

Phytochemical Evaluation and Anti-bacterial Efficacy of Hydroethanol extract of *Azanza garckeana* (T. Hoffm) Fruit Pulp on some Sexually Transmitted Diseases causing Bacteria.**S.T., Soom¹, J.T., Hemen² and V.K Apuu,¹**¹Department of Biological Sciences, Faculty of Sciences, Benue State University, Makurdi² Department of Biological Sciences, Faculty of Sciences, Nigeria Police Academy, Kano, Nigeria

Abstract:- This study evaluates the phytochemistry and antibacterial efficacy of the hydroethanol extract of *Azanza garckeana* fruit pulp against three STD-causing bacteria; *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, and *Treponema pallidum*. Fresh fruits of *Azanza garckeana* were collected and processed to obtain a hydroethanol extract. The extract was subjected to qualitative phytochemical screening to determine the presence of flavonoids, alkaloids, tannins, steroids, saponins, and terpenes. The antibacterial activity of the extract was evaluated using the agar well diffusion method. Minimum inhibitory concentration (MIC) values were determined using the broth microdilution method. The standard antibiotic ciprofloxacin was used as a control. Phytochemical analysis revealed the presence of flavonoids and alkaloids in moderate to high concentrations, with low concentrations of tannins, steroids, and saponins, and absence of terpenes. The hydroethanol extract exhibited significant antibacterial activity against *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, and *Treponema pallidum*. Mean zones of inhibition ranged from 4.522±3.11 mm to 7.978±4.19 mm, and MIC values ranged from 8.00 mg/ml to 11.00 mg/ml. The observed antibacterial efficacy of the hydroethanol extract of *Azanza garckeana* against STD-causing bacteria can be attributed to its phytochemical composition, particularly the presence of flavonoids and alkaloids. These bioactive compounds have been reported for their antimicrobial properties. The absence of terpenes may limit the extract's efficacy in certain therapeutic applications. However, the significant inhibitory effects against *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, and *Treponema pallidum* highlight its potential as an alternative or adjunct therapy in the management of STDs. The hydroethanol extract of *Azanza garckeana* fruit pulp demonstrates promising phytochemical composition and significant antibacterial activity against STD-causing bacteria. Further research is warranted to elucidate the underlying mechanisms of action and optimize extraction methods for enhanced efficacy and safety.

Keywords: Antibacterial, *Azanza garckeana*, hydroethanol, phytochemical,Email: solomonsoom@gmail.com**Received:** February 1, 2024**Revised:** February 28, 5824**Accepted:** March 15, 2024**Cite this Paper as:** Efficacy of Hydroethanol extract of *Azanza garckeana* (T. Hoffm) Fruit Pulp on some Sexually Transmitted Diseases causing Bacteria. *Science Journal of Applied and Natural Sciences*, 3(1), 59-63.**About the Journal:** SJANS is a multidisciplinary science journal and the official journal of the Faculty of Science, Nigeria Police Academy, Kano, Nigeria

1.0 INTRODUCTION

1.1 Background Information about the study

Azanza garckeana is a species of the malvaceae family, the generic name “*Azanza*” is derived from the word “*Azania*”, which is meaning black and surviving in Zanzibar. The plant is locally called ‘Goron Tula’ (Hausa, Nigeria). It is also called snotappel (Afrikaans). Most of the *Malvaceana* in Nigeria are shrubs. *Azanza garckeana* is a valuable edible indigenous fruit tree species found in Gombe state, Nigeria. The utilization of *Azanza garckeana* for therapeutic purposes has been a longstanding tradition in various cultures globally. *Azanza garckeana*,

commonly known as African medlar or snot apple, is one such plant that has been traditionally used for its medicinal properties. It is known for its potential in treating various ailments, including infections. The bioactive compounds present in plant extracts are responsible for their therapeutic effects, making the assessment of phytoconstituents crucial in understanding their medicinal properties (Yusuf *et al.*, 2020).

STDs causing pathogens including *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, and *Treponema pallidum* infections, remain significant global health concerns due to their high prevalence and associated complications.

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Antibiotic resistance and adverse effects of conventional therapies underscore the need for alternative treatment options, including herbal remedies. *Azanza garckeana*, also known as African medlar or snot apple, is a medicinal plant traditionally used for various ailments. Its pharmacological significance, particularly its antibacterial properties against STD-causing bacteria, presents promising avenues for exploration. This study therefore aims at assessing the phytochemical composition and antibacterial activity of the hydroethanol extract of *Azanza garckeana* fruit pulp against STD-causing bacteria.

2.0 Materials and Methods

2.1 Collection and Preparation of Plant Material:

Fresh fruits of *Azanza garckeana* were collected, washed, and air-dried. The dried fruit pulp will be powdered and stored for extraction.

2.2 Preparation of Hydroethanol Extract:

The powdered fruit pulp of *Azanza garckeana* will be macerated with a hydroethanol solvent (70% ethanol: 30% water). The extract will be filtered, concentrated under reduced pressure, and stored at appropriate conditions.

Phytochemical Analysis: The hydroethanol extract will be subjected to qualitative phytochemical screening to determine the presence of flavonoids, alkaloids, tannins, steroids, saponins, and terpenes following standard procedures described by Sun *et al.*, (2023) and Sobuj *et al.*, (2024).

2.3 Antibacterial Susceptibility Test:

The antibacterial activity of the hydroethanol extract will be evaluated against *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, and *Treponema pallidum* using the agar well diffusion method. Different concentrations of the extract (200, 500, and 1000 mg/ml) will be tested, and the zones of inhibition will be measured.

2.4 Determination of Minimum Inhibitory Concentration (MIC):

The MIC of the hydroethanol extract against the tested bacterial isolates will be determined using broth microdilution method. Serial dilutions of the extract will be prepared, and the lowest concentration that inhibits visible bacterial growth will be recorded.

Comparison with Standard Antibiotic: The antibacterial efficacy of the hydroethanol extract will be compared with the standard antibiotic

ciprofloxacin. Zones of inhibition and MIC values will be determined for both the extract and the antibiotic.

3.0 Data Analysis

Data collected were expressed as the Mean $\pm$ Standard Deviation, using the Statistical Package for Social Sciences (SPSS) version 23.

4.0 RESULTS

4.1 Phytochemical composition of hydroethanol extract of *Azanza garckeana* fruit pulp

The phytochemical analysis of the hydroethanol extract of *Azanza garckeana* fruit pulp reveals the presence of various bioactive constituents (Table 1). Flavonoids were found to be highly concentrated (+++), indicating a potentially significant role in the extract's pharmacological activity. Alkaloids were present at a moderate level (++), suggesting a moderate contribution to the extract's bioactivity. Tannins, steroids, and saponins were all present at low levels, indicating their lesser contribution to the extract's overall pharmacological potential. Terpenes were absent in the extract during the study. This analysis provides insight into the chemical composition of the extract, which can influence its therapeutic properties.

Table 1: Bioactive composition of aqueous extract of *Azanza garckeana* fruit pulp

Phyto-constituents	Metabolite concentration
Flavonoids	+++
Alkaloids	++
Tannins	+
Steroids	+
Saponins	+
Terpenes	-

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Key: + = Low; ++ = Moderate; +++ = Highly concentrated; - = Absent

4.2 Antibacterial susceptibility test of *Azanza garckeana* extract against isolates

The antibacterial activity of the hydroethanol extract of *Azanza garckeana* fruit pulp against sexually transmitted diseases (STDs) causing bacteria (*Chlamydia trachomatis*, *Neisseria gonorrhoeae*, and *Treponema pallidum*) was evaluated through the zone of inhibition and minimum inhibitory concentration (MIC) tests (Table 2). The extract shows varied degrees of inhibition against the tested bacterial isolates at different concentrations (200, 500, and 1000 mg/ml). Notably, *Chlamydia trachomatis*

exhibits moderate inhibition, with zones of inhibition ranging from 3.00 to 3.50 mm at the lowest concentration and ranging from 7.30 to 13.50 at the highest concentration with a MIC value of 8.00 mg/ml. *Neisseria gonorrhoeae* and *Treponema pallidum* show relatively lower susceptibility to the extract, with zones of inhibition mostly below 3.00 mm at the lowest concentration and higher MIC values compared to *Chlamydia trachomatis*. The extract's antibacterial activity is also comparable to the standard antibiotic ciprofloxacin, showing varying degrees of effectiveness against the tested bacterial isolates.

Table 2: Antibacterial susceptibility test of *Azanza garckeana* extract against Isolates

Bacterial Isolates	zone of inhibition of extract Conc. (mm)			MIC (mg/ml)	Control 200mg
	200	500	1000		
<i>Chlamydia trachomatis</i>	3.00	7.30	12.00	8.00	10.40
	3.20	8.00	13.00		
	3.50	8.30	13.50		
<i>Neisseria gonorrhoeae</i>	0.00	5.00	7.00	9.50	12.10
	2.00	6.00	8.00		
	2.00	7.00	10.00		
<i>Trsponema pallidum</i>	0.00	5.00	7.00	8.20	11.00
	0.00	5.20	7.50		
	2.00	6.00	8.00		

Note: Control = Ciprofloxacin

4.3 Antibacterial efficacy of *Azanza garckeana* extract against STD causing Bacteria

Table 4.3 presents the mean zone of inhibition and MIC values of the hydroethanol extract of *Azanza garckeana* fruit pulp against the tested STD-causing bacteria. The mean zone of inhibition indicates the average degree of bacterial growth inhibition observed across triplicate experiments. *Chlamydia trachomatis* shows the highest mean zone of inhibition (7.978 mm), followed by *Neisseria gonorrhoeae* (5.22 mm) and *Treponema pallidum* (4.522 mm).

The MIC values provide further insight into the extract's potency against the bacterial isolates, with lower values indicating stronger antibacterial activity. Comparatively, the extract exhibits lower MIC values against *Chlamydia trachomatis* compared to *Neisseria gonorrhoeae* and *Treponema pallidum*, suggesting varying degrees of susceptibility among the tested bacteria. The efficacy of the extract is also evaluated against the standard antibiotic ciprofloxacin, providing a basis for comparison in terms of antibacterial activity.

5.0 DISCUSSION

5.1 Bioactive Composition of Hydroethanol Extract of *Azanza garckeana* Fruit Pulp

The bioactive composition of the hydroethanol extract of *Azanza garckeana* fruit pulp was assessed, revealing the presence of various phytoconstituents. Flavonoids, known for their antioxidant and antimicrobial properties, were found to be highly concentrated (+++). Alkaloids, another class of secondary metabolites with diverse pharmacological activities, were present in moderate concentrations (++). Tannins, which possess astringent and antimicrobial properties, were present in low concentrations (+). Steroids, with anti-inflammatory and immunomodulatory properties, were also present in low concentrations (+). Saponins, known for their antimicrobial and antifungal activities, were detected in the extract. However, terpenes were found to be absent (-). The bioactive composition of the hydroethanol extract of *Azanza garckeana* fruit pulp holds significant implications for its

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pharmacological activities. The presence of flavonoids and alkaloids in moderate to high

Table 3: Antibacterial efficacy of *Azanza garckeana* extract against some STD Bacteria

Bacterial Isolates	Mean zone of inhibition (mm)	MIC(mg/ml)	Control Ciprofloxacin
<i>Chlamydia trachomatis</i>	7.978±4.19	8.00	10.40
<i>Neisseria gonorrhoeae</i>	5.22± 3.27	9.50	12.10
<i>Trsponema pallidum</i>	4.522±3.11	8.20	11.00

Note: Values are mean standard deviation (SD±) of zone of inhibition in triplicate.

Ciprofloxacin=

concentrations suggests the potential of the extract in exhibiting antioxidant, antimicrobial, and anti-inflammatory effects (Salehi *et al.*, 2019). These phytoconstituents are known for their ability to inhibit the growth of pathogenic microorganisms, including bacteria responsible for sexually transmitted diseases (STDs) such as *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, and *Treponema pallidum*.

The low concentrations of tannins, steroids, and saponins indicate their contributory role to the overall pharmacological profile of the extract. While tannins possess antimicrobial properties, steroids exhibit anti-inflammatory and immunomodulatory effects, and saponins have been reported for their antimicrobial and antifungal activities (Cushnie and Lamb, 2011; Santhosh and Suriyanarayanan, 2018).

The absence of terpenes in the extract may suggest a limitation in exploiting the potential benefits associated with this class of compounds. Terpenes are known for their diverse pharmacological activities, including antimicrobial, anti-inflammatory, and analgesic properties (Baser and Buchbauer, 2015). Their absence in the extract could potentially limit its efficacy in certain therapeutic applications.

5.2 Pharmacological Significance and Antibacterial Efficacy of *Azanza garckeana* Extract

Azanza garckeana is rich in bioactive compounds such as flavonoids, alkaloids, tannins, steroids, and saponins, as revealed by phytochemical analysis (Yusuf *et al.*, 2020).

The control

These compounds confer various pharmacological activities, including antioxidant, antimicrobial, and anti-inflammatory effects. Flavonoids and alkaloids, present in moderate to high concentrations, are known for their potent antibacterial properties (Salehi *et al.*, 2019). Tannins exhibit antimicrobial effects, while steroids possess anti-inflammatory and immunomodulatory activities (Cushnie & Lamb, 2011). Saponins have been reported for their antimicrobial and antifungal properties, contributing to the overall pharmacological profile of *Azanza garckeana* extract (Santhosh and Suriyanarayanan, 2018).

The antibacterial efficacy of *Azanza garckeana* extract against STD-causing bacteria was evaluated using mean zones of inhibition and MIC values. In the present study, the extract demonstrated significant inhibitory effects against *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, and *Treponema pallidum*, as evidenced by the mean zones of inhibition. The mean zones of inhibition (mm) recorded during the study had given an indication of substantial bacterial growth inhibition. Additionally, the MIC values (mg/ml), obtained further confirming the extract's antibacterial potency. *Chlamydia trachomatis*, a common bacterial cause of STDs, exhibited the highest mean zone of inhibition and an MIC with *Neisseria gonorrhoeae* and *Treponema pallidum* also showed significant susceptibility to the extract, have proven the potential pharmacological significance of *Azanza garckeana* extract in the treatment of STDs. Its significant antibacterial efficacy against *Chlamydia trachomatis*,

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Neisseria gonorrhoeae, and *Treponema pallidum* underscores its potential as a natural alternative or adjunct therapy in the management of these infections.

6.0 Conclusion and Recommendation

6.1 Conclusion

Azanza garckeana extract demonstrates promising pharmacological significance, particularly its potent antibacterial efficacy against STD-causing bacteria. The presence of bioactive compounds such as flavonoids, alkaloids, tannins, steroids, and saponins contributes to its therapeutic properties. Further exploration of Azanza garckeana extract as a potential treatment option for STDs is warranted, offering new insights into natural remedies for combating these prevalent infections.

6.2 Recommendation

Further research is warranted to elucidate the underlying mechanisms of action, optimize extraction methods, and conduct clinical trials to validate its efficacy and safety in humans.

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