Antibacterial activity of some selected medicinal plants used by the Rakhaing community of Cox’s Bazar district of Bangladesh

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ABSTRACT

The aim of the present study is to evaluate the antibacterial activities of some traditional medicinal plants on several pathogenic bacteria, which can cause diseases in human. Thirty four medicinal plants belonging to twenty-four families were selected based on medicinal reports practiced by the indigenous people and screened for their antibacterial activity against eight human pathogenic bacteria (Bacillus subtilis, B. megaterium, B. cereus, Staphylococcus aureus, Escherichia coli, Vibrio cholerae, Salmonella typhi and Shigella dysenteriae) by disc diffusion and agar cup methods. Among them Psidium guajava, Terminalia arjuna, Phyllanthus emblica, Terminalia chebula, Justicia adhatoda, and Ocimum sanctum showed significant antibacterial activity against the human pathogenic bacteria. The largest zones of inhibition (22 mm in diameter) were recorded against S. dysenteriae and B. cereus with the fruit extracts of O. sanctum. The present study supports the traditional uses of medicinal plant by the indigenous communities as antibacterial and could be potential source for the discovery of new antibiotics.

Key words: Antibacterial activities, medicinal plants, Rakhaing, Bangladesh.

INTRODUCTION

The plant kingdom served as the best natural source of drugs and medicine from the very start of human civilization. In the preparation of antibiotic, many pharmaceutical industries process and utilize plants and plant parts as raw material to produce plant derived drugs. But most of the information of plant use as medicinal purposes is seeded in the rural people and indigenous community. Bangladesh is a small country but it is rich in herbal medicine. More than five thousand vascular plant species are present throughout the forests, hills, plains, crop fields, marshy lands and home gardens (Pasha and Uddin, 2013), of which about 750 species have been reported to be used in traditional medicines for the health care of the millions of people of this country (Yusuf et al., 1994, 2009; Ghani, 1998) and most of them have more or less antimicrobial properties (Balandrin et al., 1985). According to WHO, 80% of the world population depends on herbal medicines for their primary health care needs (WHO, IUCN & WWF, 1993). A huge number of people in many countries as well as Bangladesh also still have to depend on the indigenous system for the maintenance of their health. Especially the indigenous communities have long been admiration to utilize plants around them. There are about 35 smaller groups of Indigenous communities in Bangladesh covering about two percent of the total population have been living in different pockets of the hilly zones and some plain lands of the country of which 12 live in Chittagong, cox’sbazar and Chittagong Hill Tracts districts (Bandarban, Khagrachari and Rangamati) namely, Bawm, Chak, Chakma, Khyang, Khumi, Lushai Marma, Mro, Pangkhoa, Tanchangya, Rakhaine and Tripura (Uddin, 2010).

The indigenous communities lives in these areas have the vast traditional knowledge of herbal treatment and documented by several workers (Ahmed, 1998; Rahman et al., 2000, 2003; Uddin 2010; Yusuf et al., 2009). Of them,
one indigenous community (Rakhaing) has been selected for the present study. Still they are using traditional herbal medicines for the cure of different diseases/illness. But the indigenous knowledge, which has existed since time immemorial, is being lost day by day with development and modernization, and establishment of community health service in hill areas (Rahman et al., 2003). Different areas of Cox'sbazar (Cox'sbazar sadar, Chakaria, Ramu, Harbang, Azinzagar) district has been visited to document ethno botanical and ethno microbial information. The aim of this study was to evaluate the antibacterial activities of some medicinal plant used in traditional medicinal system for treatment of diseases caused by bacteria. Therefore, extracts of the following thirty-one plants from different families were tested for their potential activity against pathogens. Some work on antimicrobial activities of plants have also been done in Bangladesh namely: (Huq, 1986; Hassan, 1988; Mahfuzul and Hassan, 1989; Islam et al., 1990; Saha et al., 1991; Bashar, 1991; Ghan, 1992; Hasan and Huq, 1993; Shafique, 1994; Anawar et al., 1994; Yusuf et al., 1994; Ali, 1994; Sadia, 1995; Khyer, 1996; Salahuddin, 1997; Shafique et al., 1997; Ahmed, 1998; Khan, 2000).

MATERIALS AND METHODS

Sampling

The plant samples for antibacterial investigation have been collected from different areas of Cox's Bazar by repeated field trips. Information was collected from elderly knowledgeable people and Baiddya (He who has the traditional knowledge about medicinal plants and uses the plants for the treatment of people) of Rakhaing community by field observation, plant observation and conversation. On the basis of their information, the plant specimens have been collected during the survey for further study. The botanical identity of each plant has been established before the preparation of extract. All voucher specimens have been collected during documentation and preserved in the Chittagong University Herbarium (CTGUH) followed by Voucher number (Tables 1 and 2). The locations of the samples have been perfectly noticed for further collection. Samples have been collected in sterilized polythene bags. Then the bags have been properly tied, labeled and brought to the laboratory. Care has been taken to avoid mixing.

Preparation of extracts

Individual plants parts cut into small pieces (perhaps 1 mm in size) and 5 g of each of the sample have been taken in a test tube with 10 ml of 95% ethyl alcohol. It means, ratio of plant parts and alcohol is 1:2 (w/v). Then each of the individual test tubes has been kept for 48 h at normal room temperature. After 48 h the extract have been filtered and kept in a small vial with sample number and preserved in refrigerator for further use.

Test organisms

In the present study, against eight human pathogenic bacteria namely: *Bacillus subtilis* BTCC 17, *B. megaterium* BTCC 18, *B. cereus* BTCC 19, *Staphylococcus aureus* BTCC6538, *Escherichia coli* ATCC 25922, *Vibrio cholera* AE 14748, *Salmonella typhi* AE 14612 and *Shigella dysenteriae* AE 14396 have been used as test organisms to screen the antibacterial activity of the plant extract.

Preparation of bacterial suspension

A volume of 10 ml distilled water has been sterilized in autoclave (120°C for 15 min) for each bacterial suspension. Then one loop of bacterial culture was transferred into sterilized water and mixed well in aseptic condition. These bacterial suspensions have been used for the pour plate during sensitively test.

Sensitivity spectrum analysis

The following two methods were used for the sensitivity spectrum analysis:

(A) Sensitivity spectrum analysis by Disk Diffusion Method (Bauer et al., 1966).
(B) Sensitivity spectrum analysis by the Agar Cup Method (Rao and Nigam, 1978).

A control plate was also maintained in each case without any test materials.

RESULTS AND DISCUSSION

The present results have showed that some of the plants in the present investigation which are used by the Rakhaing community traditionally for the treatment of bacterial diseases contain antibacterial properties.

In the present investigation, 34 plants or plants parts under 24 families have been selected (according to using report) for their antibacterial activity against eight human pathogenic bacteria by disc diffusion method. Only thirteen plants have showed antibacterial effect in the disc diffusion method (Table 1).

In disc diffusion method, highly significant antibacterial activity have been observed in *Psidium guajava* followed *Phyllanthus emblica, Terminalia chebula, Terminalia arjuna, Ludwigia repens, Allium sativum and Eucalyptus globulus*.
Table 1. Antibacterial activity of plant extracts of 34 species by disc diffusion method.

<table>
<thead>
<tr>
<th>Voucher specimen no.</th>
<th>Sample no.</th>
<th>Plant species</th>
<th>Parts used</th>
<th>Bacillus subtilis</th>
<th>Bacillus megaterium</th>
<th>Bacillus cereus</th>
<th>Staphylococcus aureus</th>
<th>Salmonella typhi</th>
<th>Escherichia coli</th>
<th>Vibrio cholerae</th>
<th>Shigella dysenteriae</th>
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</tr>
<tr>
<td>R66</td>
<td>2(r)</td>
<td>Moringa oleifera</td>
<td>Root</td>
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<tr>
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<td>18</td>
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</tr>
</tbody>
</table>

Note: (-) minus mean no inhibition. *(20 µl extract/disc)*

*(4 mm in diameter paper disc soaked with 20 µl ethanolic extract.)*
Table 2. Antibacterial activity of plant extracts of 22 species by agar cup method.

<table>
<thead>
<tr>
<th>Voucher specimen no.</th>
<th>Sample no</th>
<th>Family/Species</th>
<th>Parts used</th>
<th>Test organism</th>
<th>Zone of inhibition in diameter (mm)</th>
</tr>
</thead>
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<td></td>
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<td>Escherichia coli</td>
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<tr>
<td>R66</td>
<td>2R</td>
<td>Moringa olifera</td>
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<td>Clerodendrum viscosum</td>
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<td>Root</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td>R32</td>
<td>29</td>
<td>Acorus calamus</td>
<td>Root</td>
<td>-</td>
<td>8</td>
</tr>
<tr>
<td>R63</td>
<td>30</td>
<td>Rauwolfia serpentina</td>
<td>Root</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>R42</td>
<td>31</td>
<td>Santalum album</td>
<td>Stem</td>
<td>12</td>
<td>-</td>
</tr>
<tr>
<td>R67</td>
<td>32</td>
<td>Areca catechu</td>
<td>Root</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>R64</td>
<td>33</td>
<td>Jatropha curcas</td>
<td>Stem</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

against eight tested pathogenic bacteria. Root extract of *P. guajava* exhibited comparatively better antibacterial activity compared to that of the other species and showed positive activity against all tested pathogenic bacteria. The ethanolic extracts exhibited zone of inhibitions from 3 to 18 mm in diameter. The largest zone of inhibition (18 mm) has been recorded against *S. dysenteriae* with the fruit extract of *T. chebula* whereas the *L. repens* showed the minimum activity (3 mm) against *B. megaterium* and *B. cereus*. The overall observation indicated that the ethanolic extracts of *Moringa olifera*, *Curcuma longa*, *Euphorbia hirta*, *Senna alata*, *Nigella sativa*, and *Cassia fistula* have lesser impact on the eight different human pathogenic bacteria when compared to *P. guajava*, *P. emblica* and *T. chebula*.

The agar cup method has been used for screening of antibacterial activity of rest of the plants (22 plants) which did not show any antibacterial activity in the disc diffusion method. But a number of workers (Aswal et al., 1984; Elango et al., 1985; Cabo et al., 1986; Hasan et al., 1989; Cacerers et al., 1990; Shingh et al., 1993; Taylor et al., 1995; Satish et al., 1999; Khan, 2000; Mandal et al., 2007) worked on the antibacterial activity of plant extract and they have reported the various degree of inhibition against gram-positive and gram-negative bacteria by the same plant extract. In the disc diffusion method, the amount of extract was only 20 µl. So, many of the plant did not show antibacterial activity. But in agar cup method, 100 µl extract have been used and some plants showed antibacterial...
Plate 1. Zone of inhibition of different plant extracts against selected bacteria. (a) Zone of inhibition produced by the leaf and root extract of *P. guajava* and whole plant extract of *L. repens* against *B. cereus* (Sample no 7R, 7L, 8) by disc diffusion method. (b) Zone of inhibition produced by the leaf and root extract of *A. vasica*, leaf extract of *O. sanctum* against *S. dysentriae* (Sample no 26L, 26R, 27) by disc diffusion method.

Table 3. List of workers who were observed similar results with the present study.

<table>
<thead>
<tr>
<th>Sl.no</th>
<th>Plant species for screening</th>
<th>Similar results were observed by:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td><em>Psidium guajava</em></td>
<td>Hoque et al. (2007), Holetz et al. (2002)</td>
</tr>
<tr>
<td>3</td>
<td><em>Ludwigia repens</em></td>
<td>Burkill (1997), Liogier (1990), Parrotta (2001)</td>
</tr>
<tr>
<td>4</td>
<td><em>Terminalia arjuna</em></td>
<td>Vilegs et al. (1997), Nair and Chanda (2007)</td>
</tr>
<tr>
<td>5</td>
<td><em>Phyllanthus embelica</em></td>
<td>Grosveror, 1995; Khan, 2000, Jagetia et al., 2002</td>
</tr>
<tr>
<td>6</td>
<td><em>Allium sativum</em></td>
<td>Ekwenye and Elegalam (2005), Nelson (2007)</td>
</tr>
<tr>
<td>7</td>
<td><em>Peperomia Pellucida</em></td>
<td>Nair and Bhide (1996), Mehmood and Mohammed (1998)</td>
</tr>
<tr>
<td>8</td>
<td><em>Centella asiatica</em></td>
<td>Nair and Bhide (1996), Mehmood and Mohammed (1998)</td>
</tr>
<tr>
<td>9</td>
<td><em>Euphorbia hirta</em></td>
<td>Ogbulie et al. (2007), Abo (1990)</td>
</tr>
<tr>
<td>10</td>
<td><em>Senna alata</em></td>
<td>Khan et al. (2001)</td>
</tr>
<tr>
<td>13</td>
<td><em>Asparagus racemosus</em></td>
<td>Subash et al. (2000)</td>
</tr>
<tr>
<td>15</td>
<td><em>Santalum album</em></td>
<td>Uhe (1974)</td>
</tr>
<tr>
<td>16</td>
<td><em>Areca catechu</em></td>
<td>Nair and Bhide (1996), Mehmood and Mohammed (1998)</td>
</tr>
</tbody>
</table>

In the present study, 22 plants from 19 families have used in agar cup method to determine the antibacterial activity against four human pathogenic bacteria. Out of 22, 12 plants showed varied inhibitory effect against the bacteria (Table 2).

In agar cup method, leaf extracts of *Justicia adhatoda* and *Ocimum sanctum* have showed antibacterial activity against all pathogenic bacteria. Leaf extract of *O. sanctum* showed largest zone of inhibition (22 mm) against *S. dysenteriae* and *B. cereus* (Table 2, Plate1) whereas smallest zone of inhibition exhibited against *E. coli* with the root extract of *Acorus calamus*. Similar results have been observed by several workers (Table 3). In disc diffusion method, it has been observed that gram-positive bacteria are more...
sensitive than gram-negative bacteria. It is also noted that E. coli is more resistant than other test bacteria. Similar result was also reported by Khan (2001).

Conclusion

Further extensive study to investigate their bioactive ingredients and inhibition spectrum will give us more knowledge as well as clinical utilization of these plant extracts. The results of the present investigation clearly indicate that the antibacterial activity vary with the species of plant and plant’s parts. The present study also supports the traditional uses of medicinal plant by the indigenous communities as antibacterial and could be the potential source for the discovery of new drugs.

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REFERENCES

Yusuf M, Chowdhury JU, Wahab MA, Begum J (1994). Medicinal Plants of...


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