Minimum Inhibitory Concentration Analysis of *Nerium oleander* against Bacterial Pathogens


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**OBJECTIVE:** In this present study, it is tried to find out the antimicrobial effect and Minimum Inhibitory Concentration (MIC) of *Nerium oleander* against *Bacillus subtilis* (IFO 3026), *Sarcina lutea* (IFO 3232), *Escherichia coli* (IFO 3007) and *Klebsiella Pneumoniae* (ATTC 10031). **METHODS:** Powered leaves were prepared and used for extraction with various solvents, viz, the petroleum ether, and chloroform extract of the oleander. All the solvent extracts were evaporated to dryness. Using the disc diffusion method, the bacterial growth were inhibited. **RESULTS:** Among the solvent extracts tested, petroleum ether extract inhibited the growth of all the tested bacteria having various degrees of inhibition zones. Highest inhibitory activity was observed against *E. coli* (1.9 cm) and minimum inhibitory concentration was observed 2 μg/ml also against *E. coli*. Both results were observed in case of petroleum ether extract. Petroleum ether extract also showed inhibition zones of 1.8 cm, 1.4 cm and 1.5 cm against *B. subtilis*, *S. lutea* and *K. pneumoniae*. On the other hand chloroform extract was observed to have inhibition zones of 1.2 cm, 1.6 cm, 1.8 cm and 1.5 cm against *B. subtilis*, *S. lutea*, *E. coli* and *K. pneumoniae* respectively. **CONCLUSIONS:** The study demonstrated that the petroleum ether extract of *N. oleander* is potentially good source of antibacterial agents. Further evaluation is necessary to identify the specific bioactive compounds, their mode of action and their nontoxic nature in vivo condition.

**1. Introduction**

The use of plant materials for medicines has a long history, since ancient times plants have been indispensable sources of both preventive and curative traditional medicine preparations for human beings as well as livestock[1]. Nature is a source of medicinal agents and these agents have been used for thousands of years and number of modern drugs has been isolated from natural sources[2]. Various medicinal plants have been used for years in daily life to treat diseases all over the world. Plants produce a diverse range of bioactive molecules. Higher plants as source of medicinal compounds to play a dominant role in the maintenance of human health since ancient times[3]. Infectious bacterial diseases are becoming serious threat in developing countries like Bangladesh where peoples are not aware of their primary healthcare. Due to the lack of proper treatment, indiscriminate use of antibiotics and also ignorance are the major problems to control such bacterial diseases. Nowadays, it is a common phenomenon that microorganisms are developing their resistance to many commercial antibiotics and that is the major cause of failure to treat various infectious diseases. Therefore, immense clinical problem in the treatment of infectious diseases has been raised[4]. Bangladesh possesses a rich flora of medicinal plants. Out of 5000 species of phanerogams and pteridophytes growing in this country more than a thousand are regarded as having medicinal properties. The herbal medicines may be in form of powders, liquids or mixtures, which may be raw or boiled, ointments, liniments and incisions[5].

*Nerium oleander* Linn, belongs to family Apocynaceae commonly known as Gandeera, is a large glabrous evergreen shrub with milky juice. Leaves in threes, shortly stalked, coriaceous, 10–15 cm long, linear–lanceolate, acuminate, tapering into the short, dark green and shining above, midrib stout; nerves numerous, spreading horizontally. Flowers are rose–coloured or white, fragrant, Calyx–lobes lanceolate. Corolla 3.8 cm. diam; fragrant, lobes rounded. Filaments hairy, appendages of anthers twice as long as the cells. Follicles 15–23 cm long, rigid, at length separating. Seeds about 13 cm long, tipped with a coma of light brown
Nerium oleander has many therapeutic uses in different traditional medicine of the world. In ethno botanical literature it is mentioned to be effective in the treatment of cardiac illnesses asthma, corns, cancer, epilepsy and also used as diuretic. The leaves and the flowers are cardio tonic, diaphoretic, diuretic, emetic, antibacterial, expectorant and have antiplatelet aggregation activity. Its vario inhibitory concentration analysis. Antibacterial activity to the 512 mg/ml and serially it was diluted to 512 μg/ml, of the test s

Table 1
Minimum inhibitory concentration (MIC) values of leaf extract of N. oleander in petroleum ether.

<table>
<thead>
<tr>
<th>Test strains</th>
<th>Petroleum ether extract of N. oleander leaves (mg/ml and μg/ml)</th>
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<tbody>
<tr>
<td></td>
<td>512 mg/ml 512 μg/ml 256 mg/ml 128 μg/ml 64 μg/ml 32 μg/ml 16 μg/ml 8 μg/ml 4 μg/ml 2 μg/ml 1 μg/ml</td>
</tr>
<tr>
<td>B. Subtilis</td>
<td>1.8 cm</td>
</tr>
<tr>
<td>S. lutea</td>
<td>1.4 cm</td>
</tr>
<tr>
<td>E. Coli</td>
<td>1.9 cm</td>
</tr>
<tr>
<td>K. Pneumoniae</td>
<td>1.5 cm</td>
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</tbody>
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4. Discussion

Antibiotics are valuable drugs for the treatment of several human diseases; however, no doubt their overuse has made worldwide antimicrobial resistance. Therefore, scientists are giving top most priority in search of alternative antimicrobial drugs from different parts of medicinal plants[8]. The results of this research work indicated that extracts of the oleander leaves which was prepared using chloroform and petroleum ether, has a strong inhibitory activity on some pathogens. All of the extracts showed inhibition effect on tested bacterial strains. The petroleum ether and chloroform extracts of oleander showed the highest antibacterial activity against E. coli. MIC found in this study is much lower then other previous study[14]. Sawi et al. (2010) showed that gram positive bacteria B. subtilis is more sensitive to N. oleander extracts than gram negative bacteria[16]. But our findings differ from that result showing E. coli was more sensitive strain than the others.

Oleander is one of the most poisonous plants and contains numerous toxic compounds; the most significant of these toxins are oleandrin and nerine, which are cardiac glycosides[15]. Oleandrin suppresses activation of nuclear transcription factor-κB, activator protein-1, and c-Jun NH2-terminal Kinase 1. Oleandrin can also block NF-κB activation, as determined by consensus DNA binding, IkBα degradation, and NF-κB-dependent reporter gene expression. And these could be the molecular mechanism how oleander extracts act against biological entity[10].

Further investigation is necessary to confirm the bioactive principles of the leaf of the plant. It is essential to do the quantitative analysis was done with the help of a chromatographer in gas phase and identify the metabolites responsible for antibacterial activity.

Conflict of interest statement

We declare that we have no conflict of interest.

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References