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# Phytochemical Constituents and Antimicrobial Potency of *Aspilia Africana*

Ekaiko Marshall U[1], Arinze Adibelem G[2], Iwe Chijioke U[3], Asiegbu Emmanuel I[4]

[1,2,3]Department of Biology/Microbiology, Abia State Polytechnic, Aba, Nigeria
[4]Department of Biochemistry Abia State Polytechnic, Aba, Nigeria

***Abstract:*** **It has been estimated that over 80% of African population uses plant (herbs) regimen for treatment and control of disease due to it safety, availability, and effectiveness. In the present study, the phytochemical and antimicrobial property of *Aspilia africana* was investigated using standard methods. The result revealed that the plant contained appreciable amount of phytochemical which included Alkaloids (8.350±0.44), Tannins (0.618±0.06), Flavonoids (2.016±0.21), Saponin (3.218±0.55) and Phenol (0.201±0.02). The antimicrobial analysis showed that the plant had a broad spectrum effect on the test organism showing varying zones of inhibitions ranging from 9.3 to 18.4 and 7.1 to 10.4 for the ethanol and aqueous extract on bacterial isolates and 6.3 to12.3 and 7.2 to 7.8 respectively on the fungal isolate. The findings in the present study therefore suggest the use of the plant as an alternative antimicrobial agent due to its pharmacological properties.**

***Keywords:*** **Phytochemicals, Antimicrobial, Aspilia africana, Minimum inhibitory concentration.**

## 1. INTRODUCTION

The use of medicinal plants for treatment of various infections in traditional communities has been an age-long global practice. It has been estimated that 80% of African population use herbal regimen for treatment and control of diseases [1]. This provides a rationalization for studying medical plant extracts as a possible source of alternative therapy against infection. Apart from the expensive costs of some antibiotics, most of the clinically important antibiotics have major setbacks. A good number of conventional antibiotics have found to be neurotoxic, nephrotoxic and hypertensive, and few others cause nerve damage to the liver and bone marrow depression [2]. The primary benefit of using herbal drugs is that they are relatively safer and cheaper than the synthetic alternatives [3].

In addition, herbal medicine is a complex mixture of different phytochemicals acting by different mechanisms, which makes it difficult for pathogens to develop resistance [4]. During the early years of human existence, many plants materials by instinct, intuition of trial and errors were used to combat different ailment [5]. *Aspilia africana* (pers) C.D Adams belongs to the family *Asteracaen*. *Aspilia africana* is a common weed of field crops in West Africa, found in fallow land, especially in the forest zone. [6]

It is also spread in Nigeria and other countries. This weed is notable being used to stop bleeding and fast healing of wounds. *Aspilia africana* is used in herbal medicine to treat various infection of bacteria origin such as gonorrhea, stomach trouble and corneal opacity and also widely used as haemostatic agent [7]

The fresh leaves of *Aspilia africana* are used on cuts, the root decoction of *Aspilia africana* is taken for tuberculosis in Tanganyika. The leaf infusion is used in treating cough and related ailments in children. Traditional midwives administer the leaf and stem extract of *Aspilia africana* as enema to pregnant women to quicken and ease delivery [8]. The present study therefore evaluates the phytochemical constituents and antimicrobial potency of *Aspilia africana* on some clinical isolates.

## 2. MATERIALS AND METHODS

### COLLECTION OF PLANT MATERIALS / IDENTIFICATION:

Fresh leaf sample of *Aspilia africana* was obtained from Abia State Polytechnic, Aba in Aba north Local Government Area of Abia State. And was identified properly and authenticated by a plant taxonomist in the Department of Biology.

### PROCESSING AND EXTRACTION OF PLANT MATERIALS:

The ethanolic and aqueous extraction of the plant materials was prepared as described by Oyagade, *et al*, (1999).[9] The plants were collected in a sterile polythene bag, rinsed with a clean tap water and oven – dried at 80$^{o}$c. The plant materials were sorted, chopped into smaller pieces and grounded into -uniform powder using an electric blender. Soaking method was adopted for both ethanol and aqueous extraction, 50g of finely grounded leaf of the plant materials was suspended in 250mls of 95% ethanol and 250mls of distilled hot water respectively for 48 hours, to achieved pure dissolution and extraction of the sample. The samples were filtered using Whatman paper and the filtrate obtained was concentrated in water bath at 40$^{o}$c for about 12 – 14 hours.

### SOURCE AND MAINTENANCE OF TEST ORGANISMS:

Pure culture of test organisms used in this study; *Staphylococcus aureas, Escherichia coli, Salmonella typhi, Pseudomonas, aureginosa, Candida albicans, Aspergillus niger, Penicillium spp and Fusarium spp* were obtained from the Department of microbiology, Abia State polytechnic, Aba, and properly identified using some biochemical test and subcultured in nutrient broth and sabouraud agar respectively and incubated for 24 – 48 hours before use.

### ANTI MICROBIAL SENSITIVITY TESTING:

### AGAR WELL DIFFUSION METHOD:

20ml of molten sterile nutrient agar, and potato Dextrose agar were poured into Petri dishes, differently. After solidification, overnight broth cultures of bacteria were introduced into the surface of the sterile nutrient agar plate and a sterile glass spreader was used for even distribution.

Holes were made aseptically with a 5mm sterile cork borer and 0.1ml of the test solution of different concentrations was introduced into the well. The potato dextrose agar plates used for fungi were agar–welled using 5mm cork borer. Inside the well, different concentrations of the different extraction were dropped. The extract was allowed to diffuse into the medium for 1 hour. The bacteria plates were incubated for 24 hours at 37$^{0}$c and the fungi plates incubated for 2 – 5 days at room temperature. The plates containing the controls were incubated also. The plates were examined for zones of inhibition, which indicates the degree of susceptibility of the test organism.

### DETERMINATION OF MINIMUM INHIBITORS CONCENTRATION (MIC):

Minimum inhibitory concentration is defined as the lowest concentration able to inhibit any visible bacterial and fungal growth on the culture, plates. This is determined from the readings on the culture plates after incubation. The minimum inhibitory concentration was determined using agar- plate method. Media plate containing varying concentrations, 50% - 6.25% of the water and ethanol plant extracts respectively were incubated at 37$^{o}$c for 24 hours and the lowest concentration of the various extract causing complete inhibition of the bacterial and fungal growth were taken as minimum inhibitory concentration (MIC).

### Phytochemical analyses:

Phytochemical analyses include the Phenol determination, determination of Saponin, determination of Alkaloids and Flavonoids determination. All of these were determined based on methods of analyses described by AOAC, (1990)[10].

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## 3. RESULT

**QUANTITATIVE ANALYSIS OF THE PHYTOCHEMICAL PRESENT IN *ASPILIA AFRICANA:***

| | TESTS | AQUEOUS EXTRACT |
|---|---|---|
| 1 | Alkaloids | 8.350 ± 0.41 |
| 2. | Tannins | 0.618 ± 0.06 |
| 3. | Flavonoids | 2.016 ± 0.21 |
| 4. | Saponins | 3.218 ± 0.55 |
| 5. | Phenols | 0.201 ± 0.02 |

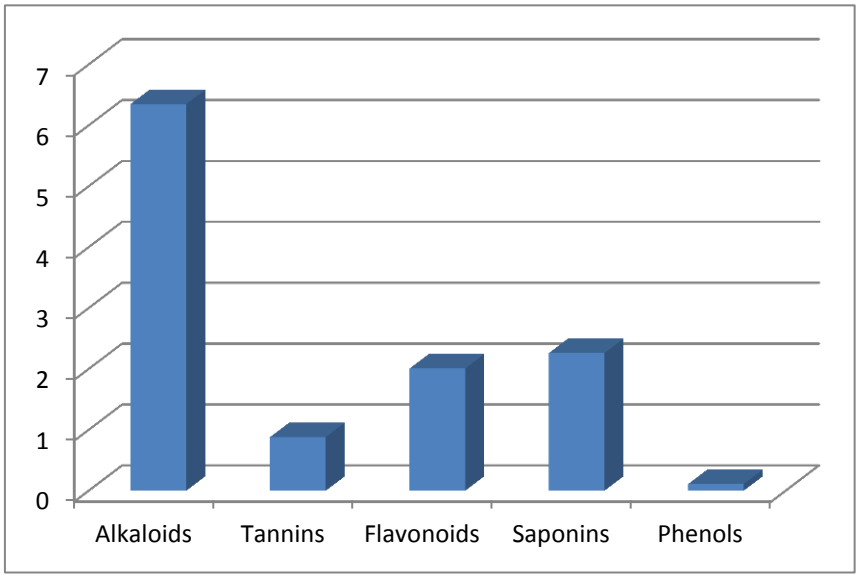


**Fig. 1 showed the quantitative phytochemical content of *Aspilia Africana.***

**SUMMARY OF THE MEAN ZONE OF INHIBITION OF THE ETHANOL AND AQUEOUS EXTRACTS OF *ASPILIA AFRICANA* ON BACTRIAL ISOLATE:**

| Isolates | Conc | Ethanol | Aqueous | control (gentamycin) |
|---|---|---|---|---|
| | 100 | 18.4 | 10.4 | 20.5 |
| | 50 | 14.2 | 7.1 | |
| *E. coli* | 25 | 9.3 | nil | |
| | 100 | 12.4 | 7.8 | 17.6 |
| | 50 | 9.3 | nil | |
| *Shigella* | 25 | 7.4 | nil | |
| | 100 | 16.0 | 9.3 | 15.2 |
| | 50 | 12.3 | 6.0 | |
| *Pseudomonas* | 25 | 9.0 | nil | |
| | 100 | 18.1 | 10.0 | 19.3 |
| | 50 | 13.9 | 7.3 | |
| *Staphylococcus* | 25 | 9.0 | nil | |

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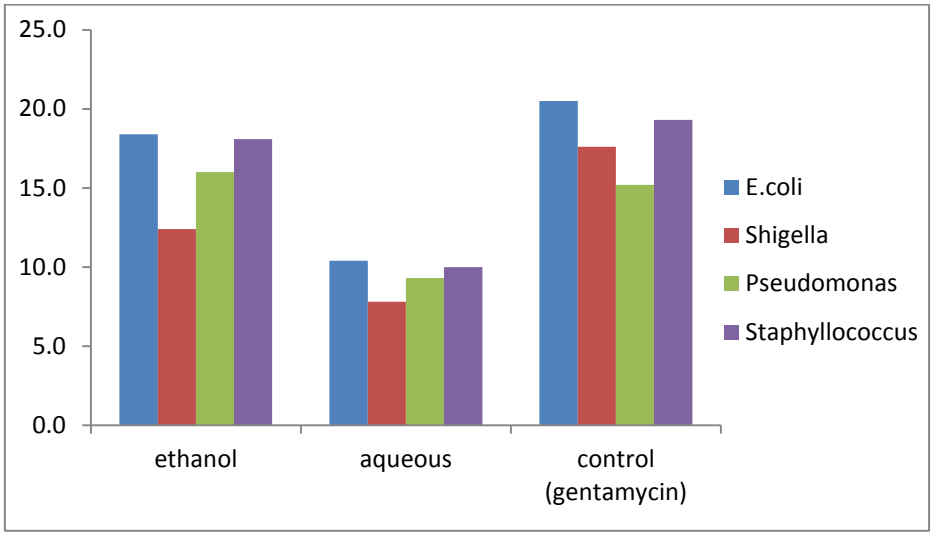


**Fig 2 (Above) shows the mean zones of inhibitions for the ethanol and aqueous extract of *Aspilia africana* and control antibiotics (Gentamycin) on bacteria isolates.**

**SUMMARY OF THE MEAN ZONE OF INHIBITION OF THE ETHANOL AND AQUEOUS EXTRACTS OF *ASPILIA AFRICANA* ON FUNGAL ISOLATE:**

| Isolates | Conc. | Ethanol | Aqueous | control Nystatin) |
|---|---|---|---|---|
| | 100 | 12.3 | 7.2 | 21.3 |
| | 50 | 7.1 | nil | |
| *Aspergillus* | 25 | nil | nil | |
| | 100 | 9.2 | 7.2 | 18.9 |
| | 50 | nil | nil | |
| *Candida* | 25 | nil | nil | |
| | 100 | 11.5 | 7.5 | 17.5 |
| | 50 | 6.3 | nil | |
| *Penicillin* | 25 | nil | nil | |
| | 100 | 11.9 | 7.8 | 20.6 |
| | 50 | 6.7 | nil | |
| *Fusarium* | 25 | nil | nil | |

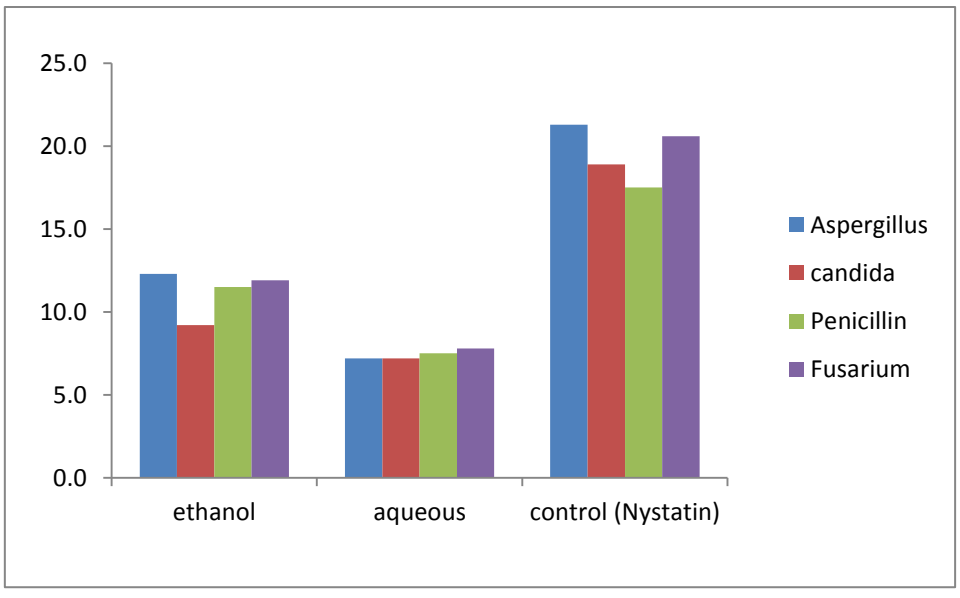


**Fig 3 (Above) shows the mean zones of inhibitions for the ethanol and aqueous extract of *Aspilia africana* and control antibiotics (Nystatin) on fungal isolates.**

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**THE MINIMUM INHIBITORY CONCENTRATION (MIC) OF THE ETHANOL AND AQUEOUS EXTRACT OF *ASPILIA AFRICANA* ON TEST ISOLATES:**

| MIC (%) | | |
|---|---|---|
| isolates | Ethanol | Aqueous |
| E. coli | 25 | 50 |
| Salmonella | 25 | 100 |
| Pseudomonas | 25 | 50 |
| Staphylococcus | 25 | 50 |
| Aspergillus | 50 | 100 |
| Candida | 100 | 100 |
| Penicillin | 50 | 100 |
| Fusarium | 50 | 100 |

## 4. DISCUSSION

Botany and medicine have been closely linked throughout history. Prior to this century, medical practitioners whether allopath (medical doctors), homeopaths, naturopaths, herbalist or shamans had to know the plants in the area and how to use them since many of their drugs were derived from plants [11]. With the recent trend of high percentage resistance of microorganisms to the present day antibiotics, efforts have been intensified by researchers towards a search for more sources of antimicrobial agents. In recent years, the growing demand for herbal products has led to a quantum jump in volume of plant materials traded across the countries [12]. Therefore, the use and history of herbs dates back to the time of early man, who had the crudest tools as his implements and use stones to start his fire. They used herbs in their raw and cooked forms to keep fit. Since that time, the use of herbs has been known and accepted by all nations and has been known also as the first art of treatment available to man [13].

In the present study, the phytochemical and antimicrobial effect of *Aspilia Africana* was investigated; the phytochemical analysis shows that the leaf of *Aspilia africana* is very rich in alkaloid and saponins which are known to have antimicrobial activities [14]. The presence of flavonoids, tannins and saponins in leaves of *Aspilia africana* as observed in this study is the proper evidence to regard the plants *Aspilia Africana as* medicinal plant [15, 16].

Saponins containing plants are important because of their detergent and haemolytic properties. Saponin when injected into the blood stream is highly toxic because of their reaction with enzymes, but when administered orally, becomes comparatively harmless [15]. The presence of saponins confirmed this plant as anti-inflammatory, anti-fungal and anti-parasitic [17]. It contains flavonoids which are super antioxidants that provide protection against oxidative cell damage [18] (Salah, *et al*, 1995). And against allergies, viruses, ulcers and inflammation [19].

The presence of flavonoid in this plant leaves also suggest that it can be used as anti spasmodic, anti-fungal and anti-bacteria drugs. This confirms the reasons for the use of this plant in the treatment of diarrhea spasmodic bronchitis and other microbial infections; these findings corresponded with report by Trease and Evans (1989) [20] who also stated the present of these phytochemical. Phenols and their oxidative products are corrosive to living bacteria cells and are considered to be potentially toxic to the growth and development of pathogens [21].

The difference on the antimicrobial effect of the ethanol extracts compared to the aqueous extract on the test organisms justifies the active principle observed in herbal physician in their preference for local gin (organic solvent) as extractants. It may be possible that the bioactive substances present in the plant are less soluble in water than in the organic solvent[9].

The susceptibility of the test organisms to the extracts of *Aspilia africana* in the present study corresponds with the work of Adeniyi and Odufowora, (2000)[7], who reported that the extracts of *Aspilia africana* possesses a broad spectrum anti-bacteria activity against both gram positive and gram negative bacteria. The result showed that the effect of plant extract can be compared favorably with conventional antibiotics. Failure of some of the concentration of the extract to exert antimicrobial effect on the test organism is not enough to conclude that the leaf does not contain substances that can exert antimicrobial activity against the test organism because the potency of extract depends on the method used to obtain the extract and some other factors [22].

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