

Antibacterial Activities of Crude Extract of *Ipomoea aquatica* (Water Spinach) Against Fish Pathogens

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ABSTRACT

The study was undertaken to determine the phytochemical screening and the anti-bacterial activities of *Ipomoea aquatica* (water spinach) against some clinically isolated fish pathogens. The healthy and disease-free plants sample was collected from Jebba Basin of River Niger and tested for antibacterial activities and phytochemical properties. *Ipomoea aquatica* powdered plant materials were extracted using sterile distilled water. The Agar diffused methods was used to determine the antimicrobial actions of the plant against *Pseudomonas fluorescens* (*P. fluorescens*), *Escherichia coli* (*E. coli*), *Salmonella typhi* (*S. typhi*), *Aeromonas hydrophila* (*A. hydrophila*), and *Vibrio anguillarum* (*V. anguillarum*). The antibacterial investigation of aqueous extracts revealed the significant activity against the microbes. Phytochemical examination of the crude extract showed the occurrence of flavonoids, saponins, alkaloids, tannins, anthraquinones, and catechins which inhibited the growth of *V. anguillarum* and *E. coli* complete while *Salmonella typhi*, *Pseudomonas fluorescens*, and *Aeromonas hydrophila*, exhibited moderate varying levels of resistance. Hence, bioactive resistance from *Ipomoea aquatica* can help combat various fish bacterial infections.

INTRODUCTION

Fish are prone to numerous bacterial infections, specifically while reared in dense conditions^[1]. Infections outbreaks are responsible for unproductiveness performance and eventual mortality, causing financial losses to the fish farmers. Using antibiotics is the primary remedy applied to manipulate bacterial infection in fish farms. However, due to the usage of varieties of antibiotics, the fish farming practice has been embroiled as a concerned environment to the development and improved of resistant bacteria and a basis of pathogens to other animals and human beings^[2].

The use of similar antibiotics in exclusive treatment veterinary and human medication ailments improves the emergence and incidence of the resistance phenomenon. Aquaculture products and its rearing facilities have become threatened due to several associated bacterial pathogens causing some zoonotic and foodborne diseases hazardous to human health. Hence, the issue of microbial resistance required all-important necessity to the established guiding principle for the control usage of antibiotics and the development of innovative pills and alternative treatments to control bacterial infections. Owing to the potential to synthesize many different constituents, the plants are one of the best foundations of improved remedies. Plants extracts have a high prospect as an alternative source of antibacterial compounds without any undesirable consequence^[3]. Therefore, the present study aimed at assessing the antimicrobial properties and phytochemical screening of crude extract of *Ipomoea aquatica* (water spinach) against some fish pathogens to help in the treatment of fish bacterial infections.

MATERIALS AND METHODS

Plant Material

The plant species of water spinach used for the study is a whole matured healthy plant sourced from Jebba Upper Basin, Nigeria in the dry season of 2017 (between February and April). The disease-free plant was first identified with the aid of Keys compiled by Obot and Ayeni [4]. Prior to phytochemical examination and antibacterial investigation, the fresh plant samples were thoroughly washed with clean running tap water and allowed to dry on a paper towel for 24 hours at $35 \pm 2^\circ\text{C}$ in the laboratory of Federal College of Wildlife Management, New Bussa, Nigeria [5].

Preparation of Aqueous Extracts

Plants and plant parts were thoroughly washed with running tap water, blotted, air dried and powdered by a grinder. From these, 10 g of powdered materials were soaked in 50 ml of distilled water for 24 hours at 25°C laboratory temperature under shaking condition (130-14 rpm). The extract was filtered with the help of muslin cloth. The filtrate dried in laboratory temperature was transferred to Eppendorf tubes.

Bioassay for Antimicrobial Activity

In the present investigation, *Ipomoea aquatica* aqueous extract was used to determine the antibacterial activity using agar well diffusion. About 50 ml of a sterilized selective medium was decanted into each Petri-dish and solidified at 25°C . A fresh bacterial culture of 100 ml having 10^8 cfu/g taken in 10 ml of soft agar was decanted on agar plates and allowed to congeal. A well 8 mm diameter punched off at earlier marked petridish into agar medium with sterile cup borer and filled with 100 ml of plant aqueous extract. Plates were placed for 30 minutes in the refrigerator for diffusion of extract after which it was incubated for 24 hours at 35°C . This was repeated for a better result.

Bacterial Strains

The gram-negative *Escherichia coli*, *Vibrio anguillarum*, *Pseudomonas fluorescens*, *Aeromonas hydrophilia*, and *Salmonella typhi* were selected for screening.

Preparation of Inoculum

Pure bacterial cultures were prepared by streaking drop of microbial suspension into optimum temperature to sustain approximately uniform development of each bacterium.

Phytochemical Analysis

Quantitative assessment of phytochemical constituents' in plant extract was carried out for flavonoids, saponins, alkaloids, tannins, anthraquinones, and catechins as described by Raaman [6].

RESULT

In *Ipomoea aquatica*, the phytochemical examination verified the presence of 6 (six) bioactive ingredients which persist to inhibit the activity of the investigative susceptible bacteria species (Table 1). Saponins and alkaloids exhibited high presence in the extracts while catechins, tannins, and anthraquinones showed moderate levels through the only trace of flavonoids (0.05 ± 0.01) was present (Table 2). Result further revealed that the aqueous extract of *Ipomoea aquatica* has maximum antibacterial activity against gram-negative *V. anguillarum* and *E. coli* with 0 cfu/g (colony forming unit per gram) while other bacteria species such as, *S. typhi*, *A. hydrophila* and *P. fluorescens* produced average resistance of (2.7×10^3 , 4.2×10^3 and 4.6×10^3) cfu/g respectively.

Table 1. Phytochemical properties of *Ipomoea aquatica*.

Phytochemical	Quantity ($\mu\text{g}/\text{mg}$ Dry weight sample)
Flavonoids	0.05 ± 0.01
Saponins	1.35 ± 0.03
Alkaloids	4.10 ± 0.03
Tannins	0.37 ± 0.04

Anthroquinones	0.27 ± 0.01
Catechins	0.43 ± 0.02
Note: Values are mean ± standard error	

Table 2. Antibacterial activities of *Ipomoea aquatica*.

Pathogens	Inhabiting activities (cfu/g X 10 ³)		Average (cfu/g X 10 ³)
<i>E. Coli</i>	0	0	0
<i>P. fluorescens</i>	4.7	4.5	4.6
<i>S. typhi</i>	2.9	2.5	2.7
<i>A. hydrophila</i>	4.3	4.1	4.2
<i>V. Vibrio</i>	0	0	0

DISCUSSION

Ipomoea aquatica contains phytochemical substances of medical value/antimicrobial effects: The presence of high level of alkaloids may attribute directly to its anti-oxidative action [7]. Polyphenolic compounds e.g. tannins play a critical function in stabilizing lipid oxidation and are connected to antioxidant action [8]. It was reported that phenolic compounds have inhibitory effects in mutagenesis and carcinogenesis even in humans when up to 1.0 g is daily ingested from a diet rich in *Ipomoea aquatica* [9]. Colony forming unit (cfu/g) was done to determine which selected microorganism is susceptible to plant extract [10]. The antimicrobial property of the plant resisted (*E. coli* and *Vibrio anguillarum*). *Salmonella typhi*, *Aeromonas hydrophila*, and *Pseudomonas fluorescens* showed moderate varying degrees of resistance to the plant extract respectively. The demonstration of antibacterial action towards some fish pathogens may be indicative of the presence of wide spectrum antibiotic compounds.

CONCLUSION

Bioactive resistance from *Ipomoea aquatica* can help combat various fish bacterial infections. Isolation identification and purification of these phytoconstituents and determination of their respective antimicrobial potential that are helpful in formulating nutraceutical preparation should be the future direction for investigation.

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