INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: https://www.ijpsjournal.com

OPEN ACCESS

Review Article

Phytochemical & Pharmacological Profile of Mimusops Elengi: A Review

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ARTICLE INFO

Published: 12 April. 2025
Keywords:
Phytochemical, Pharmacological, Mimusops Elengi, archipelago, tonic, particularly.
DOI:
10.5281/zenodo.15202936

ABSTRACT

Mimusops elengi, also known as Spanish Cherry, Bullet Wood, Bunga Mengkula, or Mengkulah, is a tropical evergreen shrub found in South Asian countries. It is a significant part of traditional medicine, particularly in Ayurveda, and is considered a sacred plant by Hindus. The plant's aromatic flowers are praised in religious texts and ancient Sanskrit literature. Mimusops elengi is native to India, Myanmar, and Sri Lanka and has been present in the archipelago for centuries. The plant's roots, bark, leaves, flowers, and foliage have been extensively studied for medicinal uses, showing promising results. It may also be used for biodiesel production. Historically, Mimusops elengi has been used as an astringent and tonic, particularly for treating diarrhea and dysentery. Recent studies have identified antioxidant properties in its leaves, which are essential for combating harmful free radicals associated with various diseases and the aging process. Research suggests that Mimusops elengi may possess anti-diabetic properties that could aid in regulating blood sugar levels, benefiting those with diabetes. However, further research is needed to thoroughly explore its characteristics and possible medical uses. It is important to seek advice from a healthcare professional before using herbal remedies, especially for medical reasons, especially if you have existing health issues or are on other medications.

INTRODUCTION

Mimusops elengi, commonly referred to as Spanish Cherry, Bullet Wood, Bunga Mengkula, or Mengkulah, belongs to the Sapotaceae family(1). This tropical evergreen shrub is widely found across South Asian countries and holds an important role in traditional medicine, especially in Ayurveda, where various parts of the plant are utilized for their medicinal properties. Due to its diverse pharmacological benefits, Mimusops elengi is a valuable resource in traditional healing practices(2). According to the World Health Organization (WHO), approximately two-thirds of

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Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

the global population relies on traditional medicine for treating various ailments, with Mimusops elengi, also known as the Indian Medlar Tree or Bakul tree, being a significant example(3). Mimusops elengi is regarded as a sacred plant by Hindus and holds significant importance in religious texts and ancient Sanskrit literature. Its aromatic flowers are praised in the Puranas and are even included among the flowers of Hindu paradise(4). In Banda Aceh, Indonesia, Mimusops elengi serves as a source of agricultural residue biomass. This species is native to India, Myanmar, and Sri Lanka and has been present in the archipelago for centuries(5)(6)(7). Currently, Banda Aceh has approximately 6,500 Mimusops elengi trees spread over 28.2 hectares(8). Literature indicates that various parts of the Mimusops elengi plant, including roots, bark, leaves, flowers, and foliage, have been extensively studied for medicinal uses, showing promising results. Additionally, it may be utilized for biodiesel production(9)(10). Historically, M. elengi has been used as an astringent and tonic, particularly for treating diarrhea and dysentery due to its ability to tighten and tone tissues. Recent studies have also identified antioxidant properties in its leaves, which are essential for combating harmful free radicals associated with various diseases and the aging process. Furthermore, research suggests that M. elengi may possess anti-diabetic properties that could aid in regulating blood sugar levels, benefiting those with diabetes. Mimusops elengi possesses various pharmacological properties that suggest its potential in traditional medicine and future applications in modern medicine. However, it is important to note that further research is needed to thoroughly explore its characteristics and possible medical uses. Always seek advice from a healthcare professional before using herbal remedies, particularly for medical reasons, especially if you have existing health issues or are on other medications(11).

Fig no.1 Mimusops elengi

Table no. 1

Sr. no.	Vernacular name	
	English	Spanish cherry, bullet wood
1.	Hindi	Bakul
2.	Tamil	magizhamboo
3.	Marathi	Bakuli
4.	Gujarati	Barsoli
5.	Kannada	Ranjal
6.	Bengali	Bakul

Table no.2

Sr.no.	Taxonomical classification	
1.	Kingdom	Plantae
2.	Division	Magnoniophyta
3.	Common name	Bakul
4.	Class	Magnoliopsida
5.	Phylum	Tracheophyta
6.	Order	Ericales
7.	Family	Sapotaceae
8.	Genus	Mimusops

Plant Description

The medium- to large-sized Mimusops elengi tree can grow to a height of 25–30 m (82–98 ft). Its crown is straight and its trunk is upright. The evergreen leaves are simple and alternate. They can have an elliptical or oblong shape and are normally 6–12 cm (2.4–4.7 inches) long. The leaves have a dark green hue and are lustrous. One of the most notable characteristics of Mimusops elengi is its extremely scented blossoms. They resemble stars, have a cream to light yellow tone, and have a waxy touch. The f lowers have a sweet and pleasant perfume and are often seen alone or in tiny groups. Blossoming typically occurs in the summer. Mimusops elengi produces a green, meaty berry as its fruit. Meaty berries that are green while immature and turn orange or yellow when ripe are the fruit of Mimusops elengi. The cuisine. Depending on how old the tree is, its grayish-brown bark may be smooth or rough. Its wood is valued for its tensile strength and is utilized for a variety of tasks, including furniture assembly and carving. The tree's extensive root system allows it to successfully establish itself in a range of soil types. South and Southeast Asia, which includes nations like India, Sri Lanka, Thailand, Myanmar, and others, is home to the Mimusops elengi. In many tropical and subtropical areas of the world, it is also grown as an ornamental tree. Mimusops elengi is prized for both its fragrant blossoms and wood, which has many use beyond its typical medicinal properties(12)(13)(14)(15).

Extraction process by Soxhlet

500 milliliters of distilled water were used to clean the fresh M. elengi leaves, which were then dried and kept for later use in a sterile, airtight container. The leaves' ethanol extract was made using the Soxhlet device. The Soxhlet apparatus's thimble contains 0.08 g of dried M. elengi leaves. The solvent will be one hundred milliliters of ethanol. Until it was needed again, the extract was kept in a sterile, airtight container(16).

Extraction process by Maceration

After being shade-dried, the leaves were ground into a coarse powder in an industrial blender. The substance of powdered leaves was macerated for four days at room temperature with sporadic shaking using methanol (1:1 weight/volume), and then remacerated for three days. Following filtration, the filtrate was evaporated in a rotary evaporator (Buchi R-210) at 30 °C with lowered pressure. Until it was used, the dry extract was stored in a refrigerator(17).

Phytochemical testing of mimusops elengi(18)

Table no.3

Phytochemical test	Reagents used	Inference	Result
Alkaloids	Mayer's test	Yellow colour ppt	Present

	Drangendroff's test Wagner's test	Orange-red ppt Reddish brown colour	Present Present
Anthroquinones	Borutrager's test	Pink or deep red colour	Absent
Flavonoids test	Shinoda test Ammonia test	Red colour Yellow spot	Present Present
Glycosides	Keller-killiani test	Brown and greenish ring	Present
Phlobatannins	Pholbatannins test	Red precipitates	Present
Reducing sugar	Fehling's test	Red precipitates	Present
Steroids	Libermann burchard test	Green colour	Absent
Tannins	Modified Prussian blue test	Blue colour formation	Present
Terpenoids	Salkowski test	Reddish brown colour	Present
Triterpenoids and steroids	Antimony chloride test	Pink colour	Absent
Saponins	Froth test	Formation of froth	Absent

Table no.4

Sr.no.	Part of plant	phytoconstituent	Reference
1	Leaves	quercitol, hentriacontane, β-carotene and glucose, D-mannitol, β-sitosterol, β -sitosterol- β-D-glucoside, and quercetin were recovered from leaves	(19)(2)
2	Seed	Quercetin, quercitol, spinasterol, taxifolin	(2)
3	Flower	D-mannitol, β-sitosterol and β-sitosterol- β -D-glucoside quercitol, ursolic acid, triterpene alcohol, lupeol, quercitol, dihydroquercetin, and quercetin,	(2)
4	Bark	Tannin, saponin taraxerone, taraxerol, β-spinasterol, sodium ursolate and betulinic acid, quercitol, lupeol, ursolic acid	(20)
5	Wood	Lupeol, spinasterol, sitosterol	(20)
6	Root	Lupeol acetate, taraxerol, spinasterol, hederagenin	(20)

Biological & pharmacological activities

1 Anti-ulcer activity:

Extract from the bark of Mimusops elengi on stomach ulcers. They looked into Mimusops elengi's 50% alcoholic extract and some of its components, such as ethyl acetate, n-butanol, methanol, and aqueous extracts, employing animal models for stomach ulcers brought on by stress, ethanol, pylorus ligation, and water immersion. 80 mg/kg of ranitidine HCl was used as the reference standard. As a reference standard, pantoprazole (20 mg/kg) was also used in the ethanol-induced stomach ulcer model. Notably, there were no indications of toxicity from the bark's ethyl acetate extract, even at dosages of up to 5000 mg/kg. The findings showed that the bark's 50% alcoholic extract at 50, 100, 300, and 500 mg/kg as well as its various fractions (given at 100 mg/kg) showed a significant In the ethanol-induced gastric ulcer model, there was a significant decrease in stomach ulceration ($P < 0.05$). Specifically, at doses of 10, 50, and 100 mg/kg, the ethyl acetate extract

showed dose-dependent prevention of stomach lesions against ethanol-induced damage. At dosages of 50 and 100 mg/kg, the ethyl acetate extract significantly decreased the ulcer index ($P < 0.05$), a measure of mucin activity, in mice with pylorus ligation over a 19-hour period Additionally, the extract of ethyl acetate had protective properties against stomach lesions caused by stress and water immersion, as demonstrated by dose-dependent decreases in the In comparison to the control group, there were significant differences in the ulcer index ($P < 0.05$), intensity score ($P < 0.05$), and overall lesion area ($P < 0.05$)(21).

2. Anti-fungal activity:

The use of poisoned food to test Mimusops elengi's antifungal activity. They looked at different aqueous concentrations of 10%, 20%, 30%, 40%, and 50%. extract from Mimusops elengi, all solvent extracts, and the separated components (Fraction I to IV) for their antifungal qualities. These extracts were added to Czepak Dox Agar (CDA) medium in order to achieve the required concentrations for the antifungal activity test. After being autoclaved, the mixture was transferred into 20 ml Petri plates and allowed to cool. Five millimeter discs from cultures of the fungi under study that were seven days old were placed onto the plates after the medium had set. For every concentration, four replicates were kept. The extract was absent from the CDA medium in the control plates. The plates were incubated for seven days at a temperature of 26.1 C. The extracts' fungitoxicity was calculated as a percentage. suppression of mycelial development. Synthetic fungicides, such as Blitox, Captan, Dithane M 45, and Thiram, were also assessed for their antifungal activity using the poisoned food technique at their indicated dosage of 2000 ppm in order to perform comparative assessments. Alkaloids, which make up fraction III, showed very strong antifungal activity. However, fractions I, II, and IV showed no antifungal activity, demonstrating the nature of the active principle. F. oxysporum exhibited the least susceptibility to the alkaloid fractions, whereas D. halodes was the most vulnerable of the examined fungi. Thiram showed the strongest antifungal activity of the four fungicides that were tested, whereas Dithane M 45 showed the weakest antifungal activity. Interestingly, at the prescribed dosage of 2000 ppm, the alkaloid fraction's antifungal activity was significantly stronger than that of Dithane M 45 and other tested fungicides(22).

3.Antioxidant activity:

Evaluated the extracts' ability to scavenge free radicals using the DPPH (1,1-diphenyl-2-picrylhydrazyl) assay. ADPPH solution was made with a 0.004%w/vin concentration. 95% methanol. A stock solution with a concentration of 5 mg/mL was then made by combining the methanol extract of Mimusops elengi with 95% methanol. Test tubes were filled with freshly made DPPH solution (0.004% w/v), and Mimusops elengi extracts were added. These tubes were then serially diluted from 1 µg to 500 µg until the final volume was 3 mL. Following a 10-minute incubation period, a spectrophotometer (HACH 4000 DU UV–visible spectrophotometer) was used to detect the absorbance at 515 nm. The reference standard, ascorbic acid, was dissolved in distilled water to produce a stock solution with the same density (5 mg/mL). In order to create a control sample, the identical volume, but with no reference ascorbic acid or extract, and a blank of 95% methanol. It was calculated what percentage of the DPPH free radical was scavenged. Plotting the inhibition curve using triplicate experiments allowed for the representation of the inhibition standard deviation as a percentage. By using probit analysis, IC50

values were determined. The DPPH test counts the number of DPPH free radicals that Mimusops elengi can scavenge. As the concentration of the sample extract rose, so did this activity. 1,1-diphenyl-2-picrylhydrazyl's potential to function as the basis for the DPPH antioxidant test When antioxidants are present, DPPH, a stable free radical, loses its hue. Because of its unpaired electron, the DPPH radical absorbs light at 515 nm and displays a deep purple hue. A change in absorbance can be used to quantify the color loss that occurs when DPPH absorbs an electron from an antioxidant molecule. Compared to the well-known antioxidant ascorbic acid (IC50 of 55.89 µg/mL), the extract's IC50 value was 43.26 µg/mL. Chloroform extract of M. elengi bark was tested for antioxidant activity using DPPH (1,1-diphenyl-2-picrylhydryl) radical, nitric oxide, ABTS radical, and hydroxyl radical in turn. The study's findings unequivocally show that M. elengi has a great deal of potential for usage as a natural antioxidant. In tests for DPPH free radical scavenging and nitric oxide scavenging, the leaf's crude methanolic extract demonstrated statistically significant antioxidant activity. Leaf extract's protective activity against lipid peroxidation and the actions of enzymatic and non-enzymatic antioxidants in tissues and plasma were investigated. Oxidative stress was assessed using enzymatic and non-enzymatic antioxidants, as well as plasma and tissue lipid peroxidative markers antioxidants. It showed promising Antioxidant properties by sig nificant Quenching impact on the extent of Lipid Peroxidation, along with Enhancement of Antioxidant defense System in Pancreas tissues(23). Assessed the M. elengi bark's ethyl acetate extract's antioxidant capacity utilizing the DPPH (1,1-diphenyl-2picrylhydrazyl) assay. This extract showed impressive DPPH. scavenging activity of radicals, exhibiting a noteworthy 92.0% suppression at 0.5 mg/mL. However, with a total antioxidant activity of 771.0 mgGAE pergram of extract, the methanol extract from the stem bark showed the greatest prevention of lipid peroxidation, reaching 62.0%.Additionally, the study found a positive relationship between radical scavenging activity (R2 ¼ 0.9229) and total phenolic content. R2 ¼ 0.9451 is the total antioxidant activity. This implies that these extracts' strong antioxidant properties and ability to scavenge free radicals are significantly influenced by their high content of total phenols(24).

4.Diuretic activity:

Assessed the diuretic properties of alcoholic, petroleum ether, and chloroform extracts of Mimusops elengi bark (200 mg/kg body weight, p. o.). Each animal was divided into five or six groups. The normal medication furosemide (20 mg/kg bodyweight) in 0.9% sodium chloride solution was given to the second group, while the first group merely got 0.9% sodium chloride solution (25 ml/kg bodyweight). solution of chloride. The remaining three groups were given 200 mg/kg body weight of petroleum ether, chloroform, and alcohol of M. elengi bark, suspended in 0.9% sodium chloride solution (p. o.). Urine was collected and its volume was noted five hours after oral treatment. The alcoholic extract had the highest diuretic efficacy. We noticed a strong diuretic and electrolyte excretion activities in M. elengi bark alcoholic extract(25). Evaluated the water, ethanol, and ethyl acetate extracts made from Mimusops elengi for their diuretic properties. Rodents served as the experimental subjects in this investigation, and measured urine volume one, two, four, six, and twenty-four hours after the extracts were taken orally at a dosage of 250 mg/kg bodies. Following the ethanol and ethyl acetate extracts, the aqueous extract was determined to have the highest Naï/Kþ ratio. In contrast to the other extracts, the aqueous

extract notably demonstrated a diuretic effect.tracts (26).

5.Antidiabetic activity:

Investigated the anti-hyperglycemic qualities of an aqueous bark extract from Mimusops elengi (Bakul). Two doses were given by them: 250 mg/kg and 500 mg/kg, for 45 days in a row, in a preclinical alloxan-induced diabetes rat model. Gliben clamide was administered at a dose of 1 mg/kg body weight as a positive control. The antihyperglycemic effects seen in the group getting Bakul at 500 mg/kg body weight were similar to those in the group receiving gliben clamide, according to the results, which showed a dose-dependent response. The study unequivocally showed that the extract's oral administration dramatically lowered blood glucose and glycosylated hemoglobin levels, while concurrently raising insulin levels in the blood. Glycogen, glucokinase, and glucose-6-phosphate dehydrogenase levels were higher in the liver samples from the cohorts given the extract compared to the diabetic control group, although glucose-6 phosphatase levels were lower. This implies that the previously disrupted metabolism has been corrected. Examine how the ethanolic leaf extract of Mimusops elengi L. affects the biochemical parameters and enzyme activities of diabetic rats that have been given STZ. Enzyme leakage from cells into the A certain sign of cell injury is plasma. Numerous enzymes that are typically found in the cytosol are released into the bloodstream when the liver plasma membrane is disrupted, and measuring these enzymes provides a quantitative indicator of the degree of damage. Rats that were given 40 mg/kg of streptozotocin to induce diabetes were used to test the cytoprotective effect of M. elengi. b.w. The marker enzymes' activity were measured in the kidney, liver, and serum. Urea, uric acid, and creatinine—all markers of kidney damage—were measured. By restoring the normal levels of renal indicators (urea, uric acid, and creatinine) in diabetic rats, the ethanolic leaf extract of M. elengi (100 mg/kg b.w.) was able to reverse the levels of the marker enzymes in the blood and protect the kidney. The findings demonstrated that M. elengi leaf extract in ethanol could lessen the liver and kidney damage brought on by diabetes induced by STZ(27).

6 Antihypertensive activity:

Examined the hypotensive effects in anesthetized rats of a meth anolic extract from M. elengi. The extract was given intravenously at doses varying from 2 to 16 mg/kg. resulting in a roughly 7%–38% decrease in mean arterial blood pressure. There was a concentration-dependent pattern to this impact. Notably, adrenergic, muscarinic, or histaminergic receptors did not appear to have any effect on the hypotensive action. Additionally, the Even after blocking the autonomic ganglion or the angiotensin-converting enzyme, the hypotension persisted. However, the extract-induced hypotension was significantly reduced by 81% and 64%, respectively, when calcium channel blockers (nifedipine at 0.9 mg/kg and verapamil at 3.9 mg/kg) were given. This finding implies that the extract has calcium-blocking properties, which are responsible for the hypotensive effects that have been noted(28).

7 Anti-inflammatory, analgesic and antipyretic activities:

used a hot plate test and acetic acid to induce white albino mice to writhe in order to examine the analgesic properties of an ethanol extract of Mimusops elengi leaves. When using a hot plate test The latency time response to the heat stimulation was significantly prolonged by the extract. Animals' anti-inflammatory, analgesic,

and antipyretic properties were evaluated using an ethanol extract of bark. The carrageenan-induced paw oedema at third and fourth weight was considerably reduced by the bark ethanol extract. In analgesic models, the ethano extract also lowers the rectal temperature in pyrexia caused by Brewer's yeast and the writhing caused by acetic acid. But in the hot plate test, there was no increase in latency time. These findings demonstrated that ethanol based bark extract possesses anti analgesic, antipyretic, and inflammatory properties. Using cotton pellets and carrageenan-induced paw oedema, the anti-inflammatory properties of the bark's ethanolic extract and separated fraction β-amyrincaprylate were assessed. Indomethacin was utilized as a conventional medication, and the results were compared. β amyrincaprylate and ethanolic extract were found to be involved in the anti-inflammatory properties of Mimusops elengi bark. evaluated the antipyretic, analgesic, and anti-inflammatory properties of a 70% ethanol extract of Mimusops elengi bark in animals. The ability of ethanol to reduce inflammation Models of cotton pellet-induced granuloma and carrageenan-induced paw edema were used to assess an extract of Mimusops elengi (200 mg/kg, p.o.). Brewer's yeast-induced pyrexia in rats was used to measure the antipyretic activity, and acetic acid-induced writhing and Eddy's hot plate models were used to evaluate the analgesic impact. The carrageenan-induced paw oedema at 3 and 4 hours was considerably prevented by the ethanol extract of Mimusops elengi (200 mg/kg, p.o.). In the cotton pellet model, it also decreased the transudative weight and, to a lesser extent, the granuloma weight. Mimusops elengi ethanol extract lowers the rectal temperature in Brewer's yeast-induced pythonosis and the writhing caused by acetic acid in analgesic models. Prexia In the hot plate test, Mimusops elengi did not, however, lengthen the latency period. These findings demonstrate the antipyretic, analgesic, and anti-inflammatory properties of Mimusops elengi ethanol extract. evaluated the alcoholic extract made from the leaves of Mimusops elengi L. (M. elengi) for its antioxidant and in vitro anti-inflammatory qualities. When compared to the conventional diclofenac sodium, the M. elengi extract showed notable anti-inflammatory effect in vitro, according to their analysis. In comparison to the standard, the extract specifically showed a stabilization rate of 73.85 0.80% and 94.23 0.50% at a concentration of 1000 µg/mL. Interestingly, the extracts' activity showed a concentration-dependent pattern, meaning that higher concentrations resulted in higher activity. The presence of phenolic chemicals, which provide potent antioxidant qualities, is probably responsible for these outcomes(29).

8 Cytotoxic activity:

investigated the antitumor effects of a 95% ethanolic extract made from the flowers of Mimusops elengi. They used human laryngeal carcinoma and the cholangiocarcinoma cell line CL6 in their in vitro studies. cell line Hep-2, normal human epithelial cells (HRE), and the human hepatocarcinoma cell line HepG2. Cytotoxicity was used as the endpoint measurement, and 5-fluorouracil was used as the positive control. During a 24-hour period, cells in the logarithmic growth phase were treated to different concentrations of either 5-fluorouracil (ranging from 78.13 to 10,000 µM) or the extract (ranging from 1.95 to 250 µg/ml). The MTT assay was utilized to evaluate the cytotoxic effects. The study's findings showed a concentration dependent cytotoxic impact; for CL-6, Hep-2, and HepG2 cells, the corresponding IC50 values were 48.84, 109.99, and 54.44 µg/ml(28). We out a study to look into the pharmacological characteristics of Mimusops elengi stem bark and to provide

scientific evidence for its cytotoxic effects actions against tumors. Using the SRB (Sulforhodamine B) assay, extracts and fractions were made, and their in vitro cytotoxicity was assessed. The most potent fractions were subsequently put through a DNA fragmentation assay and fluorescence microscopy-based evaluations employing acridine orange/ethidium bromide (AO/EB) and Hoechst33342 staining to ascertain their capacity to trigger apoptosis. Comet and micronuclei assays were used to evaluate genotoxicity. Analysis of the cell cycle was also carried out. The Ehrlich ascites carcinoma (EAC) model in mice was used to assess the anti-tumor potential of the alcoholic stem bark extract of Mimusops elengi and its four fractions in an in vivo context. The findings showed that the dichloromethane and ethyl acetate fractions, as well as the alcoholic stem bark extract, demonstrated significant in vitro cytotoxicity as based on the SRB test. The results of the DNA fragmentation assay, AO/EB staining, and Hoechst 33342 staining all supported the capacity of these two chosen fractions to cause apoptosis. The Comet and micronuclei assays were used to determine the genotoxic potential. Additionally, the fractions showed particular G0/G1 phase cell cycle suppression. When combined with the common medication cisplatin, the ethyl acetate fraction in the EAC model successfully decreased the rise in body weight relative to the control group and increased the subjects' mean survival time. Alterations in hematological and biochemical indices were successfully restored by both fractions. Consequently, the study indicates that Mimusops elengi's stem bark may retain promise as a possible medicinal substance having anti-tumor and cytotoxic qualities(30).

9 Anti-hyperlipidemic activity

examined the water-based tanjung (Mimusops elengi) leaf extract's anti-cholesterol activity in six groups of DDY-strain mice (Musmuscle). The findings showed that the mice's total cholesterol levels were significantly reduced by tanjung leaf extract. Furthermore, the mice's cholesterol levels decreased more when they received more extract. In particular, TE 3 was able to reduce cholesterol levels by up to 36%. In conclusion, this study raises the possibility that tanjung leaf extract could be used as a cholesterol-lowering treatment, providing a safe and natural substitute for pharmaceutical drugs(31).

10 Immunostimulatory effect:

investigated how the methanolic extract from Mimusops elengi's bark (MEMEL) affected the mice's immune systems. They gave 10 mg, 20 mg, and 40 mg of MEMEL orally. depending on the mice's body weight, kg/day. When employing sheep red blood cells (SRBC) as the antigen, the study evaluated both specific and non-specific immune responses using the carbon clearance test (CCT), the haemagglutination antibody (HA) assay, and delayed-type hypersensitivity. Vitamin E at 150 mg/kg was the standard reference, and distilled water was utilized as a control in every test. The findings showed that oral administration of MEMEL increased the immunostimulatory response in a dose-dependent manner. The CCT's phagocytic index revealed a substantial rise ($p < 0.01$). Additionally, a humoral antibody response was demonstrated by a significant rise ($p < 0.01$) in the generation of circulatory antibody titers. When SRBC was used as the antigen, the mean footpad thickness increased at 48 hours, indicating a less significant rise ($p < 0.05$) in the delayed-type hypersensitivity reaction(32).

11 Wound healing activity:

examined the ability of an extract made from the bark of Mimusops elengi, a plant that is well-known in Indian traditional medicine, to heal wounds. This plant was chosen for the investigation because according to its historical usage and citations in the body of current literature. The bark of Mimusops elengi was extracted methanolically by the researchers, who then combined it to create an ointment. Then, using three distinct mouse wound models—excision wounds, incision wounds, and dead space wounds—they assessed the ointment's capacity to promote wound healing. According to the findings of their tests, the extract-containing ointment significantly accelerated the healing of wounds in each of the three wound models. These outcomes were comparable to those observed with betadine ointment, a typical drug used to treat wounds, in terms of dry granuloma weight, tensile strength, wound contraction, and wound closure duration. Furthermore, histological analysis validated the discovery that Bark extract from Mimusops elengi possesses strong wound-healing properties(33).[39]

12 Anticonvulsant activity:

The bark of Mimusops elengi, a plant that has long been used as a tonic, febrifuge, and to treat inflammation and odontopathy, was evaluated by Ganu et al. (2011). This plant's blossoms are renowned for their ability to tonicify the brain and are used as snuff to relieve headaches. It was discovered that Mimusops elengi's bark was abundant in tannin, saponin, alkaloids, and glycosides, making it a useful natural antioxidant source. There are a number of drawbacks to the traditional therapies for anxiety and convulsions, especially in terms of adverse effects. Because of its multifaceted methods and few side effects, natural therapies have seen an increase in popularity. The goal of the study was to evaluate the anticonvulsant properties of bark extracts from Mimusops elengi in methanolic, aqueous, and n-butanolic forms at dosages of 50,100 and 200 mg/kg, in that order. The study concluded that there was strong anticonvulsant activity in the methanolic extract (MEME), aqueous extract (AQME), and n-butanolic extract (NBME). These findings imply that these extracts might be useful substitutes for conventional treatments of convulsive diseases(34).

13 Antianxiety activity:

examined the traditional applications of Mimusops elengi bark as a febrifuge, tonic, and treatment for inflammation and odontopathy. Additionally, this plant portion has been used in Thai traditional medicine as a neurotonic remedy and a way to rejuvenate. They also looked into Mimusops elengi's possible acetylcholinesterase inhibitory action. The effects of Mimusops elengi bark in reducing anxiety-related conditions are not well documented in scientific literature, despite the plant's extensive traditional applications. Thus, their study used the elevated plus maze test in Swiss albino mice to evaluate the anti-anxiety effects of methanolic, aqueous, and n-butanol extracts made from the bark of Mimusops elengi. The animals were given different dosages of the test extract. The findings showed that at 50, 100, and 200 mg/kg of the methanolic extract, the aqueous extract at 100 and 200 mg/kg, and the anxiolytic effects of the n-butanol extract at 200 mg/kg. In contrast to the aqueous and n-butanol extracts, the methanolic extract at a dosage of 200 mg/kg exhibited noticeably stronger anxiolytic activity. Furthermore, it was discovered that the methanolic extract's anxiolytic effects at 200 mg/kg were equivalent to those of diazepam(34).

14Anthelmintic Activity

investigated the anthelmintic properties of the crude methanolic extract and its fractions made from the leaves of Mimusops elengi. Adult earthworms were used in this study, specifically The test participants were Pheretima posthuma. The findings demonstrated that the earthworms were paralyzed and killed by the methanolic extract and the ethyl acetate fraction of the leaves, especially at higher dosages. These outcomes were contrasted with those of distilled water and the common anthelmintic medication albendazole. In a separate investigation, a methanolic bark extract was used at different concentrations (25, 50, and 100 mg/ml) to evaluate the anthelmintic efficacy of Mimusops elengi against earthworms, specifically Pheretima posthuma. Anthelmintic action was demonstrated in this study. Furthermore, a different study revealed that ethanolic and aqueous extracts of Mimusops elengi showed anthelmintic qualities that prevent adult earthworms of the redworm (Eisenia foetida) species. When the concentration reached 4 mg/ml or above, several effects were noted(35).[

15 CNS depressant activity:

Investigated Mimusops elengi's methanolic bark extract's possible analgesic and neuropharmacological effects on mice at doses of 100 mg/kg, body weight at 200 and 400 mg/kg. Tail immersion and acetic acid-induced writhing tests were used to measure analgesic activity. The effects of the extract on the central nervous system (CNS) were investigated using open field and hole cross tests. Comparing the extract to the control group in the tail immersion test revealed a significant increase in the mice's tail-licking time, which was dose-dependent ($p < 0.05$-0.001). The 400 mg/kg dose of the extract showed a significant 65.48 percent ($p < 0.001$) suppression of writhing in the acetic acid-induced writhing test when compared to the control, while the Diclofenac-Na, the reference medication, inhibited writhing by 76.36%. The extract considerably ($p < 0.05$-0.001) decreased the mice's motor activity and exploratory behavior in the hole cross and open field tests in the CNS depressant activity tests. These results imply that the extract has both analgesic and central nervous system depressing qualities(36).

CONCULSION

Mimusops elengi is a promising medicinal plant with a wide range of pharmacological activity that has been used traditionally, according to the review above. However, the researchers discovered a number of new activities following the identification of several never compound from the plant, and as a result, the plant is now gaining prominence on order to produce further new searches for future development by comprehending the gene level study. Thus, there is a lot of room for more research on mimusops elengi given its many therapeutic applications.

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HOW TO CITE: Ashwini Manjrekar*, Pratiksha Rathod, Shilpa Borkar, Jagdish Baheti, Phytochemical & Pharmacological Profile of Mimusops Elengi: A Review, Int. J. of Pharm. Sci., 2025, Vol 3, Issue 4, 1525-1537 https://doi.org/10.5281/zenodo.15202936