ANTIBACTERIAL ACTIVITIES OF SOME INDIAN TRADITIONAL PLANT EXTRACTS

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Abstract
Today the development of modern drugs from less toxic plant products with proven medicinal properties is on the rise. In India, medicinal plants are widely used by people as folk therapeutics or in different indigenous systems of medicine like Siddha, Unani and Ayurveda. Thus a study was conducted to explore the antibacterial effects of Adhatoda vasica, Aerva lanata, Alangium salviifolium and Pongamia pinnata against a panel of bacteria such as Escherichia coli, Citrobacter sp., Pseudomonas sp. and Staphylococcus sp. A. salviifolium was sensitive towards all the tested bacterial pathogens irrespective of solvents. A. salviifolium methanolic extract exhibited higher sensitivity against Citrobacter sp. (27mm). A. salviifolium petroleum ether extract was more inhibitory (26mm) towards E. coli followed by A. salviifolium methanolic extract and A. vasica petroleum ether extract (23mm each). The study clearly demonstrated that the methanolic and petroleum ether extracts of the tested plants contain antibacterial principles as arrogated by traditional herbal practitioners.

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Key words: Antibacterial Activity, Medicinal Plants, Adhatoda Vasica, Aerva Lanata, Alangium Salviifolium, Pongamia Pinnata

INTRODUCTION
Traditional medicine employment in curing ailments is still the linchpin of a number of communities all around the world (Sumathi and Parvathi, 2010). The indiscriminate use of antibiotics develops antibiotic resistance and multidrug resistance microorganisms which exemplify the demand for the novel plant based drugs and formulations throughout the world. In addition to this problem, antibiotics are sometimes associated with adverse effects on the host, including hypersensitivity, immunosuppression and allergic reactions (Oancea and Stoia, 2010). The demand for more and more drugs from plant rootage is incessantly increasing which postulates screening medicinal plants with notifiable biological activity. Medicinal plants are gifts of Mother Nature to ailments and a deluge of plants around the world have been distilled to enquire their antimicrobial activity. The present study is an attempt to explore the antibacterial activities of some traditional medicinal plants such as Adhatoda vasica, Aerva lanata, Alangium salviifolium and Pongamia pinnata.

MATERIALS AND METHODS

Plants selected
Adhatoda vasica (Acanthaceae)
It is a popular medicinal plant in Ayurvedic and Unani medicine for treating digestive, hepatoprotective, vermicide, allergy, asthma, dermatitis, antispasmodic and chronic bronchitis (Singh et al., 2011).

Aerva lanata (Amaranthaceae)
It is a medicinal plant which is used by Ayurvedic practitioners to treat various conditions such as lithiasis, headache, renal disease, malarial fever, diabetes and gonorrhea. The plant is used as a diuretic and anthelmintic. The whole plant or parts of it is used as a herbal drink, tea, porridge, extract or as a decoction with other herbs (Battu and Kumar, 2012).

Alangium salviifolium (Cornaceae)
The plant is also called as Ankola is popular in folk medicine and has been studied for its anti-inflammatory, antifertility and cardiotonic activities. Its dried seeds have traditionally been used to treat various ailments (Venkateshwarlu et al., 2011).

Pongamia pinnata (Fabaceae)
The plant has a myriad of medicinal properties and is usually used in Ayurveda and Siddha systems of medicine. The plant is used as a crude drug for the treatment of tumours, piles, skin diseases, itches, abscess, painful rheumatic joints wounds, ulcers and diarrhea (Arote and Yeole, 2010).

Extract preparation
Leaves of the plants were collected from different regions

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in the State of Kerala. The taxonomic identification was performed by using standard taxonomic keys and expert consultations. The collected plants were dried under shade, crushed and subject to soxhlet extraction with petroleum ether and methanol. The extract was filtered and concentrated.

**Antibacterial susceptibility testing**

Pure cultures of *Escherichia coli*, *Citrobacter* sp., *Pseudomonas* sp. and *Staphylococcus* sp. were used for the study. The strains were maintained on nutrient agar slants at 4°C. A loopful of each bacterial strain was added to a 50 ml sterile nutrient broth in a 100 ml conical flask. The flasks were then incubated for 24 h to activate the strain.

**Disc diffusion method**

The antibacterial activity of the extracts was obtained with two different solvents, petroleum ether and methanol and was evaluated by the disc diffusion method (Bauer et al., 1966). The strains that had been incubated for 24 h were used for the assay. A sterile cotton swab was dipped into the bacterial suspension and then was evenly streaked over the entire surface of a Nutrient agar plate to obtain a uniform inoculum.

Dried and sterilized filter paper discs (10 mm diameter) were then impregnated with the extract. Discs containing the extracts were placed on nutrient agar medium uniformly seeded with the test microorganisms. The experiment was replicated two times. The plates were then incubated at 37°C for 24 hours to allow maximum growth of the organism. If the extract has any antibacterial activity, it will inhibit the growth of the microorganism giving a clear distinct zone called "Zone of inhibition". The antibacterial activity of the test agent was determined by measuring the zone of inhibition and expressed as millimeter (mm). Control plates were also inoculated and incubated.

**RESULTS AND DISCUSSION**

Finding curative forces in plants is an ancient thought and people from all continents still trust on indigenous plants for healing several diseases. Plants have imitable power to synthesize secondary metabolites such as phenolics, polyphenols, quinones, flavones, flavonoids, flavonols, tannins, coumarins, terpenoids, essential oils, alkaloids, lectins and polypeptides with a deluge of antimicrobial activities (Cowan, 1999). Withal, a vast majority of the plants still remains unexplored and the present study is mooted in this scenario.

In an overall analysis, *A. salviifolium* was sensitive towards all the tested bacterial pathogens irrespective of solvents (Table 1). *A. salviifolium* methanolic extract exhibited higher sensitivity against *Citrobacter* sp. (27mm). The antibacterial activity of *Alangium salviifolium* was reported earlier (Dahiya and Purkayastha, 2011). They also noted that the patterns of inhibition varied with the plant extract, the solvent used for extraction, and the organism tested. The antimicrobial potential of the butanol extract of *Alangium salviifolium* was also well established (Pandian et al., 2006).

**Table 1: Sensitivity pattern of tested extracts**

<table>
<thead>
<tr>
<th>Bacteria tested</th>
<th>Plants tested</th>
<th>Zone of inhibition (mm)</th>
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<tbody>
<tr>
<td></td>
<td>A. vasica</td>
<td>A. lanata</td>
</tr>
<tr>
<td></td>
<td>PE</td>
<td>M</td>
</tr>
<tr>
<td><strong>Citrobacter sp.</strong></td>
<td>--</td>
<td>20</td>
</tr>
<tr>
<td><strong>Pseudomonas sp.</strong></td>
<td>21</td>
<td>20</td>
</tr>
<tr>
<td><strong>E. coli</strong></td>
<td>23</td>
<td>22</td>
</tr>
<tr>
<td><strong>Staphylococcus sp.</strong></td>
<td>14</td>
<td>17</td>
</tr>
</tbody>
</table>

In the present study, *Citrobacter* sp. showed more resistance towards rest of the extracts (4 extracts) succeeded by *Staphylococcus* sp (3 extracts). The resistance of *Citrobacter* sp. towards several antimicrobials even cephalosporins due to overexpression of their chromosomal β-lactamase was reported already (Pepperell et al., 2002). *A. salviifolium* petroleum ether extract was more inhibitory (26mm) towards *E. coli* followed by *A. salviifolium* methanolic extract and *A. vasica* petroleum ether extract (23mm each), *A. vasica* methanolic extract and *A. lanata* petroleum ether extracts (22mm each).

*Adhatoda vasica* is a well-known plant drug in Ayurvedic and Unani medicine. The leaves of the plant contain the alkaloid vasicine (C₁₁H₁₅N₂O), which is responsible for the bronchodilatation (Nadkarni et al. 1954) and an essential oil which is responsible for the expectorant action (Sivarajan et al. 1994). The present study also is in agreement with the available reports. Previous studies noted the presence of numerous phytochemicals such as Borneol, 1,2,3, trimethyl benzene, ethanaphthalene, 1,1,4a trimethyl-5,6-dimethylenedecahydro naphthalene, 2,1,4-dimethoxybenzene, bicyclojundec-4-ene,4,11-trimethyl-8-methylene (14.56 %), hexamethyl dewater benzene, alpha-caryophyllene, cyclopropelazaune, caryophyllene oxide and 2-naphthalenemethanol (Sarkar, 2011).

Successful previson of botanicals from plant material is largely dependent on the type of solvent used in the extraction procedure which can be pruned in terms of the polarity of the compounds being extracted by each solvent and in addition to their intrinsic bioactivity (Dey et al., 2010). These may be the reason for the differences in activity pattern of the tested extracts. The synergistic activity of compounds is the reason for the observed antibacterial activity.

**CONCLUSION**

Plant compounds are inexpensive and providing good nutrition, but also used to cure and prevent a caboodle of diseases. The multiple benefits of these plants made it a miracle of nature. The tested plants either alone or in combination with other drugs, for the treatment of various ailments are still the lynchpin of people in developing
countries like India. The results of this study reflect the presence of potent antimicrobial phytochemicals among the tested plants with varying inhibition patterns. Future research in this direction is the need of the hour, as drug resistance and disease causalities are on the rise.

BIBLIOGRAPHY


