10.1	R
ERYTHROMYCIN	15	=23	14-22	=13	5.1	R
PERCENTAGE RESISTANT						**83%**

KEY: S-Sensitivity; I-Intermediate; R-Resistant

Table II: Antibiotics susceptibility testing of *Azadirachta indica* (Neem leaf) to commercially sold antibiotics

	DISC CONTENT (mg)	CLSI S	I	R	VALUE	INTER-PRETATION
GENTAMICIN	10	=15	13-14	=12	3.5	R
TETRACYCLINE	30	=19	15-18	=14	12.5	R
CIPROFLOXACIN	5	=21	16-20	=15	8.1	R
DOXYCYCLINE	30	=19	15-18	=14	10	R
CHLORAMPHENICOL	30	=18	13-17	=12	19.2	S
ERYTHROMYCIN	15	=23	14-22	=13	4.2	R
PERCENTAGE RESISTANT						**83%**

KEY: S-Sensitivity; R-Resistant

Table III: Antibiotics susceptibility testing of *Ocimum gratissum (Scent leaf)* to commercially sold antibiotics

	DISC CONTENT (mg)	CLSI S	I	R	VALUE	INTER-PRETATION
GENTAMICIN	10	=15	13-14	=12	0.9	R
TETRACYCLINE	30	=19	15-18	=14	5.5	R
CIPROFLOXACIN	5	=21	16-20	=15	6.9	R
DOXYCYCLINE	30	=19	15-18	=14	2.5	R
CHLORAMPHENICOL	30	=18	13-17	=12	3.2	R
ERYTHROMYCIN	15	=23	14-22	=13	16.4	I
PERCENTAGE RESISTANT						**83%**

KEY: I-Intermediate; R-Resistant

Table IV: Antibiotics susceptibility testing of *Moringa oleifera (*Moringa leaf*)* to commercially sold antibiotics

	DISC CONTENT (mg)	CLSI S	I	R	VALUE	INTER-PRETATION
GENTAMICIN	10	=15	13-14	=12	2.2	R
TETRACYCLINE	30	=19	15-18	=14	6.6	R
CIPROFLOXACIN	5	=21	16-20	=15	2.5	R
DOXYCYCLINE	30	=19	15-18	=14	3.2	R
CHLORAMPHENICOL	30	=18	13-17	=12	16.4	I
ERYTHROMYCIN	15	=23	14-22	=13	2	R
PERCENTAGE RESISTANT						**83%**

KEY: I-Intermediate; R-Resistant

Table V: Antibiotics susceptibility testing of *Momordica charantia (*Balsam pear leaf) to commercially sold antibiotics

	DISC CONTENT (mg)	CLSI S	I	R	VALUE	INTER-PRETATION
GENTAMICIN	10	=15	13-14	=12	6.2	R
TETRACYCLINE	30	=19	15-18	=14	3.2	R
CIPROFLOXACIN	5	=21	16-20	=15	2.4	R
DOXYCYCLINE	30	=19	15-18	=14	3.3	R
CHLORAMPHENICOL	30	=18	13-17	=12	5.2	R
ERYTHROMYCIN	15	=23	14-22	=13	4.1	R
PERCENTAGE RESISTANT						**100%**

Y9 ò : I-Intermediate; R-Resistant

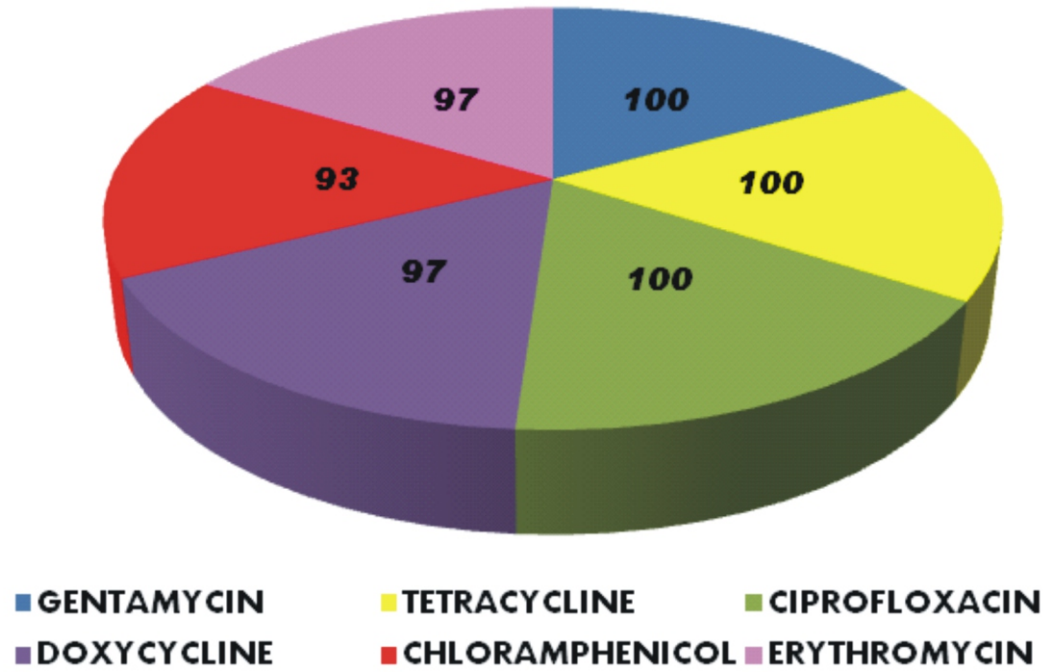


Figure 3: Percentage resistance of antibiotics to pathogenic clinical isolates of *Staphylococcus aureus*

Table VI: Spectrum range of FTIR results for Moringa (*Moringa oleifera*) leaf extract

S/N	PEAKS (cm^{-1})	INTENSITY RANGE	APPEARANCE	FUNCTIONAL GROUP	COMPOUND CLASS
1	441.71	89.2		UNKNOWN	
2	619.17	81.12	Strong	C-Br stretch	Halo compound
3	677.04	83.47	Strong	C-Br stretch	Halo compound
4	887.28	98.36	Strong	C=C bend	Alkene (Vihyidence)
5	985.66	98.55	Strong	C=C bend	Alkene (nonsubstituted)
6	1078.24	92.8	Strong	C-O stretch	Primary alcohol
7	1124.20	87.11	Strong	C-O stretch	Tertiary alcohol
8	1242	94.32	Strong	C-O stretch	Alkylaryl ether
9	1317.43	93.94	Strong	C-N stretch	Aromatic amine
10	1404.22	88.99	Strong	C-F stretch	Fluoro compound
11	1456. 30	93.71	Medium	C-H bend	Alkane
12	1633.76	63.1	Strong	C-C stretch	Carboxylic acid
13	2011.82	90.26	Strong	N=C=S stretch	Isothiocyanate
14	2341.66	98.51	Strong	O=C=O stretch	Carbon dioxide
15	2850.88	93.91	Weak	O-H stretch	Alcohol
16	2920.32	87.72	Strong	O-H stretch	Carboxylic acid
17	3439.19	34.98	Strong	O-H stretch	Alcohol

Table VII: Spectrum range of FTIR results for Neem *(Azadirachta indica*) Plant extract

S/N	PEAK VALUE(cm^{1})	INTENSITY RANGE	APPEARANCE	FUNCTIONAL GROUP	COMPOUND CLASS
1	453.29	8396			
2	522.73	83.84	Strong	C-I stretch	Halo Compound
3	584.45	82.75	Strong	C-Br stretch	Halo Compound
4	667.39	82.97	Strong	C-Br stretch	Halo Compound
5	779.27	85.13	Strong	C-H bend	1,2,4- trisubstituted
6	935.51	90.14	Strong	C=C bend	Alkene
7	1026.16	77.06	Strong	S=O stretch	Sulfoxide
8	1078.24	80.27	Strong	C-O stretch	Primary alcohol
9	1153.47	83.18	Strong	C-O stretch	Tertiary alcohol
10	1246.06	87.16	Medium	C-N stretch	Amine
11	1317.43	86.08	Strong	C-F stretch	Fluoro compound
12	1367.58	87.74	Medium	O-H bend	Phenol
13	1402.3	88.61	Strong	S=O stretch	Sulfate
14	1452.45	91.19	Medium	C-H bend	Alkane
15	1552.75	84.42	Strong	N-O stretch	Nitro compound
16	1631.83	72.96	Medium	C=N stretch	Imine/Oxime
17	1726.35	87.6	Strong	C=O stretch	α,β-unsaturated ester
18	2000.25	90		C=C=N stretch	Ketenimine
19	2372.52	97.45	Strong	O=C=O stretch	Carbon dioxide
20	2850.88	91.19	Medium	C=H stretch	Alkene(acid)
21	2924.18	85.02	Broad	O-H stretch	Alcohol
22	3427.62	66.95	Medium	N-H stretch	Aliphaticprimary amine

Table VIII: Spectrum range of FTIR result for Balsam Pear *(Momordica charantia)* leaf extract

S/N	PEAK VALVE (cm^{-1})	INTENSITY RANGE	APPEARANCE	FUNCTIONAL GROUP	COMPOUND CLASS
1	565.16	75.95	Strong	C-Br stretch	Halo compound
2	619.17	74.32	Strong	C-I stretch	Halo compound
3	653.89	73.79	Strong	C-Br stretch	Halo compound
4	925.86	97.29	Strong	C=C bend	Alkene
5	1026.16	89.36	Strong	C-O stretch	Primary alcohol
6	1053. 17	89.03	Strong	C-O stretch	Ester
7	1078.24	89.01	Medium	C-N stretch	Amine
8	1153.47	93.74	Strong	S=O stretch	Sulfone
9	1300.07	91.88	Medium	O-H bend	Phenol
10	1346,36	90.35	Strong	S=O stretch	Sulfonate
11	1408.08	66.88	Medium	O-H bend	Alcohol
12	1556.61	52.46	Strong	N-O stretch	Nitro compound
13	1631.83	57.11	Strong	C=C stretch	Alkene
14	2019.54	90.34	Strong	N=C=S stretch	Isothiocyanate
15	2933.83	82.8	Strong	N-H stretch	Amine salt
16	2972.40	80.89	Strong	O-H stretch	Carboxylic acid
17	3439.19	26.14	Strong	O-H stretch	Alcohol

Table IX: Spectrum range of FTIR result for Scent leaf *(Ocimum gratissum)* extract

S/N	PEAKVALVE (cm^{-1})	INTENSITY RANGE	APPEARANCE	FUNCTIONAL GROUP	COMPOUND CLASS
1	418.57	88.26		Unknown	
2	515.01	86.1	Strong	C-Br stretch	Halo compound
3	580.59	85.67	Strong	C- Br stretch	Halo compound
4	669.32	85.9	Strong	C- Br stretch	Halo compound
5	785.05	87.87	Medium	C=C bend	Alkene
6	931.65	94.32	Strong	C=C bend	Alkene
7	1024.24	82.09	Strong	C – F stretch	Fluoro compound
8	1078.24	85.01	Strong	C- O stretch	Primary alcohol
9	1153.47	86.44	Strong	C-O stretch	Tertiary alcohol
10	1246.06	89.24	Strong	C-O stretch	Alkyl aryl ether
11	3121.28	83.31	Medium	O-H bend	Phenol
12	1395.55	90.04	Medium	O-H bend	Carboxylic acid
13	1396.51	90.88	Medium	O-H bend	Alcohol
14	1458.23	93.79	Medium	C- H bend	Alkane
15	1545.03	85.55	Strong	N-O stretch	Nitro compounded
16	1618.33	66.53	Strong	C-C stretch	α,β- unsaturated ester
17	1647.26	67.95	Medium	C – N stretch	Imine/oxime
18	1735.99	88.36	Strong	C=O stretch	Ester
19	2000.25	90		C=C=N stretch	Keteninime
20	2364.81	94.72	Strong	O=C=O stretch	Carbon dioxide
21	2856.67	93.6	Medium	C-H stretch	Alkene
22	2928.04	88.69	Strong	C- H stretch	Imine salt
23	3439.19	61.96	Strong	O-H stretch	Alcohol

Table X: Spectrum range of FTIR result for Lime *(Citrus aurantifolia)* leaf extract

S/N	PEAK VALVE (cm^{-1})	INTENSITY RANGE	APPEARANCE	FUNCTIONAL GROUP	COMPOUND CLASS
1	453.29	83.96		Unknown	
2	522.73	83.84			Benzene derivative
3	584.45	82.75	Strong	C- Br stretch	Halo compound
4	667.39	82.97	Strong	C =C bend	Alkene
5	779.27	85.13	Strong	C-H bend	1,2, 4 trisubstituted
6	935.51	90.14	Strong	C-H band	1,2, 4 trisubstituted
7	1026.16	77.06	Strong	S= O stretch	Sulfoxide
8	1078.24	80.27	Strong	C-O stretch	Primary alcohol
9	1153.47	83.18	Strong	C-O stretch	Tertiary alcohol
10	1246.06	87.16	Strong	C-O stretch	Alkylaryl ester
11	1317.43	86.06	Medium	O-H bend	Phenol
12	1367.58	87.74	Strong	S=O stretch	Sulfonyl chloride
13	1402.30	88.61	Medium	O –H bend	Alcohol
14	1452.45	91.19	Medium	C-H bend	Alkane
15	1552.75	84.42	Strong	N-O stretch	Nitro compound
16	1631.83	72.96	Medium	C=C stretch	Cyclic alkene
17	1726.35	87.60	Weak	C-H bend	Aromatic compound
18	2000.25	90		C=C=N stretch	Ketenimine
19	2372.52	97.45	Strong	O=C=O stretch	Carbon dioxide
20	2850.88	91.19	Medium	C-H stretch	Alkane
21	2924.18	85.02	Weak	O-H stretch	Alcohol
22	3427.62	66.95	Strong	O-H stretch	Alcohol

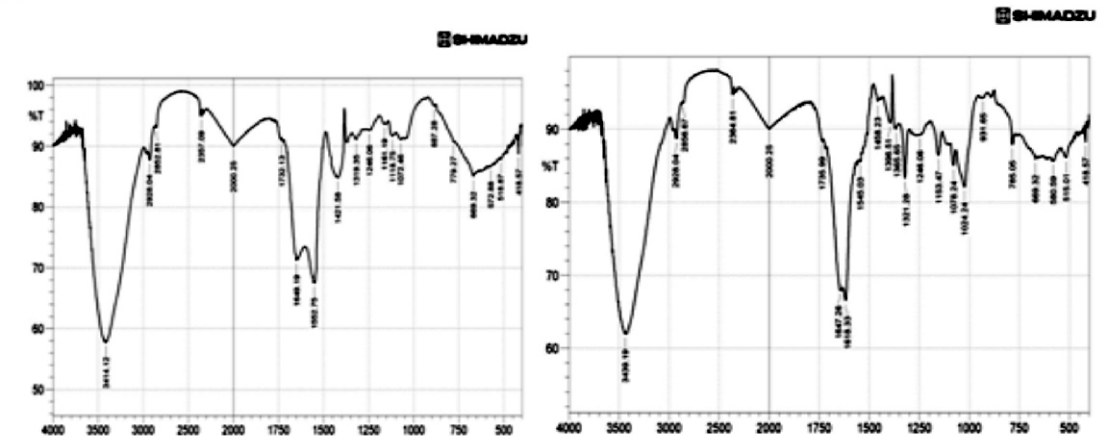


Figure 4: FTIR spectrum *Azadirachta indica* leaf extracts

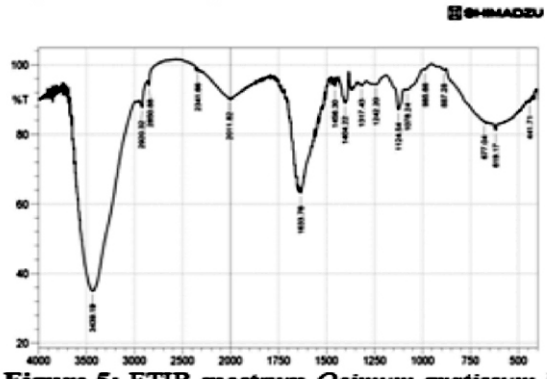


Figure 5: FTIR spectrum *Ocimum gratissum leaf extract*

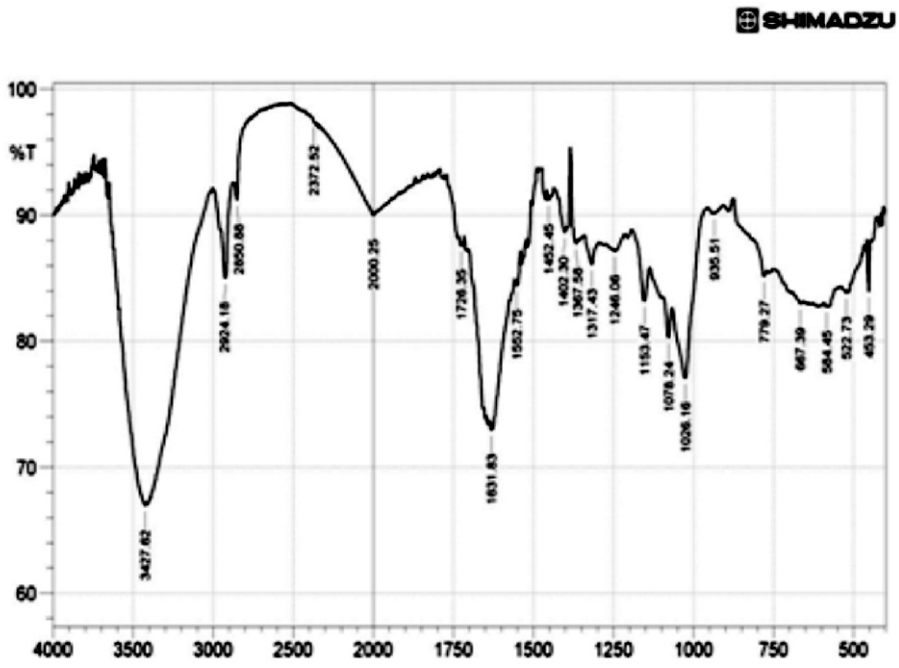


Figure 6: FTIR spectrum *Moringa oleifera leaf extract*
Figure 7: FTIR spectrum *Citrus aurantifolia leaf extract*

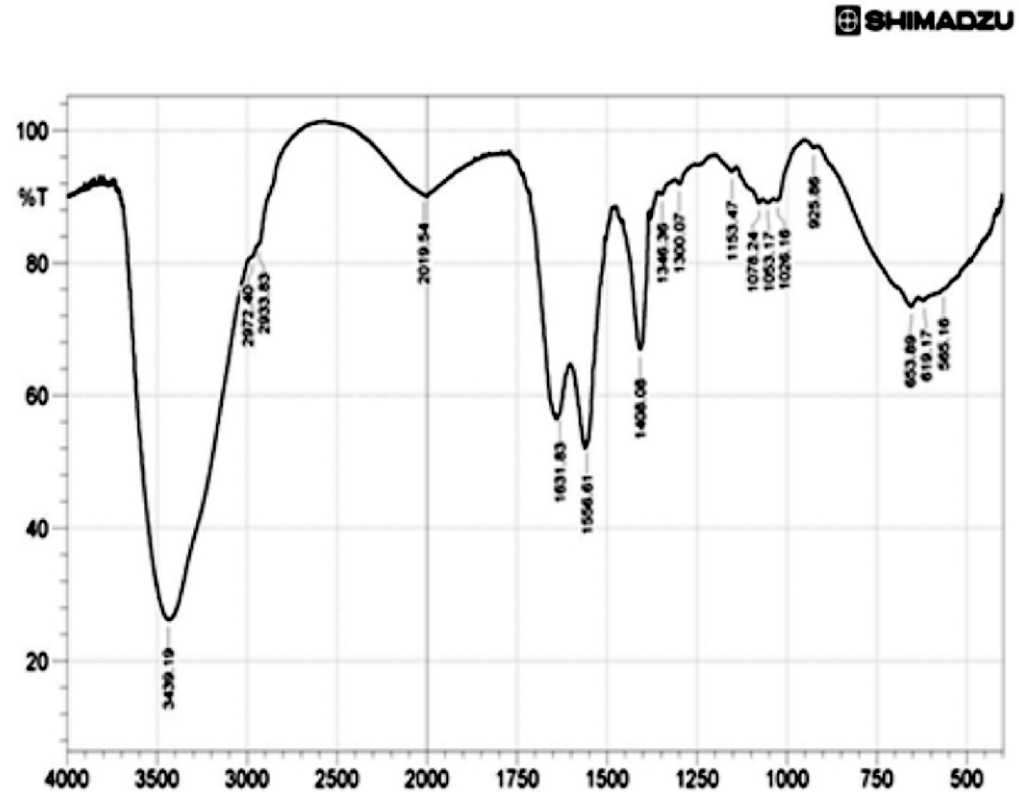


Figure 8: FTIR spectrum *Momordica charantia leaf extract*

3.0 Discussion

The result of this research agreed with the work of [6] which revealed that *S. aureus* is the most predominant bacteria in infected wounds. Annual Changes do not have any effect on the antibacterial activities of all the leaf extracts as seen in Figure 1 but the antibacterial activities of the leaf extracts were affected due to changes in weather seasons. The result from 2022 when compared with 2023 was not significantly different.For *Ocimum gratissum* in 2022, it has 16mm while in 2023 has 15mm *Moringa oleifera* has 15mm and 16mm, *Momordica charantia* 14mm and 15mm, *Azadirachta indica* 10mm and 12mm and *Citrus auratifolia* 15mm and 14mm respectively. When comparing the seasonal effects, the antibacterial activities of the leaves were very high during the rainy season than in the dry season which could be the result of the fact that the leaves were fresh and had access to complete nutrient supply than in the dried season. All the leaf extracts show higher antibacterial effects when compared to commercially sold antibiotics Figure 2. The zone of inhibition from all the leaf extracts ranges from 18mm to 23mm while that of commercially sold antibiotics ranges from 0.9mm to 19.2mm. The highest zone of inhibition was recorded from chloramphenicol (19.2mm) and doxycycline (18.7mm). Of all the antibiotics used gentamycin has the lowest zone of inhibition 0.9mm [19].

The resistance profile of each leaves to commercially sold antibiotics was described in Table I-V. Three out of the antibiotics used showed 100% resistance to *Staphylococcus aureus* (figure 3) which are Tetracycline, Ciprofloxacin, and Gentamycin followed by Doxycycline and erythromycin which are 97% resistant to Staphylococcus aureus while Chloramphenicol is 93% resistant to *Staphylococcus aureus*. *Moringa olifera* possesses some Phyto-constituents including alcohol, isothiocyanate, aromatic amine, etc. A significant proportion of pharmaceutical products in use are designed in all the tested plants.Babacan*et al.,* 2022 also reported similar result. Balsam pear possesses some phytoconstituents such as alcohol, amine salt, isothiocyanate, phenol, etc. Amoxicillin is also a good antibiotic in treating pathogenic staphylococcus aureus which is (a 12.5mm zone). Scent leaves contain alcohol, amine, ketenimine, phenol, alpha-unsaturated ester, etc.

Table VI-X describes the spectrum range of FTIR results for each leaf extract. The peak value in the infrared radiation area was used to determine the functional group of the active components. The leaves extract of *scent leaf (Ocinum gratissimum),* Moringa leaf *(Moringa oleifera),* Balsam pear leaf *(Momordica charantia),* Neem leaf *(Azadirachta indica),* and Lime leaf *(Citrus auratifolia)* were separated based on it speak ratio. FTIR analysis confirmed the presence of alcohols, phenols, alkanes, alkenes, aromatics, carboxylic acids, esters, ethers, and alkyl halides compounds which show major peaks; IR absorption spectra of the five extracts were studied and recorded in the 500-4000 cm^{-1} region (Figures 4-8); and these spectra show that there were clear differences between all the functional groups at, 3448-3414, 2972-2920, 2856-2852,2372-2357, 2019-2000, 1735-1631, 1560-1026, 935-580 and 523-502 respectively (Figures 4-8; *Table VI-X*). The five extracts' IR absorption spectra were studied and recorded in the 500-4000 cm-1 region (Figures 4-8), and these spectra demonstrate that there were distinct differences between all of the functional groups. The obtained results are summarized as follows: FTIR analysis confirmed the presence of alcohols, phenols, alkanes, alkenes, aromatics, carboxylic acids, esters, ethers, and alkyl halides compounds, which show major peaks [Mariswamy *et al*., 2012]. The peaks at 3448–3414 cm^{-1} correspond to the hydrogen-bonded O–H stretch frequency with functional groups for phenols and alcohols. The peaks at 2972-2920cm^{-1} are attributed to asymmetric and symmetric stretching of the H-C-H molecule and contain functional groups for alkanes. The alkane groups are represented by the band at 2856–2852 cm-1. The alkenes groups correspond to the peaks at 1735-1631 cm-1, which are assigned to the C-C=Csymmetric stretching frequency. The C-C=C asymmetric Stretching assigned to the peaks at 1560-1026 cm^{-1} represents aromatic rings. The H-C-H bent and alkanes groups are associated with the band between 1405 and 1400 cm^{-1}. The peaks at 1107 and 1101 cm^{-1} are associated with the C-O stretch and represent functional groups such as carboxylic acids, esters, and ethers. The signal at 831

to 820 cm^{-1}, which corresponds to alkyl halide groups, is attributed to C-Clstretch. The peaks at 523 and 502 are assigned to C-Br stretching and, in contrast to [19], corresponding to the functional groups of alkyl halides, respectively (Table 5 and Figures 5–11).

4.0 CONCLUSION

Uncovering and exploring the unexploited dietary and therapeutic wealth of leaves, roots, and herbs ruins an effective choice in incapacitating unmanageable infection/disease-causing microorganisms as an antibacterial conflict to synthetic drugs and medication continues to be a dreadful and worrisome challenge in the medical field. In this study, antibacterial activity and antibiotics sensitivity testing constituents of neem leaves, lime leaves, scent leaves, balsam pear leaves, and moringa leaves extracts were evaluated in two different years and the results revealed that all the tested leaves had the highest activities against *Staphylococcus aureus* which is a gram-positive bacteria. Balsam pear leaf (*Momordica charantia*) and Neem leaf (*Azadirachta indica*) extracts had more appreciable activities SA when compared with other leaf extracts tested.

It can be concluded that the extracts from *Ocimum gratissum*, *Moringa oleifera*, *Momordica charantia*, *Azadirachta indica,* and *Citrus auratifolia* were very effective in treating *S. aureus* and related diseaseconditions thansome commercially sold antibiotics. I suggest that more research should be done to understand the mechanism of the organism's antibacterial susceptibility as this will increase the likelihood of developing novel products that can successfully attack germs that appear to be drug resistant.

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