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Antifungal Activity of Aqueous Extract of *Mimusops elengi* (Pulp and Seed) Against Phytopathogenic Fungi

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ABSTRACT
Research indicates that India, one of the world's biodiversity hotspots, is home to a diverse array of fruit trees. Bakul, a tree native to the Indian peninsula's Western Ghats, is also known as Mimusops elengi Linn. (family Sapotaceae). However, this tree may now be seen flourishing in a number of tropical and subtropical areas across the globe. The tree, which has religious importance for Hindus, is described in a number of legendary literature. The stem, bark, leaves, and fruits are used in many traditional and Ayurvedic medicines to treat a range of ailments. In past times, ripe fruits were a staple diet, but today, no one knows how nutritious they are. Since they are little used today, no one is aware of the nutritional significance of ripe fruits, which were a significant component of the diet in prehistoric times. In the past five years, preclinical studies have shown that Bakul extracts provide pharmacological backing for the traditional Ayurvedic applications of the tree. These extracts exhibit diuretic, antihyperglycemic, antineoplastic, gastroprotective, antifungal, anti-cariogenic, free radical scavenging, antibacterial, and antinociceptive qualities. Studies have shown that the tree may contain fruit parts, such as pulp and seed extracts, that have antifungal qualities against phytopathogenic fungi including Alternaria solanii and Fusarium oxysporum. The antifungal efficacy of Mimusops elengi against phytopathogenic fungi is demonstrated in this study.

KEYWORDS: Mimusops elengi, Alternaria solanii, Antifungal, anticariogenic, antinociceptive.

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INTRODUCTION

Fungi are an important group with about 250,000 species that can cause opportunistic human diseases as well as infections in agricultural plants (Odds, 2000). Between 10% and 15% of the world's major crops fail each year due to plant diseases, resulting in direct financial losses of hundreds of billions of dollars (Chatterjee et al., 2016). Seventy to eighty percent of these disorders are caused by the pathogenic fungus. According to Li et al. (2017),

plant-pathogenic fungi negatively impact agricultural output and growth. Some of these fungi are also known to cause opportunistic human infections that can infect individuals with compromised immune systems (Felix et al., 2018). Toxins produced by phytopathogenic fungi may harm the host plants by contributing to the development of plant diseases (Soyer et al., 2015). Several extracts from the bark, fruits, and leaves of M. elengi were tested for their antifungal properties against a variety of dangerous fungus. These extracts included petroleum ether, methanol, and ethyl acetate. Compared to extracts made from *M. elengi*'s bark and leaves, fruit extracts were less effective against the majority of the species under study and neutral against the fungus *Trichoderma viride*. By contrast, according to Ali et al. (2008), leaf extracts have demonstrated good efficiency against *Trichoderma viride.*

Astringent, stomachic, anthelmintic, cardiotonic, alexipharmic, and cooling properties are all present in the bark. It is both bitter and delightful, according to Kirtikar (1849) and Basavaraj (2010). This tree's twig is used to wash teeth and is consumed for a long time to help teeth get stronger. According to Mistry et al. (2017), it is commonly used in gargles for odontopathy, inflammation, and bleeding gums.In addition to other tannin-rich ingredients, it is a necessary component of a number of herbal tooth powders. It is the primary component of "Mahakhadiradivati," a herbal treatment for halitosis, spongy gums, pharyngeal issues, and stomatitis. Additionally, commercial dyes employ it. Gargling with "Kawath" of the bark, pepper, honey, and ghee strengthens the loose teeth and eases the pain (Gami et al., 2012). Seed powder can be used to repair loose teeth. Taking a root bark decoction with milk every morning for three days could strengthen the teeth of even the old. Long-term bark chewing is the best way to strengthen teeth (Mitra, 1981).

Preclinical investigations have demonstrated the bark's anti-inflammatory, analgesic, antipyretic, antihyperlipidemic, antioxidant, cytotoxic, antidiabetic, diuretic, and hypotensive properties (Baliga et al., 2011). *M. elengi* produces astringent fruit. It is well known that the young fruits shield the loose teeth. Another method for fixing loose teeth is to use a hot water extract of dried seeds. Furthermore, *M. elengi* root exhibits astringent, diuretic, and aphrodisiac qualities (Mariyam et al., 2015). It has been shown that *M. elengi*'s roots and fruits work well to treat periodontitis. Moveable teeth can be treated with unripe fruit and seeds. Plant metabolites with antibacterial properties include alkaloids, tannins, and saponins. (Sagbo and others, 2017).

Saponins are surface-active substances found in bark that have the potential to function as surfactants (Kregiel et al., 2017). Powdered dried flowers can also be used to clean teeth. Flavonoids found in *M. elengi* have a strong anti-inflammatory action by inhibiting the production of eicosanoids. According to Sankari et al. (2014), prostaglandins are eicosanoids that are produced as byproducts of the lipoxygenase and cyclooxygenase pathways and are associated with certain immune responses. An ointment based on *M. elengi* extract has been shown to be beneficial for wound healing and ulcers. The wound healing process consists of several phases, including contraction, epithelization, granulation, collagenation, collagen maturation, and scar formation; these processes happen concurrently but separately (Gupta and Jain, 2011).

MATERIAL AND METHOD

Mimusops elengi (Pulp and Seed) plant species were collected from Mullana village in their natural habitat between February and May 2024. The collected plants were identified in the Department of Bio-Sciences and Technology, MMDU Mullana, Ambala, Haryana, India. The entire plant was cleansed using tap water and then distilled water after being collected in an open bag and brought to a laboratory. Mortar and pestle were used to grind 10 grams of pulp and seed in 100 milliliters of distilled water, and muslin fabric was used to filter the mixture. After centrifuging the mixture for 15 minutes at 10,000 rpm, the supernatant was weighed at 15 pounds, moved to a conical flask, and autoclaved at 121 degrees Celsius. The pour

plating method is used to evaluate the effectiveness of antifungals against phytopathogenic fungi. According to Pandey and Tripathi (2014), the fungus *Alternaria solani* and *Fusarium oxysporum* were isolated from soil and potato leaves, respectively.

Antifungal Activity assay: Using one milliliter of fresh plant extracts in a PDA agar medium, the fungal strains *Alternaria solani* and *Fusarium oxysporum* were cultivated independently in triplicate. The food poisoning method, which counts colony-forming units (CFU), was used to identify the antifungal test. Despite the fact that control plates were used without extracts, the media were given freshwater pulp and seed extract. Six mm diameter agar discs containing fungal mycelia were sliced from the edges of the pure cultures that were still growing a day later using a sterilized cork-borer. The center of the petri dish was then aseptically injected with these discs (Srivastava et al., 2011; Salhi et al., 2017). One milliliter of fresh pulp and seed extract used in PDA for *A. solani* or one milliliter of fresh pulp and seed used in PDA for *F. oxysporum* were added to the Petri plates, and they were incubated for 144 hours at 28°C.

RESULTS

Antifungal assay against *A. solani* and *F. oxysporum*: The antifungal activity of the extract from the pulp and seeds of *Mimusops elengi* generally inhibits the growth of A. solani and *F. oxysporum* fungus (Fig. 1, 2). When evaluated for antifungal activity in distilled water, *Mimusops elengi* pulp and seed extracts produced the best results (Table 5-6). When compared to the control (7.5 cm), the seed section of A. solani has the highest antifungal activity (4.2 cm), followed by the pulp portion (6.1 cm). When compared to the control (7 cm), the Seed component of F. oxysporum shows the highest antifungal activity (5.2 cm), followed by the Pulp portion (6.2 cm). The Zone of Inhibition is higher than the control in this instance (Table 1-4). The Zone of Inhibitions (ZOI) of a fresh distilled water extract of *Mimusops elengi* (Pulp and Seed) against *A. solani* or *F. oxysporum* was displayed in cm in Table 5-6. The antifungal activity of the seed portion of *Mimusops elengi* was found to be stronger than that of the pulp portion for both *A. solani* and *F. oxysporum*.

Table 1: Antifungal activity of *Mimusops elengi* pulp fresh Distilled water extract (1 ml) against *Alternaria solani*, (Colony diameter in cm)

Sample	3rd Day	Control	5th Day	Control	7th Day	Control
R1	4.1	4.5	5.6	6.4	6.1	7.5
R2	4.1	4.5	5.6	6.4	6.1	7.5
R3	4.1	4.5	5.6	6.4	6.1	7.5

Table 2: Antifungal activity of *Mimusops elengi* seed fresh Distilled water extract (1 ml) against *Alternaria solani*, (Colony diameter in cm)

Sample	3rd Day	Control	5th Day	Control	7th Day	Control
R1	2.6	2.8	3.8	5.5	4.2	7.5
R2	2.6	2.8	3.8	5.5	4.2	7.5
R3	2.6	2.8	3.8	5.5	4.2	7.5

Table 3: Antifungal activity of *Mimusops elengi* pulp fresh Distilled water extract (1 ml) against, *Fusarium oxysporum* (Colony diameter in cm)

Sample	3rd Day	Control	5th Day	Control	7th Day	Control
R1	2.4	3	4.7	5.2	6.2	7
R2	2.4	3	4.7	5.2	6.2	7

R3	2.4	3	4.7	5.2	6.2	7

Table 4: Antifungal activity of *Mimusops elengi* seed fresh Distilled water extract (1 ml) against *Fusarium oxysporum*, (Colony diameter in cm)

Sample	3rd Day	Control	5th Day	Control	7th Day	Control
R1	3.6	4	4.5	5.8	5.2	7
R2	3.6	4	4.5	5.8	5.2	7
R3	3.6	4	4.5	5.8	5.2	7

Table 5: Antifungal activity of fresh Distilled water extract of *Mimusops elengi* against *Alternaria solani*, ZOI in cm

Plant extract	3rd Day	5th Day	7th Day
***Mimusops elengi* Pulp**	0.4	0.8	2.4
***Mimusops elengi* seed**	0.2	1.7	3.3

Table 6: Antifungal activity of fresh Distilled water extract of *Mimusops elengi* against *Fusarium oxysporum*, ZOI in cm

Plant extract	3rd Day	5th Day	7th Day
***Mimusops elengi* Pulp**	0.6	0.5	0.8
***Mimusops elengi* seed**	0.4	1.3	1.8

Figure 1: Antifungal activity of fresh extract of *Mimusops elengi* Pulp and Seed part against *Altenaria solani*. Control (A), Pulp (B) and Seed (C)

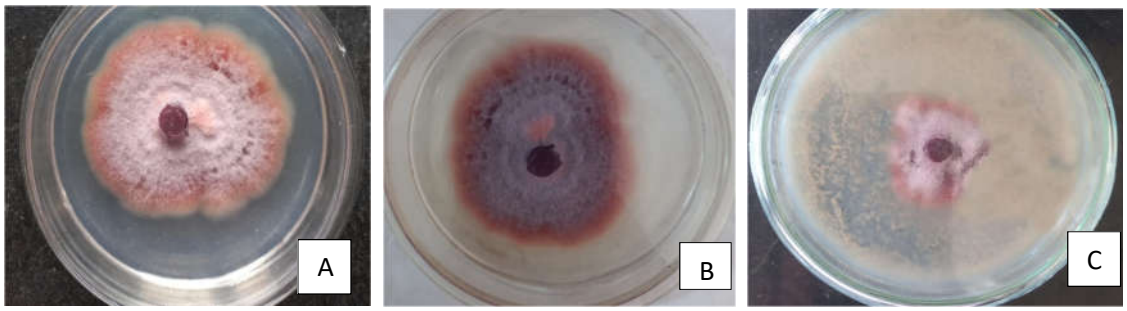

Figure 2: Antifungal activity of fresh extract of *Mimusops elengi* Pulp and Seed part against *F. oxysporum*. Control (A), Pulp (B) and Seed (C).

DISCUSSION

This study found that fresh distilled water containing an extract of the pulp and seeds of *Mimusops elengi* weeds is insufficient for the growth of *A. solani* and *F. oxysporum*. Similar antifungal activities have been demonstrated for *Aspergillus candidus, A. flavus, A. niger, A. flavipes, A. terreus, A. tamari, Penicillium oxalicum, P. chrysogenum, P. griseofulvum, Fusarium solani, F. exquisite, Penicillium notatum, Fusarium oxysporum* (Satish et al., 2008), *Puccinia arachidis* (Yusnawan and Inayati, 2018), and *Rhizopus stolon*.

The antifungal characteristics of different sub-fractions of methanolic extracts of other plant species, such as *Sisymbrium irio, Senna occidentalis, Coronopus didymus, Chenopodium album, C. quinoa, and C. murale*, have been the subject of additional research (Naqvi et al., 2019; Javaid et al., 2017a, b; Khan and Javaid, 2020, Banaras et al., 2021). Since herbal extracts are less costly and more ecologically friendly than chemicals that combat *A. solani* and *F. oxysporum*, these studies define a fresh extract as a crude extract with greater antifungal activity when compared to solvents.

CONCLUSION

The antifungal qualities of *Mimusops elengi* pulp and seed extracts in distilled water were thoroughly investigated. It was discovered that the crude extract of both plants inhibited the growth of the fungus *A. solani* and *F. oxysporum*. Fungal diseases posed a severe threat to crop plants and caused financial losses. The current study was able to provide an eco-friendly approach to treating fungal illnesses by utilizing ethnomedicinal weeds.

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