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Research Article

ANTIMICROBIAL BEHAVIOR OF SOME MEDICINAL PLANTS OF RANGPUR DIVISION, BANGLADESH

Rishikesh [1]*, Md. Mofizur Rahman [1], Md. Zakaria Faruki [1], Sk- Moynul Hasan [2], Drishti Rani Ghosh [2], Md. Moshfiqur Rahman [3]
Department of Pharmacy, Bangladesh University 1, Dhaka-1207, Bangladesh
Department of Pharmacy, University of Asia Pacific 2, Dhaka-1209, Bangladesh
Department of Pharmacy, Manarat International University 3, Dhaka-1216, Bangladesh
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Corresponding Author's email: rishibd@gmail.com

Abstract: In pastoral and rearward area of Rangpur division, Bangladesh, a number of plants are universally used as herbal medicine for the treatment of infectious diseases. Four such plants commonly used by the people of the region were screened for potential antibacterial activity. Antibacterial activity of methanol extracts of the plants parts were used for screening. The plants screened were *Psidium guajava, Sanseiveria roxburghiana Adhatoda vasica, Terminalia arjuna*. Antibacterial activity was tested against five strains of both Gram positive and Gram negative bacteria. The susceptibility of the microorganisms to the extracts of these plants was compared with selected antibiotic. The result showed that, the methanol extracts of selected medicinal plants exhibited activity against the tested organisms. The obtained results support for the uses of this plant as traditional medicine.

Key words: *Psidium guajava, Sanseiveria roxburghiana Adhatoda vasica*, *Terminalia arjuna,* Antibacterial activity.

INTRODUCTION:

Bacteria and fungi are accountable for many infectious diseases. The increasing clinical implications of drug resistant fungal and bacterial pathogens have lent additional importance to antimicrobial drug research. Worldwide, infectious disease is one of main causes of death accounting for approximately one-half of all deaths in tropical countries. Perhaps it is not surprising to see these statistics in developing nations, but what may be remarkable is that infectious disease mortality rates are actually increasing in developed countries, such as the United States. Death from infectious disease, ranked 5th in 1981, has become the 3rd leading cause of death in 1992, an increase of 58% .It is estimated that infectious disease is the underlying cause of death in 8% of the deaths occurring in the US [1]. Plants are the natural reservoir of many antimicrobial agents. In recent times, traditional medicine as an alternative form of health care and to overcome microbial resistance has led the researchers to investigate the antimicrobial activity of medicinal plants [2]. The antimicrobial screening which is the first stage of antimicrobial drug research is performed to ascertain the susceptibility of various fungi and bacteria to any agent. This test measures the ability of each test sample to inhibit the *in vitro* fungal and bacterial growth. This ability may be estimated by any of the following three methods. Traditionally, plants have provided a source of inspiration for novel drug compounds, as plant derived medicines have made large contributions to human health and well being. In our country we are using crude plants as medicine since Vedic period. A major part of the total population in developing countries still uses traditional folk medicine obtained from plant resources [3]. Nowadays, multiple drug resistance has developed due to the indiscriminate use of commercial antimicrobial drugs commonly used in the treatment of infectious disease [4].

In addition to this problem, antibiotics are sometimes associated with adverse effects on the host, including hypersensitivity, immunesuppression and allergic reactions [5]. This situation forced scientists to search for new antimicrobial substances. Given the alarming incidence of antibiotic resistance in bacteria of medical importance [6], there is a constant need for new and effective therapeutic agents [7]. Therefore, there is a need to develop alternative antimicrobial drugs for the treatment of infectious diseases from medicinal plants [8]. Several screening studies have been carried out in different parts of the world. There are several reports on the antimicrobial activity of different herbal extracts in different regions of the world [9].

MATERIALS AND METHODS:

Selection of medicinal plants:

In the present effort a few selected medicinal plants were screened for possible antibacterial activity. *Psidium guajava, Sanseiveria roxburghiana, Adhatoda vasica, Terminalia*

arjuna, shown in **Figure 1 to 4** respectively. These are as follows:

Psidium guajava
Family: Myrtaceae
Parts used: Leaf
Traditional uses: Diarrhea, dysentery, gastroenteritis, anti cough, ulcers, bowels , cholera , hypoglycemic, anti-inflammatory, analgesic, antipyretic.

Sanseiveria roxburghiana
Family: Asparagaceae
Parts used: Leaf
Traditional uses: leaves are used for fiber production; in some species, the plant's sap has antiseptic qualities, and the leaves are used for bandages in traditional first aid.

Adhatoda vasica
Family: Acantheceae
Parts Used: Leaf
Traditional uses: Asthma, dermatitis, antispasmodic and chronic bronchitis.

Terminalia arjuna
Family: Combretace
Parts used: Bark
Traditional uses: Cardiovascular diseases, myocardial infarction, degenerative neurological diseases, cancer, amyloidosis, acute pancreatitis, arthritis, atherosclerosis, inflammatory bowel disease, diabetes, senile dementia, retinal degeneration and senile cataract.

Figure-1: *Psidium guajava*

Figure-2: *Sanseiveria roxburghiana*

Figure-3: *Adhatoda vasica*

Figure-4: *Terminalia arjuna*

Identification of Plant materials:

Clean plants parts were collected from the different pastoral and rearward area of Rangpur division, Bangladesh. The taxonomic identities of this plant were determined by the skill of the Department of Pharmacy of our University. Each specimen were labeled, numbered and noted with date of collection, the locally and their medicinal uses and their approximate dosages of administration were recorded. Plant parts were washed with 70% alcohol and then rinsed with sterilized distilled water, air dried and stored.

Preparation of extracts:

Fresh dry plant samples were collected in a fiber bags. The materials were grinded to fine power with the help of mixer grinder. Then these powered materials were used for the preparation methanol extracts.

Extraction of leaves:

About 250 gm of powdered leaves was taken in a clean flat –bottomed glass container and percolated with 3 liters of Methanol. The container with its content was sealed and kept for 7 days with occasional shaking and stirring .the mixture was the filtered successively through a piece of clean white cotton .The filtrate thus obtained are kept in a open air for the evaporation of the methanol. After 10 to 15 days all the methanol are evaporated and I got the extract of methanol.

Microorganisms used:

Two gram positive (*Staphylococcus aureus and Bacillus cereus)* and three gram negative (*Escherichia coli, Vibrio cholerae,* and *Pseudomonas aureus*) pathogenic bacterial samples were collected from the Dhaka University. The organisms were sub-cultured in nutrient broth and nutrient agar for use in experiment.

***In-vitro* Antibacterial Study:**

Following methods were performed to determine the antimicrobial activity of plant extracts – The modified agar-well diffusion method of Cappuccino and Sherman (1999) was employed to study the antibacterial activity of the plant extracts [10]. 3.7% of Muller Hinton Agar was mixed with hot distilled water and autoclaved at 15 lb pressure for 15 minutes. After autoclaving, it was allowed to cool to 45^0 C-50^oC. Then the medium was poured into sterilized Petri dishes with a uniform depth of approximately 4 mm. The agar medium was allowed to cool to room temperature. To standardize the inoculums density for sensitivity test, a BaSO4 turbidity standard, equivalent to 0.5 Mac Farland standards were used. For the transformation of bacteria to Petridish a swab dipped in standard inoculums was used. After dipping, the swab was used to spread the bacteria on the media in a confluent lawn. Then the Petri dishes were left for 3 to 5 minutes. Using cork borer, 6 mm diameter wells were made in all the plates. Different extracts were added to the groove with one blank of each. Plates were incubated for 24 hours at 37^oC. After 24 hours the plates were examined. Results were recorded, as the presence or absence of inhibition zone. The inhibitory zone around the well indicated absence of bacterial growth and it was reported as positive and absence of zone is negative. The diameters of the zones were measured using diameter measurement scale. The effect of plant extract was compared with that of standard antibiotic Ciprofloxacin.

The Minimum inhibitory concentration was evaluated by dilution method [11] on plant extracts to observe the antimicrobial activity. Anti-bacterial agents were incorporate in different concentration with liquid media. These media were inoculated with the test bacteria and incubated. The lowest dilution at which there is no growth of organisms is considered significant. The turbidity of the test sample is measured by spectrophotometer with respect to blank.

RESULTS AND DISCUSSION:

The methanol extract showed different levels of antimicrobial activity toward test organisms. The methanol extract of *Psidium guajava* showed highest antimicrobial activity against all the tested organisms. The methanol extract of *Adhatoda vasica* exhibited low antimicrobial activity against *Bacillus cereus*, *Escherichia coli*, *Vibrio cholera* (Table-1). Zone of inhibition (mm) of Methanol extract of *Sanseiveria roxburghiana, Terminalia arjuna* were active against all the test organisms. To screen the antibacterial activity against tested organisms, Ciprofloxacin were used as a standard.

Table 1: Antimicrobial activity of methanolic extracts and different fractions of several plants

Test microorganisms	Diameter of zone of inhibition (mm)				
	Psidium guajava	***Sanseiveria roxburghiana***	***Adhatoda vasica***	***Terminalia arjuna***	**Ciprofloxacin**
Gram positive bacteria					
Bacillius sereus	15	13	8	11	42
Staphylococcus aureus	14	12	10	10	41
Gram negative bacteria					
Escherichia coli	12	11	8	11	42
Pseudomonas aureus	10	10	8	10	40
Vibrio cholerae	11	11	9	11	41

Successful prediction of botanical compounds from plant material is largely dependent on the type of solvent used in the extraction procedure. Traditional medicinal plants are use primarily water as the solvent but in our studies we found that plant extracts in organic solvent (methanol) provided more consistent antimicrobial activity. These observations can be rationalized in terms of the polarity of the compounds being extracted by solvent and in addition to their intrinsic bioactivity. The results of screening are presented in Table 1. The methanol extracts of *Psidium guajava*, *Sanseiveria roxburghiana Terminalia arjuna* and *Adhatoda vasica* were subjected to a preliminary screening for antimicrobial activity against Five standard bacteria: two gram positive (*Staphylococcus aureus and Bacillus cereus)* and three gram negative (*Escherichia coli, Vibrio cholerae,* and *Pseudomonas aureus*). It was clear that the methanol extract of selected medicinal plants exhibited activity against the tested organisms. Methanolic extracts of plants generally posses terpines and phenolics, which are reported by different workers as antimicrobial compounds [12]. Plants are important source of potentially useful structures for the development of new antimicrobial agents. The first step towards this goal is the *in vitro* antibacterial activity assay. Many reports are available on the antiviral, antibacterial, antifungal and anti-inflammatory properties of plants. Some of these observations have helped in identifying the active principle responsible for such activities and in the developing drugs for the therapeutic use in human beings [13]. The observed antimicrobial activity against the tested organisms could be due to the presence of tannins and cyanogenetic glycosides in the extract as these have previously been reported to possess antimicrobial activities. These could explain the rationale for the use of the plant in the treatment of the various conditions in traditionalmedicalpractice.

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REFERENCES:

1. Pinner R, Teutsch S, Simonsen L, Klug L, Grabers J, Clarke M, and Berkelman R. Trends in infectious diseases mortality in the United States. *J.Am.Med.Assoc*, 275: 189-193, **1996**.
2. Austin. D.J., Kristinsson. K.G., Anderson. R.M. **1999**. The relationship between the volume of antimicrobial consumption in human communities and the frequency of resistance. *Proc Natl Acad Sci* USA., 96:1152-6.
3. Srivastava J, Lambert J and Vietmeyer N. Medicinal Plants: An Expanding Role in Development. The World Bank, Washigton, D.C., 8, **1996**
4. Service RF. Antibiotics that resist resistance. Science, 270: 724-727, **1995.**
5. Ahmad I, Mehmood Z and Mohammad F. Screening of some Indian medicinal plants for their antimicrobial properties. *J Ethnopharmacol,* **1998**; 62: 183-193.
6. Monroe S and Polk R. Antimicrobial use and bacterial resistance. *Curr Opin Microbiol*, **2000;** 3: 496-501**.**
7. Bhavnani SM and Ballow CH. New agents for Gram-positive bacteria. *Curr Opin Microbi*l, **2000;** 3: 528-534**.**
8. Cordell GA. Biodiversity and drug discovery a symbiotic relationship. *Phytochemistry* , **2000;** 55: 463-480.
9. De Boer HJ, Kool A, Broberg A et al. Antifungal and antibacterial activity of some herbal remedies from Tanzania. *J Ethnopharmacol*, **2005;** 96: 461-469.
10. Cappuccinno and Sherman. Miccro-Alaboratory manual. Addison WesleyLongman Inc, **1999;** 254-256**.**
11. Prescott L M , Harley J P and Klein D A.Microbiology. Sixth Edition, Mc Graw Hill,783, **2005.**
12. Dwivedi S. *Terminalia arjuna* Wight & Arn.- a useful drug for cardiovasculardisorders.*J.Ethnopharmacol* **2007;**114(2):114-29,.
13. B. Mahesh and S. Satish; Antimicrobial Activity of Some Important Medicinal Plant against Plant and Human Pathogens: *World J. Agric. Sci*. **2008**; 4 (S): 839-843.