ANTIMICROBIAL ACTIVITY OF SELECTED INDIAN FOLK MEDICINAL PLANTS:
MYRISTICA FATUA, ALSTONIA BOONEI, HELICTERES ISORA, VITEX ALTISSIMA, AND
ATALANTIA RACEMOSA

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INTRODUCTION

The use of medicinal plants is a very important therapeutic resource for the treatment of diseases and the use of traditional medicine has expanded globally and is gaining popularity. It has continued to be used not only for primary health care of the in developing countries [1]. The most important of these bioactive compounds are flavonoids, stilbenes, and alkaloids are used antimicrobial activity [2].

Vitex altissima L.f. (Syn.: Vitex appendiculata Rottler; Vitex zeylanica Turcz., nom. illeg) belongs to the family Lamiaceae which includes about 3500 species in 220 genera, distributed worldwide, but mostly in the Mediterranean region and South West Asia. The largest genera are (Sahara 900), (Scutellaria 360), (Stachys 300), (Teucrium 250), and Vitex 250). It is also used in stomatitis, cardiac diseases, anorexia, blindness, leprosy, worm infestation, rheumatic swellings, and chest pain [3]. It also has anti-inflammatory [Sridhar et al., 2004] and antioxidant properties [4].

The plant Alatantia racemosa Wight, belonging to the family Rutaceae is commonly called as Kattu naragam in Tamil. It is distributed in Southern Western Ghats and South West Asia. The largest genera are (Salvia 900), (Scutellaria 360), (Stachys 300), (Teucrium 250), and Vitex 250). It is also used in stomatitis, cardiac diseases, anorexia, blindness, leprosy, worm infestation, rheumatic swellings, and chest pain [3]. It also has anti-inflammatory [Sridhar et al., 2004] and antioxidant properties [4].

Myristica fatua L. is belongs to family Sterculiacae is a sub-deciduous shrub. The species is native to Asia and Australia [10]. It occurs, throughout India, from Jamuna eastwards to Nepal, Bihar and Bengal and southern India and Andaman Islands. The fruits of H. isora is commonly used to the astringent, acid, refrigerant, demulcent, constipating, stomachic, vermifuge, vulnerary, hemostatic and urinary astringent. Colic, flatulence, diarrhoea, dysentery, verminosis, wounds, ulcers, hemorrhages, epistaxis and diabetes [11]. In this plant shows number of bioactive compounds such as saponins, tannins, anthraquinones, alkaloids, triterpenes, flavanoids, glycosides, reduced sugar, and phlobatannins [12].

Alstonia boonei De Wild. belongs to the family Apocynaceae. It is important medicinal plant used in various purposes to anti-inflammatory, analgesic, and antipyretic activities in Africa [13]. The crucial medicinal plants of genus Alstonia includes Alstonia schlorica, Alstonia congestis, and Alstonia macrophylla which have proved to be useful in various diseases by different parts of this plants and it is distributed throughout the tropical and the rain forest of west and Central Africa [Olever-Bever, 1986] [13-15]. A. boonei shows medicinal effective phytoconstituents are alkaloids and tannins [16].

Alstonia boonei, Helicteres isora, Vitex altissima, and Atalantia racemosa are the most important of these bioactive compounds are flavonoids, stilbenes, and alkaloids which have proved to be useful in various diseases by different parts of this plants and it is distributed throughout the tropical and the rain forest of west and Central Africa [Olever-Bever, 1986] [13-15]. A. boonei shows medicinal effective phytoconstituents are alkaloids and tannins [16].

This paper mainly focused on the antimicrobial activity of five different medicinal plants against selected bacteria and fungus. These medicinal plants are used in various folk medicines by the local communities in India.

ABSTRACT

Objective: To determine antimicrobial activity of methanol, ethyl acetate, and acetone extracts (AEs) of Myristica fatua, Alstonia boonei, Helicteres isora, Vitex altissima, and Atalantia racemosa against different species of pathogens, Streptococcus faecalis, Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa, Bacillus subtilis, Staphylococcus aureus, and Candida albicans.

Methods: Antimicrobial activity of various plant extracts was measured by agar well diffusion method.

Results: AE of A. boonei showed the highest inhibitory effect against E. coli (20.83±0.32 mm) and S. faecalis (19.00±1.00 mm). All the extracts of H. isora leaves showed different zone of inhibition observed in all the tested pathogens ranges between 8.13±1.53 and 15.25±1.23 mm. Ethyl acetate extract of V. altissima showed highest activity against B. subtilis (19.67±1.53 mm). Methanol and acetone leaves extracts of A. racemosa have good fungal activity against the C. albicans (19.33±1.26-16.00±1.00 mm). Methanol extract of M. fatua showed high antimicrobial activity against P. aeruginosa (15.10±0.17 mm) and B. subtilis (14.23±0.21 mm).

Conclusion: The results from the study suggest that the leaves of M. fatua, A. boonei, H. isora, V. altissima, and A. racemosa showed good antimicrobial activity against the different pathogens. They are used as the alternative source for the control and treatment of microbial infections.

Keywords: Antimicrobial activity, Leaves extracts, Well diffusion method, Pathogenic strains.
Antimicrobial activity of different leaf extract of *A. racemosa* was assayed against various bacterial and fungal pathogens by agar well diffusion method showed in Fig. 2. The result revealed that all the extracts were found to be significant against all the bacterial and fungal pathogens. It was observed that all the three solvent extracts showed prominent antimicrobial activity between 9.50±0.29 and 20.67±0.76 mm against most of the microorganisms used in the study. The ME of *A. racemosa* showed maximum antimicrobial potential followed by acetone and EAE. The ME of *A. racemosa* was most sensitive against *K. pneumoniae* (20.67±0.76 mm), and least activity was observed against *S. aureus* and *P. aeruginosa* (9.67±0.76 mm). AE was more effective against *C. albicans* (16.00±1.00 mm) than compared to other studied cultures. The EAE of *A. racemosa* showed exhibited zone of inhibition against *E. coli* (12.50±0.29 mm) followed by *S. faecalis* (11.50±0.29 mm), *B. subtilis* and *C. albicans* (11.33±0.63 mm), *K. pneumoniae* and *P. aeruginosa* (10.67±0.54 mm), and *S. aureus* (9.50±0.29 mm).

**H. isora**

Different solvent extracts of *H. isora* showed significant antimicrobial activity against all the seven microbial strains in Fig. 3. The AE demonstrated the highest activity followed by the methanol and EAE. The EAE showed the highest activity against *S. faecalis* (14.00±0.00 mm) and minimal activity against *K. pneumoniae* (8.13±0.23 mm). A significant growth inhibition was observed AE against *S. faecalis* (17.00±0.00 mm).

**Table 1: Extractive value of plant extracts**

<table>
<thead>
<tr>
<th>Plants</th>
<th>ME (% w/w)</th>
<th>EAE (% w/w)</th>
<th>AE (% w/w)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>A. boonei</em></td>
<td>11.33</td>
<td>9.66</td>
<td>8.06</td>
</tr>
<tr>
<td><em>A. racemosa</em></td>
<td>8.44</td>
<td>2.66</td>
<td>5.75</td>
</tr>
<tr>
<td><em>H. isora</em></td>
<td>10.03</td>
<td>7.75</td>
<td>4.96</td>
</tr>
<tr>
<td><em>M. fatua</em></td>
<td>6.03</td>
<td>4.16</td>
<td>2.66</td>
</tr>
<tr>
<td><em>V. altissima</em></td>
<td>9.33</td>
<td>8</td>
<td>2.83</td>
</tr>
</tbody>
</table>


**Fig. 1: Antimicrobial activity of *Alstonia boonei* leaf extracts. Each value represents mean±standard deviation of three replicates.**

- ME - Methanol extract
- EAE - Ethyl acetate extract
- AE - Acetone extract
- G - Gentamicin, plant extracts - 4 mg (0 - No inhibition)
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E. coli (15.25±1.23 mm) and S. aureus (14.33±0.58 mm). There is no any activity of EAE against E. coli (0.00±0.00 mm). They results MEs showed poor response against E. coli (9.67±0.58 mm).

M. fatua

M. fatua showed broad spectrum of antimicrobial activity in all tested microorganisms. These results suggest that all the three solvent extracts possess antibacterial and antifungal activity against such as E. coli, P. aeruginosa, S. aureus, B. subtilis, K. pneumoniae, S. faecalis and C. albicans showed in Fig. 4. Different solvent extracts of Myristica fragrans showed significant activity against all the seven microbial strains. The ME exhibited highest activity against P. aeruginosa with the diameter of zone of inhibition of 15.10±0.17 mm and B. subtilis (14.23±0.21 mm) respectively, and least activity was noted against S. aureus (8.23±0.25 mm). AE more potent effect against P. aeruginosa (12.17±0.29 mm) and least activity against S. faecalis (11.17±0.29 mm).

Similarly, EAE was found to be active with the zone of inhibition against B. subtilis (9.17±0.29 mm), K. pneumoniae (9.00±0.00 mm), E. coli (8.00±0.00 mm) and C. albicans (8.23±0.21 mm) and loss of activity against P. aeruginosa, S. aureus and S. faecalis (0.00±0.00).

V. altissima

Agar well diffusion method was used to assess the antimicrobial activity against the human affected pathogens by measuring the zone of inhibition (mm). Most of the extracts showed significant antimicrobial activity against the tested organisms at the same concentration of 4 mg/ml (Fig. 5). In general, AE demonstrated higher antimicrobial activity than the other solvent extracts. The ethyl acetate leaves extract was the most effective against the tested organisms. It recorded the highest zone of inhibition of 19.67±1.53 mm against B. subtilis and 19.00±1.00 mm against S. aureus at 4 mg/ml. This is significant activity compared with the activity of the standard gentamicin which showed zones of inhibition ranges from 17.33±0.58 to 29.00±1.00 mm. The results of antimicrobial activity are given in which clearly show that the EAE of V. altissima has both antibacterial and antifungal activity against the tested organisms.

DISCUSSION

The presence of phytochemicals in the plant extracts highly correlated to the biological activity [18]. From this revealed significant antimicrobial activity possess in the all the studied plant extracts. Nowadays, number researcher evaluated the antimicrobial compounds from plant material, they act as lesser side effect in the human body. The present study corroborates with the antimicrobial activity of various plant extracts against S. aureus and E. coli [18]. In earlier researcher reported the ME produce moderate antimicrobial activity against the microbial pathogens [19]. AE of M. fragrans seed extract showed antibacterial and antifungal activity against S. aureus (13.8±0.42 mm) and Aspergillus niger (14.4±0.37 mm) with volume of extract solutions ranging from 2.5 to 10 mg/ml [21]. In previous study reported
contrary result on MEs of H. isora leaf showed antimicrobial activity against E. coli (15.28 mm) and fungus A. niger (11.30 mm) showed good zone of inhibition and concentration was (10 mg/ml) [22]. The present study coincides with the antimicrobial activity of aqueous extracts of V. altissima [23]. Atalantia species showed good antimicrobial activity against the tested pathogens are Atalantia hydrophila followed by Proteus mirabilis, P. aeruginosa, Proteus vulgaris and E. coli while our findings also exhibited the same results against P. aeruginosa and E. coli [24]. In this study, showed good zone of inhibition against all the tested pathogens and activities were compared with positive control gentamicin.

CONCLUSION
The significant inhibitory activity of all the tested extracts M. fatua, A. boonei, H. isora, V. altissima and A. racemosa was noted against different pathogenic microorganisms. These five plant extracts could be studied further as future control the common pathogenic microbes. Phytochemical analysis could be carried out to isolate the bioactive compounds of these plant species, which act as antimicrobial agents.

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REFERENCES