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Review Article

Harnessing the Medicinal Properties of *Premna esculenta* for Diseases and Beyond: A Review of Its Phytochemistry and Pharmacology

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Abstract: *Premna esculenta* is a shrub from the *Verbenaceae* family that has historically been utilized by tribal people to cure a variety of inflammatory disorders. All of the pharmacological and phytochemical research done on the significant medicinal plant *Premna esculenta* has been attempted to be compiled in the current review. Traditional uses of *Premna esculenta* include the treatment of rheumatism, asthma, eye diseases, cough, fever, boils, and scrofulous disorders. The various plant components, including the leaves, stem, barks, roots, barks, and wood, have all been employed for extraction. Alkaloids, terpenoids, phenolic compounds, flavonoids, and amino acids make up the majority of the chemical components or secondary metabolites identified. Pharmacological activities like analgesic, antioxidant, anti-inflammatory, anti-hyperlipidemic, sedative, and hepatoprotective are mostly observed during *in-vitro* and *in-vivo* evaluation. Through a review of various studies conducted on *Premna esculenta*, this study has primarily focused on various pharmacological actions and medicinal uses.

Keywords: *Premna esculenta*; Phytochemistry; Pharmacology.

1. Introduction

Traditional pharmacological treatment for a variety of common liver problems, such as viral hepatitis and nonalcoholic fatty liver disease, has a poor success rate and adverse effects that could be fatal. Contrarily, traditional treatments have been used by many individuals around the world for a long time to cure liver problems without having any discernible adverse effects [1]. As a result, in order to replace the medications now in use and achieve greater efficacy and safety, it is required to look into different and supplementary medicine (CAM), particularly a natural remedy for liver disease illness [2]. World health has benefited greatly from medicinal plants. Many different botanicals have had their healing powers identified by science, and their active ingredients have been taken

out and examined. Today, many plant components are produced in sizable labs for use in medicinal treatments. However, the potential of many plant species as a source of novel medications is still largely untapped. *Premna esculenta Roxb*, a member of the Lamiaceae family of shrubs, is one of the covered shrubs that Bangladeshi tribal people have traditionally utilized to cure a variety of inflammatory illnesses. A thorough examination was conducted to check the phytochemical and pharmacological activity of various fractions of *Premna esculenta* in light of the extensive potential for using plants as sources for medications as well as the traditional usage prevalent in the area. In the forests of Bangladesh specially in Chittagong and Chittagong Hill Tracts, A shrub with short stems and branching is called *Premna esculenta Roxb*. (Family *Verbenaceae*) [3]. The herb often referred to as "Lelompata," has long been used by tribal people in Bangladesh to cure Jock worm and appetite infection, frenzy, hepatic, yellow fever, fluoralbus, tumor, swelling, serpent bite, abdomen ailments, and kidney stones. Consequently, for the treatment of bacterial and fungal infections, arthritis, and other conditions, the plant's leaves are applied directly to the area. That is afflicted in traditional medicine. To treat gout, edema, andjaundice, roots are frequently combined with other plants. In Khagrachari in Bangladesh, the leaves are one of the components of amedication used to treat jaundice. For jaundice patients in the Chittagong Hill Tracts, leaves boiled with a Nappi-a fermented paste made from different marine fish species are a crucial part of their diet [4]. The purpose of this review is to provide support for research work to explore the plant's uses, importance, phytochemistry and pharmacology.

2. Materials and Methods

2.1 Literature search strategy

The literature survey on *Premna esculenta* was carried out in the following databases: Google Scholar, PubMed, Research Gate, Science Direct and other applicable distributed materials. The data extraction and the selection criteria are mentioned in **Figure 1**.

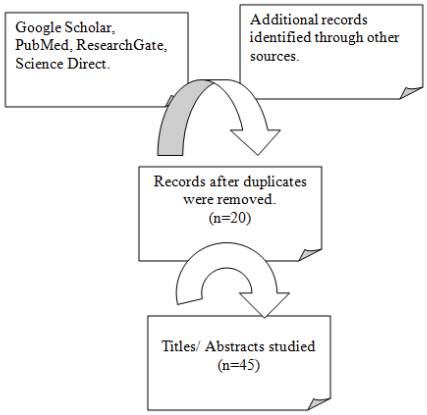

Figure 1: Flow chart of data extraction

3. Results

3.1 Botanical Description

The *Premna esculenta* shrub grows to a height of 6 to 8 feet, with a short, hair less stem, and thin, sharply four-edged branches and branch lets. Flowers are produced in corymbs made up between 4–8 opposing cymes that are velvet-hairy, measuring around 4-6 cm wide, and have four-edged stalks that are 1-2 cm long. They are present in the leaf axils and where a branch ceases to grow. Flowers are heterosexual, numerous, emerald green, and cream-colored, with 3 sprigs of flowers, cup-shaped sepals, 5 teeth, blunt teeth, and a pointed tip. The outside of the flowers is velvet-hairy. Funnel-shaped flower with two lips, 4 lobes, and lobes that are ovate to oblong in shape with blunt tips. Stamens are four, didynamous, and slightly protruding, and their filaments are thread-like and without hair, and roughly 1.5 to 2.5 mm in length. The blooming tube is slender and heavily velvet-haired at the neck, and around 3 to 4 mm in length. Simple opposite leaves are obovate-elliptic, elliptic-lance-shaped, 6–16 x 3–8 cm in size, with 4–7 on either side of the midvein, lateral veins. When young, the underside of the hair is pale yellowish velvet, and when fully grown, bald. The 0.4-0.7 cm long leaf stalks are thin. A drupe is a kind of fruit that is smooth, purple, and roughly 3 mm in diameter and has five lobed sepals that are used for fruiting.

3.1.1 Scientific Classification

Class: Magnoliopsida; Subclass: Lamiidae; Order: amiales; Family: Lamiaceae; Genus: *Premna;* Species: *Premna esculenta Roxb*. [5]

3.1.2 Typical Name

Common Name: Edible Premna; Bengali Name/Verncular: Lemon pata, Lalana, Lalong; Mizo: Lei-dum; Tamil: Atomukam, Tichamitam, Tichamitamaram; Telugu: Gabbunelli

3.1.3 Synonyms:

Gumira esculenta

There are several more names for it, including Lahanashak (Marma), Lamur (Marma), Angklung-gam (Khumi), Unarei (Bawm), Orai (Tripura), Kamrah (Marma), and Kramer-Rauh some of the Chakma people (Marma). Ailments are treated using leaf paste, leaf curry, or leaf boiling.

Figure 2: *Premna esculenta leaves*

4. Discussion

4.1 Phytoconstituents

The freshly acquired crude extract was qualitatively analyzed for the existence of several phytochemical components including alkaloids, tannins, reducing sugar, flavonoids, steroids, terpenoids, and saponins using known phytochemical methods [6, 7].

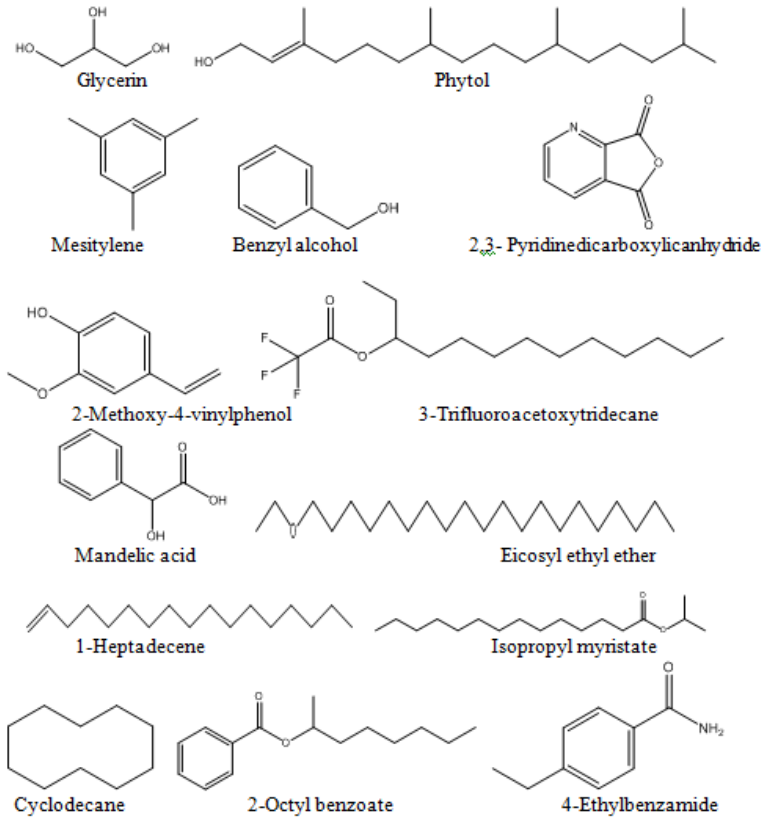

Figure 3: Reported chemical constituents of GC-MS analysis from methanolic extract of *Premna esculenta* [8]

4.*2 Pharmacological Activity*

Table 1: Reported pharmacological activity with possible mechanism of action of *P. esculenta*

Dose	Type of Activity	Type of assay	Mechanism of action	Ref.
In vitro and *In vivo* study 200 and 400 mg/kg	Hepatoprotective	Experimental animals (rat)	By reducing the elevated levels of serum enzyme, albumin, total protein, ALP	17
4.846±0.81 µg/ml	Thrombolytic	Clot disruption	Selectively bind to platelet thrombi Broad spectrum activity against human and plant pathogen	15, 16
500 µg/mL ± 0.977 µg/ml	Anti-oxidant	DPPH radical scavenging	Scavenging free radical	18
(20 µg/mL)	Anti-oxidant	DPPH	Free radical scavenging	18

4.2.1 Analgesic, anti-inflammatory, and anti-nociceptive properties

Animal models were used to assess the analgesic and anti-inflammatory effects of *P. esculenta* alcohol extract. Rats and mice were used in the radiant heat tail-flick method to assess the analgesic activity [9, 10]. To test the effectiveness of the anti-inflammatory, carrageenan-induced rat paw edema was utilized [11]. In the acetic acid-induced writhing test, chloroform and the ethyl acetate fraction of the ethanolic extract at a dose of 200 mg/kg showed a significant ($p< 0.001$) reduction in the number of writhes with 85.96 % and 61.98 % of inhibition, respectively. The extract of ethanol extended the tail-flicking period such as

88.49 % ($p< 0.001$) in the radiant heat tail-flick technique 90 minutes following oral administration of the same dosage rate. The ethanolic extract performed well in the carrageenan-induced edema test at a concentration of 200 mg/kg shown in the first and third hours of the research period, respectively, and saw significant suppression of paw edema with 22.68 % and 17.24 % inhibition [12].

4.2.2 Sedative Activity

The ethanolic extracts of root (200 mg/kg) similar leaf (200 mg/kg) of *P. esculenta* showed a substantial ($p< 0.05$ and $p <0.001$) decrease in the start and length of thiopental sodium-induced sleepiness. Administration such as 200 mg/kg *p.o.* of *P. esculenta* leaf extract of ethanolic. Pentobarbitone substantially ($p<0.01$) increased the length of produced sleep by 178 %. Pentobarbitone's ability to prolong the time spent sleeping caused by barbiturates and a considerable reduction in spontaneous motor activity (reduced locomotion) both pointed to the existence of substances in *P. esculenta* leaves that have a central nervous system (CNS) depressive effect [13, 14].

4.2.3 Thrombolytic Activity

By using an *in vitro* clot lysis model, the thrombolytic activity was assessed [15, 16]. The capability of an *in vitro* ethanolic extract from *P. esculenta* roots to dissolve blood clots. The ethanolic extract at 5 mg/mL significantly increased the amount of clot lysis activity (37.69 %, $p< 0.001$) in the clot lysis model. The plant extract's thrombolytic action was quick and dose-related, demonstrating that the impact was real and targeted. It is significant that *P. esculenta* has thrombolytic activity since it might significantly affect cardiovascular health.

4.2.4 Hepatoprotective Activity

The anti-hepatoprotective activity of *P. esculenta* was tested against rat liver damage brought by only carbon tetrachloride and assessed using the methodology outlined in [17]. Against the CCl_4-treated control group, oral administration of the ethanolic extract at a dose of 400 mg/kg/day for seven days substantially ($p<0.001$) decreased the elevated levels of serum alkaline phosphatase, glutamyl oxaloacetate transaminase, and glutamic pyruvic transaminase.

4.2.5 Anti-oxidant Activity

Anti-oxidant activity of the *P. esculenta* plant had already determined ethanolic preparations of plant leaves and roots have free radical scavenging properties that include the 1-diphenyl-2-picrylhydrazyl 1,1-diphenyl-2-picrylhydrazyl, a stable radical (DPPH). Extracting leaves with ethanol and roots has been observed to have Potential free radical scavengers: DPPH, superoxide, and NO using the *in vitro* extracts from plants with antioxidant properties[18]. The extract substantially ($p<0.001$) decreased the very high rate of SGPT, SGOT, and ALP and

enhanced the lowered amounts of albumin and total protein compared to the CCl_4-treated rats at dosages of 200 and 400 mg/kg p.o. Superoxide dismutase (SOD), catalase, and peroxidase decreased levels were also significantly increased (p<0.001) inside the extracts.

4.2.6 Anti-hyperlipidemic Activity

Premna esculenta (Roxb.) leaves and roots were used to create hyperlipidemic rats and mice, and their antihyperlipidemic efficacy was tested using ethanolic extracts of the plant's leaves and roots [19]. After a 24-hour treatment period, the ethanolic extract of leaves caused a significant (p<0.05) decrease in serum levels of triglycerides (TG), low-density lipoprotein (LDL), very low-density lipoprotein (VLDL), total cholesterol (TC), and atherogenic index when compared to the P-407-induced hyperlipidemic control mice. At a dosage of 250 mg/kg/day p.o., the leaf and root extracts significantly (p<0.05) decreased the blood levels of TC, TG, VLDL, and LDL as well as the atherogenic index as compared to P-407-induced hyperlipidemic control rats after 4 days of pretreatment.

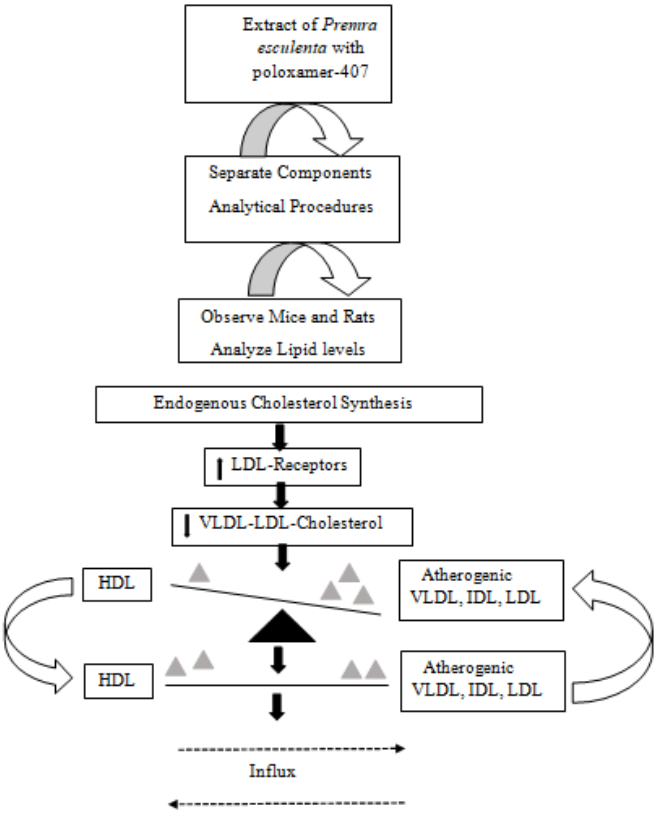

Figure 4: *Premna esculenta* in Poloxamer-407 induced hyperlipidemic mice and rats

5. Conclusion

A review of the literature revealed that *P. esculenta* contains a broad variety of pharmacological qualities that enable that to successfully cure several illnesses. *P. esculenta* is a significant herb with numerous beneficial medicinal qualities. The use of plant extracts for various therapeutic purposes, such as anti-nociceptive and anti-inflammatory, had been successfully identified, as having sedative activity, analgesic, antioxidant, thrombolytic, hepatoprotective, and antihyperlipidemic action. A proper assessment of the plant's use in medicine may be encouraged by the study's phytochemistry and various biological properties of the extracts and constituents.

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Conflict of interest statement

Authors declare no conflict of interest

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Ethical approval

This article does not contain any studies with human participants or animals performed by any of the authors.

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References

1. Umer, S., Asres, K., Veeresham, C. Hepatoprotective activities of two Ethiopian medicinal plants. *Pharm. Biol.* 2010; 48:461–468.
2. Mitra, S.K., Seshadri, S.J., Venkataranganna, M.V., Gopumadhavan, S., Udupa, V.U., Sarma, D.N. Effect of HD-03-a herbal formulation in galactosamine-induced hepatopathy in rats. *Indian J. Physiol. Pharmacol.* 2000; 44:82–86.
3. Uddin, S.N. Traditional uses of ethnomedicinal plants of the Chittagong Hill Tracts. 1st ed. Dhaka: Bangladesh National Herbarium; 2006.
4. Yusuf, M., Begum, J., Hoque, N., Chowdhury, J.U. Medicinal Plants of Bangladesh. 2nd ed. Chittagong: BCSIR Laboratories Chittagong; 2009.
5. Kabra, A., Kabra, R., Baghel, U.S. Premna Species: A Review, *J. Biol. Chem. Chron*. 2015, 1(1); 55-59.
6. Ghani, A., Medicinal plants of Bangladesh with chemical constituents and uses, 2nd ed, Asiatic Society of Bangladesh, Dhaka, 2003, 331-332.
7. Trease, G.E., Evans, W.C., A text book of pharmacognosy, 11th ed, Brailliar Tindall Ltd., London, 1989; 176-180.
8. Shaily, J.F. Investigations of chemical and biological activities of ethanolic extract of *Premna esculenta*. B. Pharma Project, Deptartment of Pharmacy, Primeasia University, 2023
9. Koster, R., Anderson, M., De Beer, E.J. Acetic acid for analgesic screening, *Fed. Proc.*, 1959; 18: 412-417.

10. Altun, M.L., Citoglu, G.S., Yılmaz, B.S., Ozbek, H. Antinociceptive and anti-inflammatory activities of *Viburnum opulus*. *Pharmaceut. Biol.* 2009; 47:653–658.
11. Winter, C.A., Risley, E.A., Nuss, G.W. Carrageenan-induced edema in the hind paw of the rat as an assay for anti-inflammatory drugs. *Proc. Soc. Exp. Biol. Med.* 1962; 111:544–547.
12. Yesilada, E., Kupeli, E. *Berberis crataegina* DC. root exhibits potent anti-inflammatory, analgesic, and febrifuge effects in mice and rats. *J. Ethnopharmacol.* 2002; 79:237–248.
13. Gupta, B.D., Dandiya, P.C., Gupta, M.L., A psychopharmacological analysis of behavior in rat. *J. Pharmacol.* 1971; 21: 293-298.
14. Takagi, K., Watanabe, M., Saito, H., Studies on the spontaneous movement of animals by the hole cross test: Effect of 2-dimethylaminoethanol and its acyl esters on the central nervous system. *Jpn. J. Pharmacol.* 1971; 21 (6): 797-810.
15. Prasad, S., Rajpal, S.K., Jayant, Y.D., Hemant, J.P., Girdhar, M.T., Hatim, F.D. Development of an *in vitro* model to study clot lysis activity of thrombolytic drugs. *Thrombosis J.* 2006; 4:14.
16. Ratnasooriya, W.D., Fernando, T.S., Madubashini, P.P. *In vitro* thrombolytic activity of Sri Lankan black tea, *Camellia sinensis* (L.) O. Kuntze. *J. Nat. Sci. Found. Sri Lanka* 2008; 36:179–181.
17. Ahmed, B., Alam, T., Khan, S.A. Hepatoprotective activity of *Luffa echinata* fruits. *J. Ethnopharmacol*. 2001; 76:187–189.
18. Brand-Williams, W., Cuvelier, M.E., Berset, C. Use of a free radical method to evaluate antioxidant activity. *LWT Food Sci. Technol.* 1995; 28:25–30.
19. Yogendrasinh, B.S., Sunita, M.J. Antihyperlipidemic activity of *Clitoria ternatea* and *Vigna mungo* in rats. *Pharm. Biol.* 2010; 48:915–923.