ANTIMICROBIAL ACTIVITY OF SOME MEDICINALLY IMPORTANT PLANTS

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ABSTRACT

The present study deals with the leaf extracts of two medicinal plants Viz. Neem (Azadirachta indica), Turmeric (Curcuma longa) and Eucalyptus (Eucalyptus camaldulensis) for their antimicrobial activity. The maximum inhibitory activity was showed by Neem against tested pathogens (gram negative and gram positive organisms) Staphylococcus aureus, E.coli, B. subtilis were found susceptible to all the extracts. Methanol, chloroform and petroleum ether were used for the preparation of crude extracts. The antibacterial activity of the crude and purified extracts was determined using the agar cup diffusion method. Thin-layer chromatography (TLC) was the technique used in determining the purity of the solvents.

Key Words: Inhibitory activity, Thin-Layer Chromatography, Antibacterial Activity.

Antimicrobial Activity

An anti-microbial is a substance that kills or inhibits the growth of microorganisms such as bacteria and fungi (Schmidt et al). Antimicrobial drugs either kill microbes (microbicidal) or prevent the growth of microbes (microbiostatic). Disinfectants are antimicrobial substances used on non-living objects. The term antibiotic is used to refer to almost any drug that attempts to rid your body of a bacterial infection (Adeniyi, et al., 2006). Antimicrobials include not just antibiotics, but synthetically formed compounds as well (Srimal, 1997).

Medicinal plants constitute an effective source of both traditional and modern medicine (Biswas, et al., 2002). Indian medicinal plants and their products are used to control diverse diseases such as catarrh, bronchitis, pneumonias, ulcers and diarrhea.

In India medicinal plants are widely used by all sections of people either directly as folk remedies or in different indigenous system of medicines (Pant, et al., 1986). Plants as used for medicinal preparations for both internal and external use in India alone.

In every developing country it is necessary that the documentation of medicinal plants be treated as a matter of extreme urgency plant based antimicrobials matter of extreme urgency plant based antimicrobials represent vast untapped source for medicines and further exploration of plant antimicrobials needs to occur.

Human infections particular those involving microorganisms i.e. bacteria, fungi and viruses that cause serious infection (Chattopadhyay et al., 2004).


Medicinal plants discovered by traditional societies are proving to be an important source of potentially therapeutic drugs. This approach is actually one of several methods that can be applied in selected plants for pharmacological studies (Biswas et al., 2002). Hence the present study deals with the screening of plants for antibacterial activity. The pathogenic organisms were selected for the study on the basis of their clinical, pharmaceutical importance as well as for their potential drugs.

MATERIALS AND METHODS

1. NEEM

Collection of Samples

Plant materials were collected in fresh and washed with tape water, dried at room temperature and used for dry extract preparation.

Solvents Used

Organic solvents like alcohol, petroleum ether, and Hydrocarbons are used instead of water. Solvents used were of analytical grade.
Dried leaves of neem were ground to coarse powder and placed in a conical flask. 10 grams of coarse powder of neem leaves was dipped in 30 ml of petroleum ether overnight at a temperature of 50 to 55°C. The extracts obtained were concentrated, under reduced pressure in a rotary evaporator and stored in refrigerator.

**Determination of antibacterial activity**

The agar diffusion method was used to evaluate the antibacterial effect of the isolated extracts. To screen for antibacterial activity, sterile nutrient agar plates were used according to the diffusion. Wells (10 mm diameter) were made with the aid of a cork borer on the surface of the agar plates. About 0.1 ml of each of the gel and the leaf extracts. Plates were incubated at 37°C in the dark. Zones of inhibition were examined after 24hrs.

**EUCALYPTUS**

**Collection of plant materials**

_Eucalyptus camaldulensis_ leaves were collected and air dried. The leaves were air-dried and then grind before use for this study.

**Solvent used**

Methanol is used as an extraction solvent for eucalyptus.

**Extraction Procedure**

The dried and powdered leaves (400g) were subjected to soxhlet extraction with methanol as the extraction solvent. The extracts were filtered and allowed to evaporate to dryness.

**Determination of antibacterial activity**

The antibacterial activity of the extracts was determined using the agar cup diffusion. An overnight culture of each bacterium was used to seed sensitivity test agar plates maintained at 45°C.

The seeded plates were allowed to set and a sterile cork borer of 8mm diameter was used to cut equidistant wells on the surface of the agar.

The wells were filled with 0.1mL solution of each extract reconstituted with methanol at a concentration of 10mg mL-1. The plates were incubated at 37°C for 24h after which the diameter of zones of inhibition were measured.

**TURMERIC**

**Collection of sample**

Fresh rhizomes of _C. longa_ were obtained and dried. The rhizomes (10 g) were grind finely in a mortar and pestle.

**Solvent used**

The powder was collected and was dipped in 20 ml alcohol.

**Dry Extraction**

The coarsely ground powder (10 g) was dipped in 20ml alcohol over night in a conical flask. The extracts obtained were concentrated and stored in refrigerator.

**Determination of antibacterial activity**

The agar diffusion method was used to evaluate the antibacterial effect of the isolated extracts. To screen for antibacterial activity, sterile nutrient agar plates were used according to the diffusion.

Sterile agar (at 45°C) was poured into sterile petri dishes, which had been inoculated with the test organisms. The plates were allowed to gel for an hour. Wells (10 mm dia.) were made with the aid of a cork borer on the surface of the agar plates. About 0.1 ml of each of the gel and the leaf extracts were delivered into each of the wells. These were incubated at 37°C for 24 hrs.

**RESULT AND DISCUSSION**

**Neem (Crude and Purified Extract)**

Petroleum ether is used for the extraction of crude neem extract. Hexane and ethyl acetate (7:3 ml) is used for the purified neem extract. The antibacterial activity neem extracts on bacteria were tested and tabulated as under
Organisms/ Plant  |  B.megaterium  |  B.subtilis  |  Staphylococcus  |  S.aureus  |  M.luteus  |  E.coli  |
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<td>Neem (Crude extract)</td>
<td>1.4</td>
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<td>Neem (Purified extract)</td>
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<td>3.6</td>
<td>3.4</td>
<td>3.1</td>
<td>3.1</td>
<td>2.9</td>
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</tbody>
</table>

Antimicrobial Activity of Neem (Crude and Purified Extract) against Bacteria

X-axis= Organisms, Y-axis = Readings in cms

The maximum zone of inhibition of crude extract of neem was shown by *S.aureus* i.e 2.0 cm and minimum zone of inhibition was shown by *M.luteus* i.e 0.9 cm. The maximum zone of inhibition of purified extract of neem was shown by *B.subtilis* i.e 3.6 cm and minimum zone of inhibition was shown by *E.coli* i.e 2.9 cm.

Eucalyptus (Crude and Purified Extract)—: Methanol is used for the extraction of crude Eucalyptus extract. Hexane and ethanol (5:5 ml) is used for the purified Eucalyptus extract. The in vitro antibacterial activity of crude extracts on the isolates of Gram-negative and Gram positive organisms were tested and tabulated as under-

Organisms/ Plant  |  B.megaterium  |  B.subtilis  |  Staphylococcus  |  S.aureus  |  M.luteus  |  E.coli  |
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<td>3.0</td>
<td>2.9</td>
<td>2.4</td>
<td>2.0</td>
<td>2.2</td>
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Antimicrobial Activity of Eucalyptus (Crude and Purified Extract) against Bacteria

X-axis= Organisms, Y-axis = Readings in cms. The maximum zone of inhibition of crude extract of eucalyptus was shown by *B.subtilis* i.e 1.5 cm and minimum zone of inhibition was shown by *M.luteus* i.e 0.8 cm. The maximum zone of inhibition of purified extract of eucalyptus was shown by *B.megaterium* i.e 3.1 cm and minimum zone of inhibition was shown by *M.luteus* i.e 2 cm.

3. Turmeric (Crude and Purified Extract)—: Alcohol is used for the extraction of crude Turmeric extract. Chloroform and acetic acid (8ml:2ml) is used for the purified Turmeric extraction. The in vitro antibacterial activity of extracts on the isolates of Gram-negative and Gram positive organisms were tested and tabulated as under-
### Organisms/Plant Table

<table>
<thead>
<tr>
<th>Organisms/Plant</th>
<th>B.megaterium</th>
<th>B.subtilis</th>
<th>Staphylococcus</th>
<th>S.aureus</th>
<th>M.luteus</th>
<th>E.coli</th>
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### Antimicrobial Activity of Termeric

**Antimicrobial Activity of Termeric (Crude and Purified Extract) against Bacteria**

X-axis = Organisms, Y-axis = Readings in cms. The maximum zone of inhibition of crude extract of turmeric was shown by **B.subtilis** and **Staphylococcus** i.e 1.6 cm and minimum zone of inhibition was shown by **M.luteus** i.e 1.2 cm. The maximum zone of inhibition of purified extract of turmeric was shown by **S.aureus** i.e 3.8 cm and minimum zone of inhibition was shown by **B.megaterium** i.e 2.8 cm.

**Antimicrobial activity shown by crude extracts of medicinal plants on pathogens**

**On E.coli.**
- Eucalyptus
- Neem
- Termeric

**On B.subtilis**
- Eucalyptus
- Neem & Termeric

**On M.luteus**
- Eucalyptus
- Neem
- Termeric

**On S.aureus**
- Eucalyptus
- Neem
- Termeric

Photographs of antimicrobial activity shown by purified extracts of medicinal plants on isolated pathogen

**On E.coli.**

**On B.subtilis**
Results of TLC for crude and purified extraction

<table>
<thead>
<tr>
<th>Plants</th>
<th>Eucalyptus</th>
<th>Neem</th>
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CONCLUSION

Eucalyptus

The results of this study have shown that the leaf extracts of *E. camaldulensis* (*Eucalyptus*) have great potential as antimicrobial agents in the treatment of infectious organisms. Further detailed investigation of the active components of the plant for the exact mechanism of action will contribute greatly to the development of new pharmaceuticals.

Neem

The aqueous extract of neem leaves show antibacterial activities. Neem possesses, antibacterial and antipyretic (fever reducing) properties and it is used for a wide range of
ailments including flu, fever, sore throat, cold, fungal infections, skin diseases, malaria and many more ailments. It is believed to remove toxins from the body, neutralize free radicals and purify the blood. It is also used in treatment of malaria. Recently it used as anti-cancer and it has hepatorenal protective activity and hypolipidemic effects.

**Turmeric**
The use of essential oil from turmeric as a potential antiseptic in prevention and treatment of antibacteria infections. Various sesquiterpenes and curcuminoids have been isolated from the rhizome of *C. longa*, attributing a wide array of biological activities such as antioxidant, anti-inflammatory, wound healing, anticancer and antiproliferative, antifungal and antibacterial activities. The development of bacterial resistance to presently available antibiotics has necessitated the search for new antibacterial agents.

**REFERENCES**

