Original Research Article

Phytochemical Analysis and In-vitro Anti-Microbial Activity of Methanolic Leave, Root and Stem Extracts of *Bryophyllum pinnatum, Cochlospermum tintorium and Erythrina senegalensis.*

ABSTRACT

This Studieswas design to determine the phytochemical and antimicrobial activities samples of leaf, root and stem bark of *Cochlospermum tentorium, Bryophyllum pinnatum, and Erythrina senegalensis* obtained in Takum Town of Taraba state. Three (3) bacterial strains were suspended in liquid media withplant extracts at various concentrations and then spread, after 24 h incubation, and antibacterial activity measured by zone of inhibition on using agar well diffusion technique.Phytochemical screening revealed the presence of alkaloids, glycoside, flavonoids, phenols, saponins, tannins and steroids. Flavonoids were however absent in the leaf and stem bark of *Cochlospermum tintorium,* leaf and roots of *Bryophyllum pinnatum,* and leaf and roots of *Erythrina senegalensis.* Phenol and tannins were absent in the roots of *Bryophyllum pinnatum.* The quantitative screening shows that the leaf of *Cochlospermum tintorium* had the highest amount of glycoside (1.55mg/dl) while the roots had the least amount (0.81mg/dl). Stem bark of *Bryophyllum pinnatum* showed the highest amount of tannins (7.51mg/dl) while the leaf had the least (3.54mg/dl). Stem bark of *Cochlospermum tintorium* showed the highest amount of flavonoid (6.54mg/dl) while the leaf had the least (3.66mg/dl). Stem bark of *Cochlospermum tintorium* recorded the highest amount of phenol (4.37mg/dl) while the roots had the least (1.48mg/dl). The stem bark of *Bryophyllum pinnatum* recorded the highest amount of alkaloid (1.30mg/dl) while the leaf recorded the least (0.72mg/dl). Stem bark of *Bryophyllum pinnatum* showed the highest amount of saponins (2.85mg/dl) while the roots showed the least (1.57mg/dg). The methanolic leaf, root and stem bark extract of *Cochlospermum tentorium* had potent antibacterial activity, while *Bryophyllum pinnatum, and Erythrina senegalensis* had minimal antibacterial activities against the tested clinical isolates. This result indicates that the methanolic leaf, root and stem bark extract of *Cochlospermum tentorium* could be a promising potential antimicrobial agent.

Keywords: Phytochemical, Anti-MicrobialActivity, *Bryophyllum pinnatum, Cochlospermum tintorium and Erythrina senegalensis*.

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1.0. INTRODUCTION

The emergence of antimicrobial resistance in clinical practice have reduced the efficacy of commonly used antimicrobials, this has resultedin increased therapeutic failure and mortality cases globally With an urgent need for newer, effective and affordable antimicrobial (Tanwar et al.,2014; Fankam et al., 2017). Since the beginning of time, Humans have been in continuous search for ways of relieving common ailments and diseases this has led to great discoveries on the use of plant (leaves, roots and stem barks, pods and flowers) with medicinal properties for treatment of common diseases (Petrovska, 2012).

Over the past decades, traditional herbal medicine has immensely gained acceptance with approximately 80% of the world population relying solely on this system as form of treatment (Dorine et al., 2021). The acceptance of medicinal plants for the treatment of common ailments is attributed to its accessibility, availability, effectiveness and affordability (Patwardhan et al., 2005). Additionally,

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secondary metabolites from plant origin possess notable activity against a wide range of microbes (Abreu et al., 2012; Chandra et al., 2017),this has gained acknowledgement by the World Health Organization (WHO), that traditional medicine plays a critical role in the health care system that provides good results to its users (Palhares et al., 2015).

Given the predominant uses of medicinal plants in traditional medicine, there is an upsurge in research to investigate the active medicinal compounds, efficacy, and safety of such plants (Tekuri et al., 2019). The literature suggests that the search for novel therapeutic compounds based on traditional uses and folkloric information about medicinal plants obtained from the community could guide and serve as a potential strategy for the development of new therapeutic compounds. Therefore, there is need for data and high quality-research on medicinal plants to provide stronger scientific evidence and confirm their medicinal uses and safety in traditional medicines (Ahmad et al., 2021).

Bryophyllum pinnatum belongs to the family Crassulaceae commonly known as sprouting leaf. The leave and leaf juices have been used traditionally as an anti-inflammatory, antipyretic, antimicrobial, antioxidant, antidiabetic, antiulcer and a cough depressant agent (Ali et al., 2013),its bark are used as astringent, analgesics and are useful in the control of diarrhea and vomitions (Quazi et al., 2021). *Cochlospermum tinctorium* (Cochlospermaceae) has recently gained attention from the scientific community due to its traditional and wide range medicinal use,it has been successfully used to treat malaria, liver diseases, management of burns, ulcers, syphilis, hemmoroids, intestinal worms, measeals and yellow fever (Fankibe et al., 2021). *Erythrina senegalensis* (Fabaceae) leaves, stem bark and roots have been used to treat malaria, gastrointestinal disorders, fever, dizziness, secondary sterility, diarrhea, jaundice, nose bleeding and pains (Togola et al., 2008),antibacterial activity (Doughari, 2010), inhibitory activity against HIV-protases (Lee et al., 2009), plasmodium falciparum and hepatoprotective properties (De et al., 2002). Despite the extensive use of these plants and their traditional claims of their efficaciesthere is paucity of information on their pharmacological and antimicrobial activities of these plants from Takum local government area of Taraba state,Hencethis study aims to analyse the phytochemical constituents and investigate the antimicrobial activity of *Bryophyllum pinnatum, Cochlospermum tinctorium* and *Erythrina senegalensis* methanolic leave, root and strem bark extracts on some selected clinical isolate using Agar well diffusion method.

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2.0. MATERIALS AND METHODS

2.1. Plant collection and identification

Fresh leaves, roots and stem bark of *Bryophyllum pinnatum, Cochlospermum tinctorium* and *Erythrina senegalensis* were collected fromTakum local Government area Taraba state, in the month of July 2022 and transported to the department of biological sciences, Modibbo Adamma University,Yola and was identified by a botanist.

Comment [19]: Authors are advised to reform the information as suggested below: '.....a local farm/garden/park in Takun Local Government Area, Taraba State, in the month of .....'

2.2. Extraction of plant materials

The fresh leaves, roots and stem barks of *Bryophyllum pinnatum, Cochlospermum tinctorium* and *Erythrina senegalensis* were washed, chopped into small pieces, air dried under room temperature

and grounded into fine powder with the aid of an electric blender. The powder was packed in sterile airtight ziplock bags and stored in cool, dry selfawaiting extraction.The methanolic extracts was prepared by taking 200g of *Bryophyllum pinnatum, Cochlospermum tinctorium* and *Erythrina senegalensis* leaves, roots and stem bark powders into an extraction jar, 1000 ml of methanol was added gradually to each jar, then shaked vigorously until a uniform consistency was obtained. The mixtures were stirred continuously using a magnetic stirrer for 72 hours and then filtered. The filtrate was evaporated using a rotary evaporator at an operating temperature of 40º C for 4 hours. The resulting content was then placed into an amber colour bottle, covered with an aluminum foil and then placed on a hot sand bath to get a consistent powder. The methanolic extractwas repeated to give enough yield for the study.

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2.3. Phytochemical studies

The methanolic leaves, roots and stem bark extracts were qualitatively screened for the presence of saponins (Egwaikhide and Gimba, 2009), Tanins (Ayoola *et al.,* 2008), Glycosides(Egwaikhide and Gimba, 2009), Alkaloids using Mayers test, Flavonoids (Njoku and Obi, 2009),Phenols (Ayoola *et al.,* 2008), Steriods (Siddiqui *et al*., 2009) and Terpenoids (Edeoga *et al.,* 2009).

2.4. Antimicrobial Study

2.4.1.Collection of test Organisms

Comment [22]: Remove Italics

Three bacterial strains *Escherichia coli, Klepsiella pneumonae and staphylococcus aureus* were obtained from stock cultures from microbiology laboratory, Departmet of microbiology Modibbo Adama Univerversity, Yola

2.4.2. Preparation of culture and Antimicrobial Sensitivity Test

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The stock solution was prepared according to the clinical laboratory standards institutes (CLSI). A loopful of pure cultures of each microbe was suspended in 10 ml sterile physiological saline to give a concentration equal to that of 0.5 MacFarland standards. Each test microorganism was spread on aseptically prepared nutrient agar by the use of aswab. Five (5) wells of 8mm in diameter and 10mm depth were made on the agar plates with a sterilized cock borer. 0.1ml of the extracts of varying concentration of 0.5mg/ml, 1.0mg/ml, 1.5mg/ml, 2.0mg/ml, and 2.5mg/ml was pipetted into each of these five holes where 0.5ml of the pure solvent into the sixth hole served as the negative control. All the plates were allowed to stand on flat bench for an hour for proper disperse into agar before incubation at 37^{o}c for 24hrs. Antimicrobial activity was evaluated by measuring the diameter of the zone of inhibition measured in millimeters (Shagal *et al., 2012*).

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3.0. Statistical Analysis

All experiments were performed in triplicates; data were analyzed using statistical package for social science (SPSS), version 23, and results are provided as mean ± SEM. One-way analysis of variance (ANOVA) and post hoc ANOVA using the Turkey HSD test was used to compare the difference in means among and between groups. Differences (among and between groups) were considered to be statistically significant at $p< 0.05$.

4.0. RESULTS

4.1. Phytochemical Screening

The Phytoconstituents detected in the methanolic leaf, root and stem barks of *Cochlospermum tintorium, Bryophyllum pinnatum* and *Erythrina senegalensis* were Alkaloids, Glycosides, Flavonoids, Phenols, Saponins, Tannins and Steroids. Alkaloid, Glycoside and Steroids as given in table 1.

According to the results, alkaloids, Glycosides, Saponins and Steroids were present in all leave, roots and stem bark methanolic extracts of *Cochlospermum tintorium, Bryophyllum pinnatum* and *Erythrina senegalensis*, Flavonoids were only detected in the roots extract of *Cochlospermum tentorium* and stem bark extracts of *Bryophyllum pinnatum* and *Erythrina senegalensis,* Phenols and Tanins were detected in all methanolic extracts except the root extract of *Bryophyllum pinnatum.*

4.2. Antimicrobial Activity

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Importantly, authors should format the tittle labels in this way: **4.1. Phytochemical Screenig**(The text in this section is not needed, only tittle is enough). (The text under this should be taken down to **4.1.2.Qualitative Screening of Phytochemical Constituents**'.

Table 1. Phytochemical analysis of the Methanolic Leave, roots and Stem bark Extracts of the *Cochlospermum tentorium, Bryophyllum pinnatum* and *Erythrina senegalensis*

Qualitative phytochemical analysis of the methanolic extract of the plants							
Plants	Al	Gl	Fl	Ph	Sa	Ta	St

Cochlospermum tintorium leaves	+	+	-	+	+	+	+	
Cochlospermum tintorium stem bark	+	+	-	+	+	+	+	
Cochlospermum tintorium roots	+	+	+	+	+	+	+	
Bryophyllum pinnatum leaves	+	+	-	+	+	+	+	
Bryophyllum pinnatum stem bark	+	+	+	+	+	+	+	
Bryophyllum pinnatum roots	+	+	-	-	+	-	+	
Erythrina senegalensis leaves		+	+	-	+	+	+	+
Erythrina senegalensis stem bark		+	+	+	+	+	+	+
Erythrina senegalensis roots		+	+	-	+	+	+	+

Key; + presence of phytochemical, - absence of phytochemical, Al-Alkaloid, Gl-Glycoside, Fl-Flavonoid, Ph-Phenol, Sa-Saponin, Ta-Tannins, St-Steroid

4.3. Quantitative Screening of Phytochemical Constituents

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The results of quantitative analysis of some phytochemicals constituents of the plants in mg/dl is presented in Table 2 The results revealed that, for Glycoside, the leaf of *Cochlospermum tintorium* has the highest yield of 1.553mg/dl while it recorded the least yield of 0.810mg/dl. For Tannins, the stem bark of *Bryophyllum pinnatum* has the highest yield of 7.508mg/dl while its leaves has the least yield of 3.535mg/dl. Roots of *Bryophyllumpinnatum* has the highest yield for Flavonoid which is 6.573mg/dl while the roots of *Cochlospermum tintorium* has the yield of 3.427mg/dl. Stem bark of *Cochlospermumtintorium* has the highest yield of 4.372mg/dl for Phenol while the least yield of 1.482mg/dl was recorded for its roots. The stem bark of *Bryophyllum pinnatum* has the highest yield of 1.300mg/dl for Alkaloid while the leaves of *Erythrina senegalensis* have the least yield of 0.620mg/dl. Stem bark of *Bryophyllum pinnatum* has the highest yield of 2.845mg/dl for Saponins while its roots have the least yield of 1.565mg/dl.

Table 2. Quantitative Analysis of Phytochemicals (mg/dl)

Plants	Gl	Ta	Fl	Ph	Al	Sa
C.tintorium leaf	1.55 ± 0.003	4.21 ± 0.009	3.66 ± 0.01	3.06 ± 0.006	0.72 ± 0.000	1.86 ± 0.000
C. tintorium Stem	0.94 ± 0.005	4.72 ± 0.207	6.54 ± 0.002	4.37 ± 0.002	0.74 ± 0.000	2.08 ± 0.000
C.tintorium roots	0.81 ± 0.003	3.65 ± 0.009	3.43 ± 0.007	1.48 ± 0.002	1.10 ± 0.000	2.41 ± 0.005
B. pinnatum leaf	1.13 ± 0.003	3.54 ± 0.005	5.13 ± 0.005	2.45 ± 0.005	0.84 ± 0.000	1.91 ± 0.000
B. pinnatum stem	0.87 ± 0.009	7.51 ± 0.008	4.55 ± 0.002	3.40 ± 0.000	1.30 ± 0.000	2.85 ± 0.005
B. pinnatum roots	1.08 ± 0.003	5.91 ± 0.013	6.57 ± 0.003	2.89 ± 0.000	0.82 ± 0.000	1.57±0.005

E.senegalensis leaf 1.34 ± 0.003 5.56 ± 0.002 5.14 ± 0.005 3.79 ± 0.001 0.62 ± 0.000 2.14 ± 0.000

E. senegalensis stem 1.17 ± 0.004 4.33 ± 0.003 5.41 ± 0.005 1.76 ± 0.005 0.96 ± 0.000 1.62 ± 0.005

E. senegalensis roots 1.05 ± 0.043 5.16 ± 0.009 4.10 ± 0.004 2.46 ± 0.004 1.06 ± 0.000 2.24 ± 0.005

Key: Gl-Glycoside, Ta-Tannin, Fl-Flavonoid, Ph-Phenol, Al-Alkaloid, Sa-Saponin

4.4. Antimicrobial Activity

Comment [27]: Label section as 4.2.

A varying antimicrobial activity of the methanolic extract of the leaves, stem and roots of *Cochlospermum tintorium, Bryophyllum pinnatum* and *Erythrina senegalensis* was recorded based on zone of inhibition against the selected bacterial isolates: *Klebsiella pneumoniae, Escherichia.coli* and *Staphylococcus aureus.* The leave, roots and stembark extracts of *Cochlospermum tentorium* exhibited potent activity against *Klebsiella pneumonia, Escherichia coli* and *Staphylococcus aureus* in a dose dependent manner with zones of inhibition ranging from 11.00 ± 0.45 mm – 20.00 ± 0.05 mm when compared to the standard control ciprofloxacin tablets 25 mm, 22 mm and 26 mm respectively. The leaf, roots and stem bark extracts of *Bryophyllum pinnatum* showed minimal antibacterial activity against *Klebsiella pneumonia, Escherichia coli* and *Staphylococcus aureus* with zone of inhibition ranging from 3.00 ± 0.50 mm -12.00 ± 0.40 compared to the standards control ciprofloxacin tablets 25 mm, 22 mm and 26 mm respectively. The leaf and root extracts of *Erythrina senegalensis* had minimal antibacterial activity at all concentrations, while the stem bark had no antibacterial activity against *Klebsiella pneumonia.* The leaf, root and stembark extract had minimal inhibitory activity at 2.0 and 2.5 mg/ml when compared to the standard control 22 mm, additionally, no antibacterial activity was seen against *Staphylococcus aureus.*

Table 3. Antimicrobial activity of methanolic leave, root and stem bark extract of *Cochlospermum tintorium* on various concentrations using agar well diffusion technique.

Microorganism	Concentration (mg/ml)	Leaf Extract (mm)	Root Extract (mm)	Stembark extract (mm)	Control Ciprofloxacin Tablets (mm)
Klebsiella pneumonae	0.5	-	6.00 ± 0.50	-	25
	1.0	10.00 ± 0.25	10.00 ± 0.48	-	
	1.5	11.00 ± 0.50	10.00 ± 0.50	-	
	2.0	12.00 ± 0.34	11.00 ± 0.10	8.00 ± 0.45	
	2.5	15.00 ± 0.30	20.00 ± 0.20	10.00 ± 0.20	
Escherichia coli	0.5	3.00 ± 0.50	5.00 ± 0.45	-	22
	1.0	5.00 ± 0.40	9.00 ± 0.50	-	
	1.5	6.00 ± 0.38	10.00 ± 0.30	7.00 ± 0.50	
	2.0	16.00 ± 0.50	12.00 ± 0.50	8.00 ± 0.30	
	2.5	16.00 ± 0.50	18.00 ± 0.50	9.00 ± 0.10	
Staphylococcus aureus	0.5	-	9.00 ± 0.50	5.00 ± 0.30	26
	1.0	16.00 ± 0.20	11.00 ± 0.30	7.00 ± 0.51	
	1.5	18.00 ± 0.50	12.00 ± 0.53	9.00 ± 0.20	
	2.0	19.00 ± 0.40	15.00 ± 0.40	10.00 ± 0.40	
	2.5	20.00 ± 0.45	20.00 ± 0.42	12.00 ± 0.31	

Zone of inhibition expressed in mean ± SEM

Table 4. Antimicrobial activity of methanolic leave, root and stem bark extract of *Bryophyllum pinnatum* on various concentrations using agar well diffusion technique.

Microorganism	Concentration (mg/ml)	Leaf Extract (mm)	Root Extract (mm)	Stembark extract (mm)	Control Ciprofloxacin Tablets (mm)
Klebsiella pneumonae	0.5	5.00 ± 0.45	-	-	25
	1.0	5.00 ± 0.20	-	-	
	1.5	6.00 ± 0.51	2.00 ± 0.40	-	
	2.0	8.00 ± 0.10	4.00 ± 0.50	-	
	2.5	10.00 ± 0.20	6.00 ± 0.30	10.00 ± 0.10	
Escherichia coli	0.5	-	-	-	22
	1.0	-	9.00 ± 0.10	-	
	1.5	-	10.00 ±0.40	-	
	2.0	10.00 ± 0.10	11.00 ± 0.50	-	
	2.5	12.00 ± 0.50	13.00 ± 0.53	-	
Staphylococcus aureus	0.5	-	-	-	26
	1.0	3.00 ± 0.50	-	-	
	1.5	5.00 ± 0.10	-	-	
	2.0	9.00 ± 0.30	2.00 ± 0.50	-	
	2.5	11.0 ± 0.50	3.00 ± 0.30	-	

Zone of inhibition expressed in mean ± SEM

Table 5. Antimicrobial activity of methanolic leave, root and stem bark extract of *Erythrina senegalensis* on various concentrations using agar well diffusion technique.

Microorganism	Concentration (mg/ml)	Leaf Extract (mm)	Root Extract (mm)	Stembark extract (mm)	Control Ciprofloxacin Tablets (mm)
Klebsiella pneumonae	0.5	6.00 ± 0.30	-	-	25
	1.0	9.00 ± 0.50	-	-	
	1.5	10.00 ± 0.20	-	-	
	2.0	11.00 ± 0.51	-	-	
	2.5	12.00 ± 0.10	7.00 ± 0.52	-	
Escherichia coli	0.5	-	-	-	22
	1.0	-	-	-	
	1.5	-	-	-	
	2.0	-	2.00 ± 0.40	3.00 ± 0.20	
	2.5	7.00 ± 0.51	6.00 ± 0.51	7.00 ± 0.45	
Staphylococcus aureus	0.5	-	-	-	26
	1.0	-	-	-	
	1.5	-	-	-	
	2.0	-	-	-	
	2.5	-	2.00 ± 0.54	5.00 ± 0.43	

Zone of inhibition expressed in mean ± SEM

Comment [28]: Where possible, inclusion of one image of best interactions on Petri dish would be nice.

5.0. Discussion

The emergence of drug resistant microbial strains has posed a great challenge to global public health (1), Owing to this, there is an urgent need to develop new therapeutic agents which is critical toward the future management of common infectious diseases. Medicinal plants and their secondary metabolites have shown to be a reliable source of future antimicrobial with abilities to combat a wide range of infectious pathogen (Dorine et al.,2021). The purpose of the current study was to investigate the qualitative phytochemical constituents and antimicrobial activity of the methanolic leaf, root and stem bark extracts of *Cochlospermum tintorium, Bryophyllum pinnatum* and *Erythrina senegalensis*from Takum local government area of Taraba State.

Comment [29]: (Fankam et al., 2017)?

Phytochemicals constituents are secondary metabolites of plants with diverse pharmacological and biochemical effects on living organisms. Alkaloids and flavonoids found in plants have diuretic, anti-inflammatory and analgesic effects. Alkaloidsare capable of reducing headache associated with hypertension, used in the management of cold, fever and chronic Catarrh. Flavonoids are known for their antioxidantactivity and hence they help to protect the body against cancer and other degenerative diseases (Osuntokun et al., 2016:Fankibe et al,2017). Tannins are known to have antiviral,antibacterial and antitumor activities. Saponin is usedas hypercholesterolemia, hyperglycaemia,antioxidant, anticancer, anti-inflammatory and weightloss. The presence of these phytochemicals (alkaloids,Glycosides, Phenols, Saponins, flavonoids and steroids) in *Cochlospermum tintorium, Bryophyllum pinnatum* and *Erythrina senegalensis*supports their use as medicinal plants. Thesechemical constituents could be responsible for theirantibacterial activity containing complexes of chemicals with unique biological activity,which is attributed to toxins and secondarymetabolites they contain (Farnsworth and Bingel, 1977).

The results of the antibacterial studies showed that *Cochlospermum tintorium,* methanolic leaf and root extracts posses varied antibacterial activity against the tested isolates (Table 3), Klebsiella pneumonia, *Escherichia coli* and *Staphylococcus aureus* were susceptible to the extracts at 2.0 mg/ml and 2.5 mg/ml with zone of inhibition ranging between 15 mm to 20 mm when compared to the standard control ciprofloxacin tablets (25 mm, 22 mm and 26 mm) respectively, However the methanolic stem bark extract showed minimal antibacterial activity with 5.00 ± 0.30 mm and 12.00 ± 0.31 as the least and highest zone of inhibition recorded for the bacterial isolates compared to the control.

This result agrees with the findings of Tijani et al., (2009) who documented the antibacterial activity of the methanol root extract of *C. tinctorium* (500, 1000, and 2000 µg/ml) using hole-in-plate bioassay technique with ciprofloxacin (10 µg/ml) and gentamicin (10 µg/ml) as standard drugs. The extract demonstrated significant antibacterial activity at 2000 µg/ml against *Staphylococcus aureus* (19.00 mm), *Corynebacterium ulcerans* (17.20 mm), *Klebsiella pneumoniae* (11.00 mm), *Escherichia coli* (14.30 mm), *Proteus mirabilis* (11.00 mm), and *Shigella dysentriae* (19.00 mm) .The highest activity of the extract was observed against *Staphylococcus aureus* and *Staphylococcus dysentriae* (19.00 mm). Further, Muhammad et al., (2020) reported the antibacterial activities of the methanol root extract of *C. tinctorium* and its n-hexane, ethyl acetate, and aqueous fractions (500, 1000, and 2000 µg/ml) using hole-in bioassay plate method. The extract produced the highest activity at 2000 µg/ml against *Pseudomonas aeruginosa* (8.72 ± 0.26 mm), *Escherichia coli* (20.33 ± 0. mm), *Staphylococcus aureus* (15.67 ± 0.58 mm), and *Klebsiella pneumoniae* (19.00 ± 1.0 mm).The antibacterial activity of the methanol root extract of the plant could be due to the presence of alkaloids, flavonoids, tannins, and cardiac glycosides. Flavonoids are known to possess effective antimicrobial activity against a wide range of microorganisms due to their ability to form complex with cellular proteins andbacterial cell walls (Ahmad et al., 2021).

The methanolic leaf and root extract of *Bryophyllum pinnatum* showed minimal antibacterial activity against *Klebsiella pneumonia, Escherichia coli* and *Staphylococcus aureus,* these isolates were resistant to the methanolic extracts at all concentrations with the highest zone of inhibition of (11.0 ± 0.50) mm and the lowest (3.0 ± 0.40) mm when compared to the standard control ciprofloxacin tablet (25 mm, 22 mm and 26 mm). Additionally, the methanolic stem bark extract had no antibacterial activity against the isolates. This findings does not agree with that of Aibinu et al., (2007) who documented that extracts from *Bryophyllum pinnatum* leaves, the methanol extract was the most active. It showed marked antibacterial activities against Control strain of *Staphylococcus aureus*, *Enterococcus faecalis*,*Bacillus subtilis* and *Pseudomonas aeruginosa* andAkinpelu (2000) and Ofokansi (2005) that showed strong activities of methanol extract of *Bryophyllum pinnatum* against some Gram-positive organisms. The antimicrobial effect of methanol extract against these organisms can be attributed to the ability of the methanol to liberate most of the active properties in the plants like phenolic, saponin, bryophyllin and other secondary metabolites which are reported poses antimicrobial activities (Cowan, 1999; Okwu and Josiah, 2006). The minimal antibacterial activity is most likely attributed to fact that, the total phenols and saponins deposit in the plants may not in sufficient quantity within these geographic location compared to others.

The methanolic leaf, root and stem bark extracts of *Erythrina senegalensis* exhibited minimal antibacterial effect on all test isolates with zones of inhibition ranging from (2.0 ± 0.54 mm) as the lowest and (12.0 ± 0.10 mm) as the highest compared to the standard control ciprofloxacin tablets (25 mm, 22 mm and 26 mm). This findings does not agree with that of (Osuntukon et al, 2016) who documented that the antimicrobial activities of ethyl acetate bark extract using ethyl acetate to elute shows that *Staphylococcus aureus* is susceptible followed by *Klebsiella pneumonia* while *Candida albicans* is less susceptible. This disparity might be attributed to the solvent used for extracting the active metabolites within these plants.

CONCLUSION

This study showed that the methanolic leaf, roots and stem bark extracts of *Cochlospermum tentorium, Bryophyllum pinnatum, and Erythrina senegalensis* obtained in Takumlocal government area of Taraba state contains active phytochemicals in sufficient quantities such as Alkaloid, Glycoside, Flavonoid, Phenol, Saponin, Tannins,Steroid. These compounds might be responsible for their antibacterial activity of these plants. The methanolic leaf, root and stem bark extract of *Cochlospermum tentorium* was the most potent against all tested isolates while the leaf, root and stem bark extracts of *Bryophyllum pinnatum, and Erythrina senegalensis* had minimal antibacterial activity against the tested isolates.

Comment [30]: As before

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