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# An Evaluation of Antimicrobial Activities of *Mimusops elengi* Linn.

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**Abstract:** Different solvent extracts of bark, fruits (fleshy portion) and leaves of *Mimusops elengi* were screened for their antibacterial and antifungal activities against some pathogenic bacteria and fungi. The activities of the extracts were not significantly enough against most of the tested organisms. Fruit extracts were less potent against most of the tested organisms compared to those obtained from bark and leaves and were inactive against the fungus *Trichoderma viride*. Leaves extracts displayed good activity against *Bacillus subtilis* and *Trichoderma viride* and were inactive against *Helminthosporium sativum*. This study may be a lead for further ethnopharmacognostic investigation to identify new compounds with therapeutic promise.

**Key words**: *Mimusops elengi*, antibacterial activity and antifungal activity

## INTRODUCTION

The limited life span of antimicrobials due to resistance because of indiscriminate use necessitates the continuous search for alternatives. Awareness for misuse of antibiotics and also the potential risk of using synthetic form of phytochemicals have been reported[1]. Nature has been a source of medicinal agents for thousands of years and an impressive number of modern drugs have been isolated from natural sources, many based on their use in traditional medicine. Various medicinal plants have been used for years in daily life to treat disease all over the world. The use of traditional plant extracts as well as other alternative forms of medical treatments have been getting momentum since the 1990s[2]. The medicinal use of plant species outnumbered (~10%) its use as food and feed[3]. Traditionally common people use crude extracts of plant parts as curative agents[4-5]. Plants with possible antimicrobial activity should be tested against an appropriate microbial model to confirm the activity and to ascertain the parameters associated with it.

*Mimusops elengi* Linn. belongs to the family *Sapotaceae*. It is an evergreen tree, 5-8 m tall and is cultivated throughout our country as an ornamental tree. The bark is used as a gargle for odontopathy, ulitis and ulemorrhagia. Fruits are used as astringent, coolant and anthelmintic. The tender stems are used as tooth brushes, and in cystorrhea, diarrhea and dysentery. The seeds are used in constipation[6]. Due to the fact that the plant *Mimusops elengi* is very useful, as found by above mentioned reports and the fact that little information cited in the literature[6-9] is available on the biological activities, there is a need to find out more about the potentiality of this plant as an antimicrobial agent. The present study is, therefore, designed to assess the potency of different solvent extracts of *Mimusops elengi* on some selected microorganisms.

## MATERIALS AND METHODS

The plant materials of *Mimusops elengi* were obtained from the tree growing in the Rajshahi University of Engineering and Technology campus, Bangladesh. Organisms used in the present study were collected from the Department of Biochemistry and Molecular Biology and from the Institute of Environmental Science, Rajshahi University, Bangladesh. All solvents used for this study were redistilled and purified. Other chemicals, including culture media used were of analytical grade unless otherwise specified.

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**Plant Samples:** The fleshy portion was collected from the ripe fruits. The plant materials bark, fruits (fleshy portion) and leaves were separately dried in sunlight and pulverized into fine powder and then stored in airtight container. 60 g of each of powdered plant materials was extracted separately at room temperature using petroleum ether (40-60$^0$C) as extracting solvent with gentle stirring for seven days (three times within this period). The resultant extracts were combined and combined extract was filtered and concentrated under a vacuum to obtain semi-solid mass. Extraction was carried out successively with ethyl acetate and methanol from the residue left after extraction with petroleum ether applying the same procedure as mentioned above.

**Antimicrobial Screening:** *In vitro* antibacterial and antifungal screening were performed with petroleum ether, ethyl acetate and methanol extracts of bark, fruits and leaves of *Mimusops elengi* against 7 pathogenic bacteria and 6 fungi by the standard disc diffusion method[10-12]. Nutrient agar medium was used for determining antibacterial activity whereas potato dextrose agar medium (PDA) was selected for antifungal activity.

The crude extracts were dissolved in sufficient amount of the respective solvents, so that each 10 µl of solutions contained 300 µg of the test materials for antibacterial and antifungal activity tests. Kanamycin (30 mg/disc) and Fluconazole (50 mg/disc) were used as standard for comparison in antibacterial and antifungal tests respectively. The antimicrobial activities were determined by measuring the diameter of the inhibitory zones in mm using a transparent scale. The diameters of the zones of inhibition by the samples were then compared with the diameter of the zone of inhibition produced by the standard antibiotic disc used.

## RESULTS AND DISCUSSION

As can be seen from Table 1, petroleum ether, ethyl acetate and methanol extracts obtained from *Mimusops elengi* bark have been shown to be mild to moderately effective against most of the tested bacteria. But no inhibitory effect of methanol extract was observed against only the bacteria *Bacillus subtilis*. The results were compared with those of Kanamycin as a standard antibiotic. Petroleum ether extract showed higher activity against *Staphylococcus aureus* (15 mm) and *Klebsiella species* (14 mm) whereas ethyl acetate extract displayed maximum towards *Staphylococcus aureus* (14 mm) and *Shigella dysenteriae* (16 mm). The activities were about two-third to that of standard. But the activities, on overall consideration, of ethyl acetate extract were better as compared to those of other extracts extracted from *Mimusops elengi* bark. As shown in Table 2, all the three extracts from *Mimusops elengi* fruits displayed weak activity against most of the bacteria tested. Methanol extract showed inhibition towards all the tested bacteria while ethyl acetate extract was inactive against only gram-negative *Shigella boydii*. Moreover, all of the extracts were appeared to be effective against the organisms *Streptococcus*

**Table 1:** Antibacterial activities of different extracts of *Mimusops elengi* bark.

| Test organisms | Diameter of zone of inhibition in mm | | | |
|---|---|---|---|---|
| | PEB | EEB | MEB | STK |
| | Gram positive | | | |
| *Staphylococcus aureus* | 15 | 14 | 11 | 22 |
| *Streptococcus b- haemolyticus* | 8 | 12 | 13 | 21 |
| *Bacillus subtilis* | 12 | 11 | 0 | 24 |
| | Gram negative | | | |
| *Klebsiella species* | 14 | 10 | 12 | 23 |
| *Shigella shiga* | 9 | 10 | 8 | 23 |
| *Shigella boydii* | 7 | 11 | 9 | 21 |
| *Shigella dysenteriae* | 10 | 16 | 11 | 23 |

PEB= Petroleum ether extract of bark (300 mg/disc); EEB= Ethyl acetate extract of bark (300 mg/disc); MEB= Methanol extract of bark (300 mg/disc) and STK = Kanamycin (30 mg/ disc).

**Table 2:** Antibacterial activities of different extracts of *Mimusops elengi* fruits.

| Test organisms | Diameter of zone of inhibition in mm | | | |
|---|---|---|---|---|
| | PEF | EEF | MEF | STK |
| | Gram positive | | | |
| *Staphylococcus aureus* | 9 | 7 | 8 | 22 |
| *Streptococcus b- haemolyticus* | 7 | 8 | 7 | 21 |
| *Bacillus subtilis* | 0 | 13 | 12 | 23 |
| | Gram negative | | | |
| *Klebsiella species* | 0 | 9 | 7 | 23 |
| *Shigella shiga* | 0 | 7 | 8 | 23 |
| *Shigella boydii* | 10 | 0 | 7 | 22 |
| *Shigella dysenteriae* | 16 | 10 | 10 | 23 |

PEF= Petroleum ether extract of fruits (300 mg/disc); EEF= Ethyl acetate extract of fruits (300 mg/disc); MEF= Methanol extract of fruits (300 mg/disc) and STK = Kanamycin (30 mg/ disc).

**Table 3:** Antibacterial activities of different extracts of *Mimusops elengi* leaves.

| Test organisms | Diameter of zone of inhibition in mm | | | |
|---|---|---|---|---|
| | PEL | EEL | MEL | STK |
| | Gram positive | | | |
| *Staphylococcus aureus* | 14 | 12 | 13 | 23 |
| *Streptococcus b- haemolyticus* | 12 | 9 | 11 | 22 |
| *Bacillus subtilis* | 15 | 17 | 16 | 24 |
| | Gram negative | | | |
| *Klebsiella species* | 10 | 13 | 0 | 23 |
| *Shigella shiga* | 0 | 9 | 11 | 23 |
| *Shigella boydii* | 9 | 12 | 8 | 21 |
| *Shigella dysenteriae* | 12 | 13 | 13 | 23 |

PEL= Petroleum ether extract of leaves (300 mg/disc); EEL= Ethyl acetate extract of leaves (300 mg/disc); MEL= Methanol extract of leaves (300 mg/disc) and STK = Kanamycin (30 mg/ disc).

**Table 4:** Antifungal activities of different extracts of *Mimusops elengi* bark.

| Test organisms | Diameter of zone of inhibition in mm | | | |
|---|---|---|---|---|
| | PEB | EEB | MEB | STF |
| *Penecillum sp.* | 11 | 10 | 12 | 16 |
| *Aspergillus niger* | 13 | 11 | 11 | 15 |
| *Trichoderma viride* | 10 | 8 | 10 | 12 |
| *Aspergillus flavus* | 0 | 0 | 0 | 13 |
| *Candida albicans* | 9 | 8 | 9 | 14 |
| *Helminthosporium sativum* | 12 | 0 | 11 | 11 |

PEB= Petroleum ether extract of bark (300 mg/disc); EEB= Ethyl acetate extract of bark (300 mg/disc); MEB= Methanol extract of bark (300 mg/disc) and STF = Fluconazole (50 mg/disc).

**Table 5:** Antifungal activities of different extracts of *Mimusops elengi* fruits.

| Test organisms | Diameter of zone of inhibition in mm | | | |
|---|---|---|---|---|
| | PEF | EEF | MEF | STF |
| *Penecillum sp.* | 11 | 15 | 9 | 16 |
| *Aspergillus niger* | 10 | 9 | 7 | 15 |
| *Trichoderma viride* | 0 | 0 | 0 | 12 |
| *Aspergillus flavus* | 8 | 9 | 7 | 13 |
| *Candida albicans* | 9 | 0 | 8 | 14 |
| *Helminthosporium sativum* | 9 | 0 | 7 | 13 |

PEF= Petroleum ether extract of fruits (300 mg/disc); EEF= Ethyl acetate extract of fruits (300 mg/disc); MEF= Methanol extract of fruits (300 mg/disc) and STF = Fluconazole (50 mg/disc).

**Table 6:** Antifungal activities of different extracts of *Mimusops elengi* leaves.

| Test organisms | Diameter of zone of inhibition in mm | | | |
|---|---|---|---|---|
| | PEL | EEL | MEL | STF |
| *Penecillum sp.* | 12 | 9 | 8 | 15 |
| *Aspergillus niger* | 7 | 10 | 8 | 15 |
| *Trichoderma viride* | 11 | 12 | 10 | 12 |
| *Aspergillus flavus* | 0 | 8 | 7 | 13 |
| *Candida albicans* | 9 | 11 | 10 | 14 |
| *Helminthosporium sativum* | 0 | 0 | 0 | 12 |

PEP= Petroleum ether extract of leaves (300 mg/disc); EEP= Ethyl acetate extract of leaves (300 mg/disc); MEP= Methanol extract of leaves (300 mg/disc) and STF = Fluconazole (50 mg/disc).

*aureus*, *Streptococcus b- haemolyticus* and *Shigella dysenteriae*. Petroleum ether extract showed maximum activity against *Shigella dysenteriae* with an inhibition diameter of 16 mm, which is two-third to that with standard. With regard to antibacterial activity of different extracts of leaves of *Mimusops elengi*, all the crude extracts, we reported herein (Table 3), appeared to have moderate activity against most of the bacterial strains. Petroleum ether extract did not show activity against only gram-negative *Shigella shiga* whereas methanol extract was inactive against *Klebsiella species*. Results also indicated that all the three extracts showed maximum activities against gram-positive *Bacillus subtilis* with inhibition diameters 15-17 mm i.e. about two-third to that with standard.

As found in Table 4, The bark extracts were found to be active against most of the tested fungal strains. The fungus such as *Aspergillus flavus* was resistant against all the crude extracts. Ethyl acetate extract did not show any inhibitory effect against *Helminthosporium sativum*. The inhibition diameters displayed by the bark extracts against the fungi *Penecillum sp.* and *Aspergillus niger* were more than two-thirds of the standard Fluconazole. Results depicted in Table 5, demonstrate that all the extracts obtained from *Mimusops elengi* fruits displayed weak activity against most of the fungi. All the extracts were found to be inactive against *Trichoderma viride*. Ethyl acetate extract showed maximum antifungal effect against *Penecillum sp.* with inhibition diameter 15 mm that is about equal to that with the standard. From the Table 6, it is evident that the extracts of *Mimusops elengi* leaves showed considerable inhibitory effect against most of the tested fungi. All extracts were found to be inactive against *Helminthosporium sativum*. Moreover, no inhibitory effect of petroleum ether extract was observed against *Aspergillus flavus*.

From the above experimental results, it is found that the antibacterial and antifungal activities of different extracts of *Mimusops elengi* reported herein were not significantly enough against most of the tested organisms. During the screening work, it was found that different extracts of *Mimusops elengi* fruits displayed lower activities against most of the tested bacteria compared to those of bark and leaves extracts. All the extracts of leaves showed maximum activities (15-17 mm) against gram-positive *Bacillus subtilis*. The extracts of bark and fruits were found to be inactive against the fungi *Aspergillus flavus* and *Trichoderma viride* respectively. The activities showed by petroleum ether and ethyl acetate extracts (300 mg/disc) of bark and leaves of *Mimusops elengi* were lower than those of same extracts (200 mg/disc) of *Oroxylum indicum* root bark against most of the tested bacteria[13]. But the activities displayed by methanol extract (300 mg/disc) of bark and leaves of *Mimusops elengi* were higher than those of same extracts (200 mg/disc) of *Oroxylum indicum* root bark against most of the tested bacteria[13].

On the basis of the data obtained in the present investigation, conclusion may be drown that the crude extracts obtained from various portions of the plant *Mimusops elengi* may be used as drug to treat the disease caused by those organisms, which are sensitive to the above mentioned samples. But before use in human being isolation of pure compound, toxicological study and clinical trial in animal model should be carried out thereafter. However, further and specific studies are needed to better evaluate the potential effectiveness of the crude extracts as the antimicrobial agents.

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