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Comparative Studies of the Phytochemical and Antimicrobial Properties of the Leaf, Stem and Tuber of *Anchomanes difformis*

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Abstract: Ethanolic extracts of the stem, leaf and tuber of *Anchomanes difformis* were screened for the presence of phytochemicals. The extracts of these three parts of the plant were found to contain saponin, tannins and alkaloids. Antibacterial assay of the extract against indicator bacteria reveal zones of inhibition ranging between 2 to 35 mm. The extract of the tuber was found to be more effective in inhibiting *Salmonnella species* and *Bacillus subtilis*. The result of this study confirms the local use of the extract of tubers soaked in water in the treatment of dysentery by herbal practitioners.

Key words: *Anchomanes difformis*, leaf, stem, tuber, phytochemicals, antibacterial

INTRODUCTION

Medicinal plants have been used as sources of medicine in virtually all cultures (Baquar, 1995; Anwannil and Atta, 2006). It has been reported that long before mankind discovered the existence of microbes, the idea that certain plants had healing potentials, indeed, that they contained what we would currently characterize as antimicrobial principles was well accepted (Rios and Recio, 2005). In the developing countries, the use of medicinal plants in the treatment of infectious diseases is rife. The reasons are the high cost of very effective antibiotics and the problem of antibiotic resistance which is very common in developing countries (Okeke *et al*., 1999). The high cost involved in the development of patentable chemicals and drugs had also been reported as one of the reasons for a renewed interest in herbal product (Hack, 2006).

A record of medicinal plants in earliest period in Nigeria is virtually not available because there was no documentation for their isolation, selection and preparation. Every fact about potent herbal plant was passed by word of mouth from generation to generation (Kochnar, 1981). The Nigerian climate favours a wide variety of plants with vast medicinal potentials some of which have been used traditionally for decades without reference to their phytochemical and antimicrobial properties. *Anchomanes difformis*, a member of the family Araceae (Burkill, 1985), is one of such plants. *Anchomanes difformis* is known as Abrisoko in the south west of Nigeria. Locally, peeled tuber of *Anchomanes difformis* soaked in water is used in treating cases of dysentery. Morton (1961) also reported that after prolonged washing and cooking, the tuber is edible at early stage of shooting.

The active principles of plant drugs are commonly more concentrated in storage organs such as leaves, roots, seeds, barks and in most cases flowers and woody parts of herbaceous stem are usually relatively inert (Kochnar, 1981). The present study aims at comparing the phytochemical constituents and antimicrobial properties of the leaf, stem and tuber of *Anchomanes difformis*.

MATERIALS AND METHODS

Source and Treatment of *Anchomanes difformis*

This above study was carried out in the Departments of Microbiology and Biochemistry, Federal University of Technology, Akure, Nigeria. *Anchomanes difformis* plants were obtained from

Obakekere Campus, Federal University of Technology, Akure. The plant was separated into leaf, stem and tuber. The tuber was further sliced into pieces to aid sun drying. The three parts (leaf, stem and tubers) were sun dried for one week after which they were blended into powdery form. Ethanol extraction was performed by soaking 300 g of the sample in 900 mL of ethanol. The resultant mixture was concentrated using rotary evaporator into a semi solid form.

Antibacterial Assay

The extracts from the leaf, stem and tuber were reconstituted by dissolving the semi solid form in sterile water. It was sterilized by passing it through a Millipore filter. The agar well diffusion assay for antibacterial test of Schillinger and Lucke (1989) was adopted. Overnight broth culture of bacterial isolates obtained from Department of Microbiology, Federal University of Technology, Akure were used to seed Nutrient agar (Oxoid) plates. The indicator bacteria used are *Pseudomonas aeruginosa*, *Salmonella* species, *Proteus vulgarus*, *Escherichia coli*, *Bacillus subtilis* and *Serratia marscence*.

Determination of Minimum Inhibitory Concentration (MIC)

Different concentrations of the extract (50 and 20 mg mL^{-1}) were prepared in test tubes by serial dilution. The different concentrations were introduced into Nutrient agar plates that had been seeded with the indicator bacteria. The plates were incubated at 37°C for 24 h after which they were examined for zones of inhibition.

Phytochemical Screening of *Anchomanes difformis*

The extracts were examined for the presence of the following phytochemicals: Alkaloids, tannins, saponins, cardiac glycosides, anthroquinones and phlobatannins. The methods described by Herborn (1998) were used to ascertain the presence of alkaloids, cardiac glycosides and phlobatannins. The presence of saponins was detected using the method of Odebiyi and Sofowora (1978), while tannins and anthroquinones were screened for using the method of Trease and Evans (1985).

RESULTS AND DISCUSSION

The interest in the study of medicinal plants as a source of pharmacologically active compounds has increased worldwide (Rios and Recio, 2005). In most developing countries of the world, plants are the main medicinal sources used in treating infectious diseases (Sofowora, 1993). One of these medicinal plants is *Anchomanes difformis*. Locally, the peeled tubers of *Anchomanes difformis* soaked in water are used to treat cases of dysentery. Ironically, there has not been serious scientific investigation to authenticate its claimed potency especially in the treatment of dysentery.

Phytochemical analysis of the leaf, stem and tuber of *Anchomanes difformis* reveal the presence of the following phytochemicals: saponins, tannins and alkaloids (Table 1). The secondary metabolites have been proven to be medicinal in nature as they have various protective and therapeutic effect essential to prevent diseases and maintaining a state of well being (Sujatha *et al*., 1985). Adegoke *et al*. (1968) had earlier reported that *Anchomanes difformis* contain strong alkaloids which had been used by man for several ages as medicine. Saponins had also been reported to have therapeutic effect.

The leaf, stem and tuber of *Anchomanes difformis* show appreciable antibacterial effect against the indicator bacteria (Table 2). Plant parts are known to contain bioactive compounds that are active against pathogenic organisms. In recent studies, extracts of various parts of medicinal plants were found to have broad spectrum antimicrobial activities against pathogenic organisms (Sudhakar *et al*., 2006; Khan *et al*., 2006). The zones of inhibition observed ranged between 2 to 35 mm at concentration of 50 mg mL^{-1}. The extract obtained from the tuber had a more pronounced antibacterial effect with the zone of inhibition as high as 35 mm against *Bacillus subtilis*. *In vitro*

Table 1: Phytochemical constituents of the extract of *Anchomanes difformis*

Phytochemicals	Stem	Leaf	Tubers
Alkaloids	+	+	+
Tannins	+	+	+
Saponins	+	+	+
Anthroquinones	-	-	-
Phlobatannins	-	-	-
Cardiac glycosides	-	-	-

+: Present; -: Absent

Table 2: Inhibitory zone (mm) of extracts of *Anchomanes difformis* against indicator bacteria at 50 mg mL^{-1} concentration

Bacterial indicator	Stem	Leaf	Tubers
Pseudomonas aeruginosa	3	21	-
Salmonella species	4	27	29
Proteus vulgaris	3	28	-
Escherichia coli	-	-	
Bacillus subtilis	-	-	35
Serratia marcescens	-	-	-

Values are means of three replicates. -: No inhibition

Table 3: Minimum inhibitory concentration (MIC) of extracts of *Anchomanes difformis* (mg mL^{-1}) against indicator bacteria

Bacterial indicator	Stem	Leaf	Tubers
Pseudomonas aeruginosa	50	20	-
Salmonella species	20	20	20
Proteus vulgaris	50	20	-
Bacillus subtilis	-	-	20

-: No inhibition

inhibition of bacteria by plant extracts had been extensively reported (Tadeg *et al*., 2005; Alanis *et al*., 2005; Oyetayo and Oyetayo, 2006). The extracts of the tuber and leaf were observed to have a minimum inhibitory concentration of 20 mg mL^{-1} while the stem had 50 mg mL^{-1} (Table 3). This confirms the report of Kochhar (1981) that the active principles of plant drugs are more concentrated in storage organs such as leaves, roots, seeds, bark while flowers and woody parts of herbaceous stem are relatively inert.

Conclusively, the result of the antibacterial screening reveals that the extract of the tuber is more efficacious than the leaf and stem extracts in the *in vitro* inhibition of the test bacteria. The observation above may give credence to the efficacy of extract obtained by soaking *Anchomanes difformis* tuber in water in treating dysentery in locally in some parts of South West of Nigeria. Bioassay guided fractionations of the active crude extracts to isolate and identify the compound(s) responsible for antibacterial and other therapeutic activity is a subject of further studies.

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