

Antimicrobial Property of Ethanolic Extract of *Tetrapleura tetraptera* leaves on *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella pneumonia*, and *Proteus* species

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Abstract

Antimicrobials are defined as substances of natural, semi-synthetic or synthetic origin that inhibits the growth of microorganisms (Aboaba et al; 2011). Some microorganisms have developed resistance to pharmaceutical drugs. Medicinal plants have been used from time past to treat different kind of illness, hence, the need to study antimicrobial properties of ethanolic extract of Tetrapleura tetraptera (Aidan). 100g of powdered Tetrapleura tetraptera leave sample was poured into a sterile airtight glass jar and 400ml of extract (ethanol) was added to it and the mixture was agitated vigorously. The prepared nutrient agar was heated for 15 minutes using the autoclave. The cooled nutrient agar was poured into series of petri plates. The zone of inhibition shown by various isolates was determined using Agar well diffusion method. The antimicrobial analysis of the leaves extract of Tetrapleura tetraptera with nutrient agar medium showed that all the microorganism are resistant to the extract while Escherichia coli and Proteus species, were susceptible to the antimicrobial effect of Tetrapleura tetraptera leaves extract. Klebsiella pneumoniae has the highest susceptibility to the plant extract antimicrobial property.

The extract have potent invivo antibacterial activities against Klebsiella pneumonia, Proteus species E. coli, and Staphylococcus aureus thus a veritable source of new antimicrobial agent.

Keywords: Antimicrobial, Nutrient agar, Zone of inhibition, Tetrapleura tetraptera

1. Introduction

Antimicrobials are defined as substances of natural and unnatural origin that inhibits the growth of microorganisms (Aboaba et al; 2011). Antimicrobial are of different classes which include; disinfectants, antiseptics and antibiotics. Disinfectants are antimicrobials that are applied to nonliving surfaces to inhibit the growth of microorganisms (Awofisayo, 2010). Antiseptics are applied topically on living tissues to prevent the growth and spread of microorganisms and thereby prevent infection (Awofisayo, 2010). Antibiotics are substances of natural origin that inhibit the growth of microorganisms' low concentrations (Sugathanetal.2017). All antibiotics are antimicrobials but all antimicrobial are not antibiotics (Awofisayo, 2010), this is because antibiotics as the name implies kill life while antimicrobial may not necessarily kill life but inhibit life.

Antimicrobials are classified on the bases of their spectrum of activity, chemical structure or mode of action. Antimicrobials have a narrow spectrum of activity when they inhibit only a limited number of organisms, like glycopeptides and bacitracin inhibit only gram-positive bacteria, whereas polymyxins act against gram-negative bacteria. While amino glycosides and sulfonamides act primarily against aerobic organisms, nitroimidazoles inhibit only anaerobic Microbes. Antimicrobials that have a broad spectrum are said to be able to inhibit all kind of microorganism (Sugathanetal.2017), the chemical structure determines the mechanism of action of the antimicrobial and spectrum of organism it will have effect on.

Tetrapleura tetraptera a plant native to tropical Africa where it is distributed from Mauritania to Tanzania belong to the family fabaceae (Katende *et al.* 2016). The plant is most common in dense rainforests and preserved forest patches around villages. It is commonly known as “Prekese” in Ghana, “Aidan” in Nigeria and “Kikangabalimu” in Uganda”. *T. tetraptera* is known to have various medicinal and nutritional properties (Adesina *et al.* 2016). *T. tetraptera* medicinal actions are due to presence of bioactive compounds (alkaloids, flavonoids, saponins, tannins, and phenols andglycosides) which are responsible for health properties of plants (Okwu 2010). The fruits of *Teraptera tetrapleura* has been reported to have anti-arthritis, anti-inflammatory and anti-diabetic properties (Ojewole *et al.* 2010). The fruit is a major spice in the local delicacies in Nigeria and Africa at large.

There has been an increase in of drugs resistance especially to antibiotics and the need for new sources of antimicrobial agent has been on the rise. The aim of this study was to determine the anti-microbial property of *Tetrapleura teraptera* leaves extract

2. Methodology

The method used for this experiment was as described by Lino and Deogracious, 2021.

Collection and preparation of Plant material

The fresh leaves of *Tetrapleura tetraptera* were collected from the Redeemer’s College of Technology and Management Botanical Garden. The leave was taken to the Federal University of Agriculture (FUTA) herbarium to make sure that the plant leaves collected were really *Tetrapleura tetraptera* leaves. The plant leaves samples collected were dried at room temperature and were grounded into powder using a clean electric blender.

Extraction

100g of powdered *Tetrapleura tetraptera* leave sample was poured into a sterile airtight glass jar and 400ml of extract (ethanol) was added to it and the mixture was agitated vigorously. The mixture was left for 120 hours (5 days).The mixture was poured on the muslin cloth placed on a beaker and the solution was allowed to drain through the cloth. It was later squeezed to allow the solution to totally drain and the filtrate was gotten. The Whatman filter paper was folded in

the filter funnel and the filter funnel was placed in the measuring cylinder. The filtrate gotten was poured into the setup until totally drained, the filtrate was collected and it measured up to 150ml. The rotary evaporator was then used to concentrate the filtrate.

Preparation of Nutrient Agar

300ml of distilled water was poured in a clean conical flask; 8.4g of nutrient agar was measured using the analytical balance. The measured nutrient agar was poured in the conical flask containing 300ml of distilled water and mixture was shaken until the mixture was smooth. The prepared nutrient agar was heated for 15 minutes using the autoclave. After 15 minutes the nutrient agar was brought out of the autoclave and cooled. The cooled nutrient agar was poured into series of petri plates.

Antimicrobial screening

The zone of inhibition exhibited by the various isolates was determined using Agar well diffusion method previously described by Doherty, *et al.* 2010 with slight modification by Agu and Thomas, 2012, Kigigha (Kigigha, *et al.* 2015). About 0.4ml of the test organisms in peptone water that was incubated for 24 hours was spread over a nutrient agar plates. 3 holes of 6mm each were made with sterile cork borer. Approximately 2ml of each of the extracts was dispensed into the agar well separately. All the plates were incubated at room temperature. The zones of inhibition were measured using a meter rule in millimeter after 24 hours of aerobic incubation.

3. Results and Discussion

Table 1 Antimicrobial property of *T. tetraptera* on microorganism prepared on Muller Hinton agar (MHA)

S/N	Microorganism	Extract of Tetrapleura Tetraptera	Media	Inhibition Zone(Mm)	Source
1	<i>Escherichia coli</i>	Leaf extract	MHA	20	Spoilt milk
2	<i>Klebsiella pneumoniae</i>	Leaf extract	MHA	Not Detected	HVS
3	<i>Klebsiella pneumoniae</i>	Leaf extract	MHA	Not Detected	Urine
4	<i>Klebsiella pneumoniae</i>	Leaf extract	MHA	2	Urine
5	<i>Staphylococcus aureus</i>	Leaf extract	MHA	2	Eye swab
6	<i>Staphylococcus aureus</i>	Leaf extract	MHA	1	Eye swab
7	<i>Proteus species</i>	Leaf extract	MHA	2	wound

This result was obtained in 2021

Table 2Antimicrobial property of antibiotics sensitivity disk on microorganism prepared on nutrientagar (N/A)

S/N	Microorganism	Antibiotic Sensitivity Disks	Media	Inhibition Zone(Mm)	Source
1	<i>Escherichia coli</i>	Sensitivity disks	N/A	Not Detected	Spoilt milk
2	<i>Klebsiella pneumoniae</i>	Sensitivity disks	N/A	Not Detected	HVS
3	<i>Klebsiella pneumoniae</i>	Sensitivity disks	N/A	Not Detected	Urine
4	<i>Klebsiella pneumoniae</i>	Sensitivity disks	N/A	Not Detected	Urine
5	<i>Staphylococcus aureus</i>	Sensitivity disks	N/A	Not Detected	Eye swab
6	<i>Staphylococcus aureus</i>	Sensitivity disks	N/A	Not Detected	Eye swab
7	<i>Proteus species</i>	Sensitivity disks	N/A	Not Detected	wound

This result was obtained in 2021

4. Discussion

This study was to determine if the leaves of *Tetrapleura tetrapleura* has antimicrobial properties considering the fact that its fruit has been used as spices in the preparing soup in various part of West Africa and as medicine and as dietary supplement rich in vitamins (Osei-Tutu *et al.* 2010). The extract of the fruit of this plant is known for its anti-inflammatory properties and this advocates its inhibitory impacts against certain human pathogens (Ozaslan *et al.* 2016). According to (Ozaslan *et al.* 2016) the fruit of this plant is mostly used in the management of convulsion, leprosy, inflammation and rheumatic pains, schistosomiasis, asthma, hypertension and also recommended for fast relief of ailment such as malaria fever.

From the results obtained and presented on the table 1-2 for the antimicrobial analysis of *Tetrapleura tetrapleura* leaves extract; the following deduction can be made

Table 1 Muller Hinton agar medium was used and it showed that all the microorganisms except *Klebsiella pneumoniae* were susceptible to the antimicrobial effect of *Tetrapleura tetrapleura* leaves extract. *Escherichia coli* had the highest susceptibility to the antimicrobial

effect of the plant extract. This point to the fact that apart from the fruit of this plant, the leaves also posses antimicrobial activities and should be considered as a broad-spectrum antimicrobial agent.

Table 2 Muller Hinton agar medium used showed that none of the microorganisms were susceptible to the antibiotic's sensitivity disc. The result from the tables shows that all the microbial organism isolates used are resistant to antibiotic.

The results from these two tables had indicated that *Tetrapleura tetraptera* leaves are potent against the microorganisms used except for *Klebsiella pneumonia* whereas the same microorganism are resistant to the control antibiotics sensitivity used. *Tetrapleura tetraptera* leaves should be considered as one of the antimicrobial agents needed to overcome the challenge of antibiotics resistant in the society.

5. Conclusion and Recommendation

Tetrapleura tetraptera leaves have potent invivo antibacterial activities against *E. coli*, *Staphylococcus aureus* and *Klebsiella pneumonia*, and *Proteus species*, that are resistant to antibiotics sensitivity disk, thus a veritable source of new antimicrobial agent.

There is need to do more research on our flora in the quest to solving myriad of health challenges plaque the world, especially for under developed countries that have minimal resources in tackling these health challenges.

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