Antimicrobial activity of selected leaf extracts against water borne pathogenesis

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ABSTRACT

Traditional medicine is an important source of potentially useful new compounds for the development of novel pharmaceutical products. Leaves were consumed as food by our ancestors which are not even known to the present generation. In the present study leaves extracts of two tubers (Colocasia esculenta, Cucurbita maxima and Dioscorea alata) were studied for their antimicrobial activity different bacterial strains isolated from water samples of tribal areas in Visakhapatnam Dist., which was measured in terms of zone of inhibition, all results were compared with standard antibiotics with highest activity against tested microorganisms.

Keywords: Tuber, leaf extract, bacterial strains, antimicrobial activity

1. INTRODUCTION

Biological activities of plants investigation increases during the past two centuries. The emergence of medicinal chemistry as a major route for the discovery of novel and more effective therapeutic agents [1]. In developing countries, especially in rural contexts people usually turn to traditional healers when in diseased conditions and plants of ethnobotanical origin are often presented for use.

According to World Health Organization, 2003 medicinal plants would be the best source of a variety of drugs and therefore such plants should be investigated to better understanding of their properties safety and efficiently. The use of plants and plant products as medicines could be traced as far back as the beginning of human civilization. Nature has very rich botanical wealth and a large number of desire types of plants that grow in different parts of the country. Various researches have reported that the plant extract have antimicrobial activity, anti-inflammatory activity, antibacterial activity and contain antifertility agents. In the Tribal area of Visakhapatnam have a richest biodiversity, with an available of many food plants used as herbs, health foods and for therapeutic purposes. Numerous studies have been carried out on plants, vegetables and fruits because they are rich sources of antioxidants, such as vitamin A, vitamin C, Vitamin E, carotenoids, polyphenolic compounds and flavonoids which prevent free radical damage, reducing risk of chronic diseases. Antioxidants are substances that delay or prevent the oxidation of cellular oxidizable substrates [2]. Cucurbita maxima are rarely found growing in the wild in Nigeria. It is cultivated in northern
Nigeria for the fruits. In southern Nigeria, in a largely unimproved form, it is cultivated for both the leaves and fruits [3]. Leaves of Colocasia esculenta were extracted with organic solvent like ethyl acetate and its biological activity against antibacterial strain was checked for 100 ppm concentration [4].

In the present investigation, Colocasia esculenta, Cucurbita maxima and Dioscorea alata leaves was selected as one of the medicinally important plant, extensively consumed by tribal people as food [5]. Cucurbita maxima leaf extract has a significant antibacterial activity against Staphylococcus aureus, Bacillus subtilis, Pseudomonas aeruginosa and Escherichia coli [6]. The aim of the present study was focused on the antimicrobial activity of Colocasia esculenta Cucurbita maxima and Dioscorea alata leaves with selected for water borne pathogens.

2. MATERIALS AND METHODS

2.1. Study Area

The Chintapalli Mandal located on the North Easter part of Visakhapatnam dist., in A.P state of India. It lies between 17°44’22” North Latitude to 18°04’29” East to 82°38’04” East. The climate conditions are very cool in the area on account of elevation, green vegetation and think forest. The temperature gets down with the onset of south west monsoon and tumbles to a mean minimum of 4°C by January after which there is reversal trend till the temperature reaches mean maximum of 34°C by end of May, that is April to June are warmest Months. This tribal area which rain season account for 90% of rain fall an average Annual rain fall of 1178.mm.

2.2. Collection of Plant Leaves

Plants were collected locally, in the Tribal area of Chintapalli Mandal Vegetable field. The plant identification was done by an expert of Dr S.B.Padal, Associate professor, from Department of Botany, Andhra University in India. After the careful removal of the leaves, they were washed with distilled water, shade dried, powdered and subjected to Soxhlet extraction using methanol and ethanol as solvents.

2.3. Preparation of Plant Extract

Plant material was separated into two different parts such as tuber and leaves. Only leaves were fine powered into grinder. Twenty gram of each powdered plant material was extracted separately at room temperature using various solvents namely methanol and ethyl acetate with gentle stirring for 24 hrs. The filtered solvent was concentrated in water bath for 6 hrs [7-8].

2.4. Test Pathogens

The water borne pathogens like S. aureus, Stroptococci, E.coli, Pseudomonas, Vibrio cholera and Salmonella were isolated from drinking water used in tribal area of Chintapalli mandal, Visakhapatnam district, Andhra Pradesh with the help of department of Environmental Sciences Andhra University.

2.5. Antibacterial Activity Assay

The test organism was activated by inoculating a loop full of culture in 25ml of nutrient broth, incubated 37°C overnight on a rotary shaker. Mueller Hinton Agar media were used for antibacterial activity. The assay was performed by the agar well diffusion method with 200 μL of inoculums introduced into molten Mueller Hinton agar and poured into petri dishes when the temperature reached 40–42 °C. The media were solidified and wells were prepared in the seeded agar plates with the help of a cup borer (8 mm). Next, 100 μl of the leaf extract was introduced into the well and the plates were incubated at 37 °C for 24 and 48 hours. The control sets were maintained with the antibiotic Ampicillin under aseptic conditions; plates were incubated at 37°C for 24 hours. All the tests were performed in triplicate under strict aseptic conditions. The microbial growth was determined by measuring the diameter of the zone of inhibition in millimeters.

3. RESULTS AND DISCUSSION

The three leaf extract has an antibacterial activity against water borne pathogens isolated from drinking water. In particular the antibacterial action of each compound was different in intensity and specificity. The leaf was extracted with ethanol and methanol activities shown Table 1 and Figures 1 and 2.

The ethanol extract of C. esculenta highest zone of inhibition was observed in Pseudomonas and V.cholera (16mm) followed by Stroptococci (15mm), Salmonella (14mm) and S. aureus (12mm) and lowest zone of inhibition was observed in E.coli (10mm). In methanol extract shows the sufficient zone of inhibition against the microorganism as 20 mm in Pseudomonas, 18mm in S. aureus, 16 mm in

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V. cholera and Stroptococci, 14mm in E.coli, 10mm in Salmonella respectively. Antibacterial activity of Colocasia esculenta has been mentioned by Ravikumar and co-workers [9].

In C. maxima the highest zone of inhibition was observed in Pseudomonas (22mm) in ethanol extract, and S. aureus (28mm) observed in methanol extract. The lowest zone of inhibition was observed in Salmonella (16mm) on methanol extract.

The ethanol extract of D. alata shows the sufficient zone of inhibition against 23 mm Stroptococci spp., as 22mm in S.aureus and V cholera, 18mm in Pseudomonas and Salmonella and 12mm in E.coli in respectively. In methanol extract shows maximum activity against the V. cholera (24mm), Pseudomonas and E.coli (22mm) zone of inhibition respectively. Whereas the minimum activity was reported Salmonella (12mm).

These results are in agreement with earlier studies realized Dioscorea attributing antimicrobial activities to the presence of secondary metabolites [10]. Methanol extracts of Albizia procera, Cassia auriculata (Leaves and flowers), Peltophorum pterocarpum, Punica granatum and Syzygium cumini showed activity, Punica granatum possesed 25 % Tannin and the antibacterial activity may be indicative of the presence of some metabolic toxins or broad spectrum antibiotic compounds [11]. Also ethanolic extracts of Punica granatum fruit showed some antibacterial activity against P. vulgaris and B. subtilis [12].

The crude methanolic extract of ghuinya (20mg/ml) showed maximum zone of inhibition against the microorganism A.niger (22mm) whereas the minimum activity is reported against candida albicans (16mm).

### Table 1. Antimicrobial Activity of Leaf Extracts

<table>
<thead>
<tr>
<th>Test Organisms</th>
<th>Ethanol Extract</th>
<th>Methanol Extract</th>
<th>Control</th>
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<tbody>
<tr>
<td></td>
<td>Colocasia</td>
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<td></td>
<td>esculenta</td>
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<td>Cucurbita</td>
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<td>S. aureus</td>
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<td>Stroptococci</td>
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<td>Pseudomonas</td>
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<tr>
<td>Vibrio cholera</td>
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<tr>
<td>Salmonella</td>
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<td>16</td>
<td>12</td>
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<tr>
<td>E.coli</td>
<td>10</td>
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</table>

Figure 1. Antibacterial activity against water pathogens

Figure 2. Antibacterial activity against water borne pathogens
4. CONCLUSION

It may be concluded from the present studies that leaves extracts contain more potential source of natural antimicrobial compound. Antibacterial susceptibility assay indicated that the ethanol extract showed the highest activity against water borne pathogeneses. For follow-up research, it is needed to determine the active components in each extract and confirm their mechanism of action.

Acknowledgement

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Conflict of Interest

The authors declare that they have no conflicts of interest.

References