Phytochemical and antimicrobial screening of *Gymnema sylvestre*, *Mentha arvensis*, *Solanum surattense*, extracts in dental caries.

R Rama Subramania Raja* and B Parimala Devi  
Department of Phytomedicine and Phytopharmacy, CARISM, SASTRA University, Thirumalaisamudram, Thanjavur, 613 402, Tamilnadu, India

Received on: 20-09-2009; Revised on: 16-11-2009; Accepted on: 09-12-2009

**ABSTRACT**

Hydro alcoholic dry extracts of *Gymnema sylvestre*, *Mentha arvensis*, *Solanum surattense*, for treatment of a dental caries were screened for antimicrobial activity by Agar well diffusion method against *Streptococcus mutans*, *Staphylococcus aureus*, *Streptococcus mitis*, and *Candida albicans*. Among them the extracts of *Gymnema sylvestre* dry extract showed strong antimicrobial activity against the bacteria and fungi with the zone of inhibition ranges from 16-20mm at 25mg/ml. The other extracts such as *Solanum surattense*, *Mentha arvensis* showed concentration-dependent activity against all the tested micro-organisms with the zone of inhibition ranges from 12-24mm at various concentrations.

**Keywords:** Dental Caries; *Gymnema sylvestre*; *Solanum surattense*; *Mentha arvensis*, *Streptococcus mutans*.

**INTRODUCTION**

Dental caries is defined as indigenous infection caused by cariogenic bacteria. Different kinds of Gram-positive bacteria are closely related to the formation and progression of dental caries (Marsh P et al 1992). Organisms such as *Streptococcus mutans*, *Staphylococcus aureus*, *Streptococcus mitis*, these are primary cariogenic bacteria, and fungus like *Candida albicans* from dental plaque by adhering to tooth surfaces through synthesis of extracellular polysaccharides from sucrose. They subsequently metabolize sugar to organic acid such as lactic acid which is responsible for the demineralization of the tooth enamel (Hamada S et al 1980, Akhtar M.S et al 2004, Bhattacharya, S. et al 2003). The elimination of cariogenic bacteria from the oral cavity using antibacterial agents is one of the primary strategies for the prevention of dental caries. Extensive efforts have been made to find an active against dental caries. However an anticariogenic organism was found to be resistant to many of the antibacterial agents viz., Penicillin, Chloramphenicol, Clindamycin, Ampicillin (Bhattacharya, S. et al 2003, Jarvinen, H. et al 1993). In addition they may lead to side effects including gastrointestinal problems (Crig, A. et al 1998).

This drawback justifies further research and development of natural antimicrobial agents that are effective and safe for the host. It has been well documented that traditional medicinal plants considerable antimicrobial activity against various organisms (Jonathan et al 2000) many plants were reported to inhibit the growth of many oral microorganisms (Pack, et al 1988). Particularly *Streptococcus mutans*, *Staphylococcus aureus*, *Streptococcus mitis*, *Candida albicans* are control plaque and thus prevent caries have been investigated (Jagtap, A.G et al 2000, Margan, T.D. et al 2001). In Present study we tried to explore of anti microbial activity of various medicinal plants like *Solanum surattense*, *Gymnema sylvestre*, *Mentha arvensis* in dental caries.

**MATERIALS AND METHODS**

The Different ratio of the Cold Macerated Hydro Alcoholic Standardized dry extract of *Solanum surattense* (8:1), (Batch Number-7579) *Mentha arvensis* (3:1), (Batch Number-6086) *Gymnema sylvestre* (10:1) (Batch number- 7349) was collected from Amsar Private Limited Indore, India.
R.R. Raja et al. / Journal of Pharmacy Research 2010, 3(1), 21-23

Table 1. Preliminary phytochemical screening of the plant extracts Gymnema sylvestre, Mentha arvensis, Solanum surattense and C. albicans respectively. Nutrient Agar (NA) and Potato Dextrose Agar (PDA) were used respectively for testing the antibacterial and antifungal activity.

<table>
<thead>
<tr>
<th>Phytoconstituents</th>
<th>Gymnema sylvestre</th>
<th>Mentha arvensis</th>
<th>Solanum surattense</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkaloids</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Amino acids</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Antaquinones</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Carbohydrates</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Catechins</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Flavonoids</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Phenolic groups</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Resins/gums</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Saponins</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Steroids</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Tannins</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Triterpenes</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

+ = Present  - = Absent

Determination of Antimicrobial Activity

Agar well-diffusion method (Perez C, et al 1990) was followed to determine the antimicrobial activity. Nutrient agar (NA) and Potato Dextrose Agar (PDA) plates were swabbed (sterile cotton swabs) with 8 h old - broth culture of respective bacteria and fungi. Four wells (10mm diameter) were made in each of these plates using sterile cork borer. About 0.3 ml of different concentrations of plant solvent extracts were added using sterilized dropping pipettes into the wells and allowed to diffuse at room temperature for 2 hours. The plates were incubated at 37°C for 18-24 hours for bacterial pathogens and 28°C for fungal pathogens. Respective proper controls of solvent plant extracts were also maintained. Diameter of the inhibition zones was recorded. Triplicates were maintained and the experiment was repeated thrice and the average values were recorded for antimicrobial activity.

Table: 2 Anti Microbial activity of Hydro alcoholic extracts of Gymnema sylvestre, Mentha arvensis, Solanum surattense

<table>
<thead>
<tr>
<th>Micro-organisms</th>
<th>Solanum surattense mg/ml</th>
<th>Std 10μl/ml</th>
<th>Zone of Inhibition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100 50 25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S. aureus MTCC96</td>
<td>22 20 12</td>
<td>22 18 14</td>
<td>26 (Ch)</td>
</tr>
<tr>
<td>S. mutans MTCC 2695</td>
<td>18 16 12</td>
<td>24 21 17</td>
<td>28 (A)</td>
</tr>
<tr>
<td>C.albicans MTCC 227</td>
<td>16 14 12</td>
<td>17 16 16</td>
<td>29 (P)</td>
</tr>
</tbody>
</table>

Ch – Chloramphenicol; Cl- Clindamycin; A – Ampicillin; P – Penicillin, Std- Standard drug

Phytochemical Screening:

Phytochemical analyses for the above three plant extracts were performed and the phytoconstituents reported in table no: 1 (Trease GE, Evans WC. (1983), Harborne JB. 1998).

Antimicrobial studies

Hydro alcoholic extracts of the selected plants were used at various concentrations 100, 50 and 25 mg/ml respectively and tested against the microorganisms predominantly present in dental caries and infections associated.

Test Microorganisms

All the microbial strains of human pathogens used in the antimicrobial bioassay were procured from Institute of Microbial Technology (IMTECH), Chandigarh, India. Staphylococcus aureus (MTCC 96), Streptococcus mitis (MTCC 2695), Streptococcus mutans (MTCC 890), and Candida albicans (MTCC 227) strains were used for the present study.

Selective antibiotics and media

Selective standard antibiotic drug (10μg/ml) was used against individual organism for Eg. Chloramphenicol against S. aureus, Clindamycin against S. mutis, Ampicillin against S. mutans, and C. albicans respectively. Nutrient Agar (NA) and Potato Dextrose Agar (PDA) were used respectively for testing the antibacterial and antifungal activity.

RESULTS

The medicinal plants taken for the present study were checked for the constituents. The qualitative analysis showed the presence of Flavonoids, Phenols and triterpenes in all the three extracts of Solanum surattense, Gymnema sylvestre and Mentha arvensis. And the distribution of various other constituents in the individual plant extracts reported table no: 1. From the results, all the three extracts having marked activity against the microorganisms tested in dose dependent manner. In addition the phytoconstituents present in the extracts may enhance the activity that can be justified if the study can be conducted with the plant components. These results will give a clear idea for the researchers who are working in this direction. The isolation of active fraction responsible for the potent activity need to be focused and the active fractionation is under progress in our laboratory.

DISCUSSION

Dental caries are the most common oral infectious disease among children and old age. The prevention strategy against dental
caries includes the elimination of cariogenic micro organisms from the oral cavity, inhibition of their plaque formation and the enhancement of tooth resistance to demineralization. In the former strategies, photochemical have been widely studied for their antimicrobial activity (Namba, T. et al 1982, Hattori, M et al 1996, Heisey, R.M et al 1992). A variety of plants with potent activity are known to be traditionally used for dental hygiene world-wide (Elvin-Lewis, 1980). Antibiotics and other antimicrobial agents are effective in the prevention and treatment of dental caries, but they also cause undesirable side effects such as ecologic disturbance of oral and gut flora. Furthermore, viridans group streptococci including S. mitis, S. mutans, C.albicans most representative human cariogenic bacteria are moderately resistent to antibiotics (Leclercq R., et al 1988, Venditti, M. et al 1989). Therefore, antimicrobial herbs could offer an effective alternative to antibiostic strategies for oral infection disease like dental caries.

CONCLUSION

Among the three plants hydro alcoholic dry extracts effective against list out the Micro organisms like S. aureus, S. mitis, S. mutansi, C.albicans Gymnema sylvestre showed highest activity at the low concentration level. Thus from our findings, it was concluded that the bioactive principles responsible like treatment of dental caries.

ACKNOWLEDGEMENT

The authors are thankful for the gift samples of the extracts by Amsar Private Limited Indore, India and authorities of SASTRA University, Thanjavur.

REFERENCES


Source of support: Nil, Conflict of interest: None Declared