Antibacterial Activity of *Spirulina platensis* and *Oscillatoria* Sp.

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In the present investigation an attempt has been made to experimentally test the antimicrobial efficacy of Blue green algae, *Spirulina* and *Oscillatoria* against various pathogens both the algae were tested separately using different solvent such as acetone, ethanol and diethyl ether for the extraction of active compounds. Among these diethyl ether extract was found to be high effective against *E. coli*, *Pseudomonas sp.*, *Klebsiella pneumoniae*, *Enterobacter sp.* and *Salmonella typhi*. In rest of the solvents extracts exhibited varying degree of inhibitory activity.

**Key words:** *Spirulina platensis*, *Oscillatoria*, Solvents, antimicrobial activity.

The Cyanobacteria are an ancient and diverse group of photosynthetic microorganisms. Blue green algae (Cyanobacteria) dating back almost 3.5 billion years and become one of the most successful and economically significant group (Kumar *et al.*, 2003). Algae are rich in proteins, essential aminoacids, vitamins and natural β-carotene and minerals such zinc, selenium and magnesium. Edible blue green algae like *Spirulina* and *Aphanizomenon* and *Nostoc* are being used as food.

Cyanobacteria have yielded new types of products, not found in higher plants and traditional drugs sources (Shimizu, 1996). β-carotene is also proven to stimulate the immune system (Kazi *et al.*, 1997) and prevent skin cancer (Santamaria, 1996) oral and breast cancer (Garewal, 1995). BGA serves as a protein storage unit and as an antioxidant and inflammatory agent (Romay, 1998). The present study aims was to analyse the antibacterial activity of *Spirulina* sp. and *Oscillatoria* sp. against bacterial pathogens.

**MATERIALS AND METHODS**

The culture of *Spirulina plantensis* and *Oscillatoria* sp. was obtained from the Department of Botany, Thiagarajar College, Madurai. The two cultures were subcultured in Zarrowk’s medium and Chu’s – 10 medium.

The pure form of *Spirulina platensis* and *Oscillatoria* sp. were grown in both synthetic medium and dairy effluent. Then, they were incubated at room temperature for 10 days and analysed the antibacterial activity.

**Preparation of antibacterial compounds**

Crude extracts of the cyanobacteria were prepared using different solvents viz. acetone, ethanol and diethyl ether (Rao, 1986).

10gm of each dried algal powered sample were ground with 50ml of diethyl ether, 50ml of acetone, 50ml of ethanol separately. Then they were centrifuged at 1000rpm for 15min. The respective supernatants were transferred separately into sterile screw cap test tubes and stored at room temperature.

**Antibiotic disc preparation**

Antibacterial activity of the cyanobacterial
extracts were evaluated against different bacterial cultures. The experiment was performed by following Kirby-Bauer disc diffusion method. Sterilized discs were made from Whatmann no. 1 filter paper (5mm diameter) and 50 µl of extracts were loaded to the discs and dried completely in sterile condition (Padmini Sreenivasa Rao et al., 1986).

**Antibacterial Assay**

The prepared *Spirulina plantensis* and *Oscillatoria* sp. extracts were screened for antibacterial activity against six pathogenic bacteria *E. coli, S. typhi, Pseudomonas sp., V. cholerae, K. pneumoniae* and *Enterobacter* sp. Sterile Muller Hinton agar plates were prepared and the inoculum (18-24hrs old culture) of the pathogenic bacteria were spread by using sterile swabs. The crude extract loaded discs were placed on the seeded plates by using a sterile forceps. The plates were then incubated for 24-48 hrs and observed for clear zone of inhibition. The inhibition zone was measured in mm.

**RESULTS AND DISCUSSION**

The antibacterial compounds were extracted from Cyanobacteria using different solvents Viz. acetone, ethanol and diethyl ether. The extracts were tested against *E. coli, K. pneumoniae, Pseudomonas sp., V. cholerae, S. typhimurium* and *Enterobacter* sp. (*Table 1*). The diethyl ether extracts of *Oscillatoria* and *Spirulina* are sensitive to *E. coli, Pseudomonas sp., K. pneumoniae, Enterobacter* sp and *S. typhi*. The ethanol extract of *Oscillatoria* and *Spirulina* show moderate sensitive to *E. coli, K. pneumoniae* and, *Enterobacter* sp. except *Enterobacter* sp. and *K. pneumoniae*, all other bacteria resistant to acetone extract compound.

Shrivastava *et al.* (2001) have isolated and characterized an active compound called *Oscillatorin* from *Oscillatoria laetevirens*. It exhibits a minimum inhibition on other cyanobacteria and an interesting herbicidal activity. The cell extracts of *Lyngbya* was most effective against *Xanthomonas vesicatoria*.

The water soluble extract of *Spirulina platensis* was found to have a sulphated polysaccharide, Calcium spirulinan. Which is an antiviral agent (Hayashi and Hayashi, 1996). These compounds selectively inhibits the penetration of enveloped viruses (Herpes simplex, Measles virus, Mumps virus, Influenza A virus, and HIV I) into host cell. *Spirulina* is widely used as biotherapeutic agent against oral cancer, *Diabetes mellitus* (Mani *et al.*, 2000). Cholesterol lowering effect (Nakaya and Honma, 1988). Intestinal and vaginal infections (Elmer *et al.*, 1996). Therefore, *Oscillatoria* sp. and *S. platensis* could be used in food industry. In pharmaceutical industries, it is in therapeutic use as an alternative medicine and also colouring agent.

**Table 1.** Antibacterial activity of *Spirulina plantensis* and *Oscillatoria* sp. against various pathogenic bacteria

<table>
<thead>
<tr>
<th>Organism</th>
<th>Sample</th>
<th>Ethanol extract (mm)</th>
<th>Acetone extract (mm)</th>
<th>Diethyl ether extract (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>E. coli</em></td>
<td>Oscillatoria sp.</td>
<td>11</td>
<td>-</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td><em>S. platensis</em></td>
<td>20</td>
<td>-</td>
<td>12</td>
</tr>
<tr>
<td><em>Pseudomonas</em> sp.</td>
<td>Oscillatoria sp.</td>
<td>-</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td><em>S. platensis</em></td>
<td>-</td>
<td>-</td>
<td>20</td>
</tr>
<tr>
<td><em>V. cholerae</em></td>
<td>Oscillatoria sp.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td><em>S. platensis</em></td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>S. typhi</em></td>
<td>Oscillatoria sp.</td>
<td>-</td>
<td>-</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td><em>S. platensis</em></td>
<td>-</td>
<td>-</td>
<td>7</td>
</tr>
<tr>
<td><em>K. Pneumoniae</em></td>
<td>Oscillatoria sp.</td>
<td>13</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td><em>S. platensis</em></td>
<td>11</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td><em>Enterobacter</em> sp.</td>
<td>Oscillatoria sp.</td>
<td>13</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td><em>S. platensis</em></td>
<td>15</td>
<td>13</td>
<td>7</td>
</tr>
</tbody>
</table>

REFERENCES


