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AEGLE MARMELOS (LINN.) CORREA EXTRACT: A COMPREHENSIVE REVIEW ON PHYTOCHEMICAL AND PHARMACOLOGICAL ACTIVITY

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ABSTRACT

Aegle marmelos (L.) Corrêa, commonly known as Bael or Bengal quince, is a significant medicinal plant in traditional systems of medicine such as Ayurveda and Unani. It is valued for its broad spectrum of therapeutic properties, which are attributed to its diverse array of bioactive phytochemicals. Phytochemical analyses have revealed the presence of alkaloids, flavonoids, tannins, saponins, coumarins, and essential oils in various parts of the plant, including the fruit, leaves, bark, and roots. Key constituents like marmelosin, aegeline, skimmianine, and rutin are linked to the plant's medicinal efficacy. Pharmacological studies have demonstrated that Aegle marmelos possesses a wide range of biological activities, including antimicrobial, antidiabetic, anti-inflammatory, antioxidant, hepatoprotective, gastroprotective, and anticancer properties. The present review articles summarizes and focused to explore the different pharmacological activities of Aegle. marmelos plant.

KEYWORDS: *Aegle marmelos*, alkaloids, phytochemical, coumarins, tannins and pharmacological activities.

INTRODUCTION

Thousands of years Aegle marmelos have been used as a natural source of medicinal compounds. Man is using numerous herbs and plant extract to cures and relief from various physical and mental illness. These herbs are used in traditional Chinese, Ayurveda, Siddha, Unani and Tibetan medicines. Ancient literature such as Rigveda, Yajurveda, Atharvaveda, Charak Samhita and Sushrut Samhita also describe the use of herbs for the treatment of various health problems.*Aegle marmelos (L.)* commonly known as Bael belonging to the family Rutaceae has been widely used in indigenous systems of Indian medicine due to its various medicinal properties. *A. marmelos* is native to Northern India, but widely found throughout the Indian Peninsula and in Ceylon, Burma, Bangladesh, Thailand and Indo. It is a medium to large sized deciduous glabrous, armed tree with the axillary and 2.5 cm long alternate trifoliate leaves, short flower and globular fruits. Bel is a sacred tree native to India and has great aesthetic value among Hindus as tree is worshiped in rituals by masses.

Fig. No. 1: *Aegle marmelos* Fruit.

Taxonomical Classification

• English:	Bael Tree, Bael Fruit, Bengal quince, Elephant Apple, Golden Apple, Holy Fruit, Indian Bael, Indian Quince, Stone Apple, Wood Apple
• French:	Bel Indien, Cognassier du Bengale, Oranger du Malabar
• Bengali:	Bel
• Central Khmer:	Bnau
• German:	Baelbaum, Belbaum, Schleimapfelbaum
• Gujarati:	Bili
• Hindi:	Bel
• Indonesian:	Maja Batuh
• Javanese:	Modjo
• Lao:	Toum
• Malay:	Bilak
• Malayalam:	Vilvam
• Portuguese:	Marmelos
• Tamil:	Vilvam
• Thai:	Matum
• Vietnamese:	Trai mam

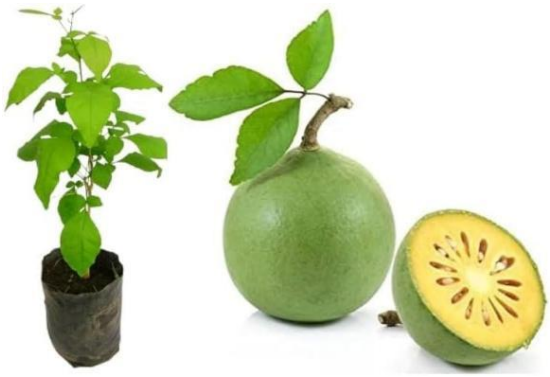

Fig No:2 Aegle marmelos plant.

Fig no: 3 Aegle Marmelos fruit, flowers and seeds.

PHYTOCHEMISRY OF *Aegle marmelos*

Aegle marmelos having a variety classes of compounds like alkaloids, cardiac glycosides, saponins, steroids, coumarin's, terpenoids, phenylpropanoids, tannins, polysaccharides, vitamins, carbohydrate, coumarin, flavonoids, fati acid and essential oil which are obtained from the different parts of tree.

PHARMACOLOGICAL PROPERTIES OF *Aegle marmelos*

Aegle marmelos is one of the most widely used medicinal plant in the family Rutaceae. In recent history this plant is reported for various medicinal properties. In recent history this plant is reported for various medicinal properties.Various study of different pharmacological activities of *Aegle marmelos* mention bellow in details.

Anticancer activity

It investigated *the A. marmelos* can be an effective weapon to boost our healing process in fighting cancer disease. Studies showed that plant extract can inhibit the increase of leukemic K562, T-lymphoid Jurkat, B-lymphoid Raji, erythroleukemia HEL, melanoma Colo38, and breast cancer cell lines MCF 7 and MDA-MB-231. phytochemicals present in the plant such as lupeol, eugenol, citral, cineole and d-limonene present can show antineoplastic effects. reported that the Most of the potent antineoplastic drugs available are expensive, mutagenic, and teratogenic inducing drugs derived from natural sources (paclitaxel). Hence attention is being given to developing inexpensive and nontoxic drugs from alternate sources. The extracts of *A. marmelos* were tested for cytotoxicity using brine shrimp lethality assay; sea urchin eggs assay, and MTT assay using tumor cell lines.

Antiulcer activity

It was demonstrated Methanolic extract of unripe fruit of *Aegle marmelos* reduced gastric ulceration and prevent the oxidative stress caused by Helicobacter Pylori-Lipopolysaccharide in rats. investigated that Bael plant also demonstrates anti-ulcer activity. In a study, the ulcer was artificially induced by using indomethacin, stress, and pylorus. Methanolic showed potential anti-ulceration impact with a significant p-value of 0.05. It even reduces gastric juice amount, free acidity and increased pH.

Guttle Sakshi Hanumant et al., (2020) concluded that ulcer is a result of the defensive failure of mucosal layer of the GIT, it is due to imbalance between defensive and attacking factor like acid. There are several factors which induced peptic ulcer like H.pyloribacteria, acid secretion, drinking of alcohol, smoking and many more Moreover the recurrence of ulcer after stopping medicine is high. About 70% of ulcer could recur. An infusion of *Aegle marmelos* leaves is an effective remedy for peptic ulcer.

Antinflammatory activity

It suggested that the anti-inflammatory properties of the aqueous extract of *A. marmelos* dried flowers are investigated in Wistar rats. The anti-inflammatory effects of water extract were most effective at 200 mg/kg two hours after administration. evaluated anti- inflammatory activitiy of different extracts of the leaves of *Aegle marmelos* The extracts produced significant inhibition of the carragenin-induced paw edema and cotton pellet granuloma in rats. The leaves exhibited antiinflammatory property due to presence of lupeol, skimmianine.

Antidiabetic activity

Concluded that the Leaf extract of *A. marmelos* is an important medicine for the treatment of diabete Bae leaf extract significantly decreases the levels of blood urea and cholesterol and also decreases oxidative stress in experimental diabetic animals, it is indicated by significant reduction in lipid peroxidation, conjugated diene and hydroperoxide level and increased levels of various enzymes like superoxide dismutase, catalase, glutathione peroxidase, and glutathione levels in serum as well as liver repoered that the *A. marmelos* fruits were more effective at enhancing glucose uptake by yeast cells as compared to the common medicine ‘metformin.’

Antihyperglycemic activity

Reported that the ethanolic extract of *Aegle marmelos* leaves possess antihyperglycemic activity when administered orally at 250 and 500 mg/kg to diabetic rats. Anoticeable decrease in glucose absorption and inhibition of both α amylase and intestinal disaccharidase enzyme activity were observed due to inhibition of carbohydrate digestion and absorption, and improvement of insulin action to uptake glucose in peripheral tissue. concluded The recent study revealed that leaf juice of *A. marmelos* was effective in diabetes mellitus and possibly it was due to presence of bioactive components, aegelin, scopoletin and sitosterol in the leaves. indicated the Oral administration of aqueous extract of bael fruits and seeds separately to a dose of 250 mg/kg to streptozotocin-induced diabetic rats significantly lowered the serum and tissue lipid profile.

Antimicrobial activity

Demonstrated that the Antimicrobial activity of the plant ingredient was tested. To test this agar wall diffusion method was followed. Constituents such as aqueous, petroleum ether and ethanol extract of the leaves presented efficient antimicrobial activity. reported the methanol extract of bilwa has high antimicrobial activity against Basillus subtitlis, Staphylococcus aurens, Klebsiella pneumonia, Proteus mirabilis, Escherichia coli, Salmonella paratyphi Aand Salmonella paratyphi B. Also, the antimicrobial activity of different extracts was evaluated by agar well diffusion method.

Hepatoprotective activity

Reported that leaves, seed and pulp of fruit of *A. marmelos* shows hepatoprotective activityThe methanolic leaves extract of *Aegle marmelos* @500 mg/kg possess hepatoprotective activity against paracetamol induced hepatotoxicity in rats. concluded the hepatoprotective activity of *A. marmelos* aqueous extracts at different doses, which indicate toxicity in mice. Various biochemical parameters of blood and tissue such as AST, ALT, SALP, cholesterol, triglycerides, urea, LPO, GSH, ATPase, G-6-Pase, SOD, and CAT are changed after CCl4 administration. In conclusion, the aqueous extract of *A. marmelos* may be able to cure liver damage in mice induced against CCl4. It may also be mediated through antioxidant activity.

Anxiolytic and Antidepressant activity

It demonstrated The methanolic leaves extract of *A. marmelos* possess anxiolytic and antidepressant activity and it enhances anxiolytic and antidepressant activity of imipramine and fluoxetine. concluded that aqueous extract of *Aegle marmelos* possess potential antidepressant effect when comparable to that of tablet Fluoxetine The antidepressant effect of Aegle marmelos was evaluated using tail suspension test (TST) and the decrease in duration of immobility was compared with the standard drug Fluoxetine. investigated that Fruit pulp extract (300 mg/kg) of *A. marmelos* has demonstrated maximum antidepressant activity in FST and SID models, which was comparable to standard drug.

Antifertility activity

It Investigated That *A. marmelos* leaf, seed and fruit is known to affect male fertility in reversible manner. A. marmelos bark extract is a rich source of marmin and fagarine known for reducing male fertility. Demonstrated *A. marmelos* bark, two chemical compounds such as marmin and fagarineare present which is claimed to beresponsible for the reduction of male fertility. According to methanolic extract of *A. marmelos* reduces reproductive organ weight and serum testosterone levels.

Antiviral activity

It investigated that effect of various extracts of bael also acts on the late protein synthesis were studied to evaluate its degree of potentiality as an antiviral agent. The 50% ethanolic extract of the fruits has shown antiviral activity against Ranikhet disease. The fruit extract has exhibited interferon-like activity against the same virus but not showed an activity against vaccinia virus. So that the bael has better viricidal activity. It evaluated that Hydro alcoholic extract of wooden apple produces antiviral

activity against Ranikhet disease virus. Interferon like activity against the same virus is also reported. Thus, wooden apple can be used as a better viricidal potential and may be exploited as a potent antiviral agent in near future.

CONCLUSION

Aegle marmelos is an important medicinal herb and extensively used in Ayurveda, Siddha and other medicinal systems. The different parts of this plant such as leaf, fruit, seed, bark and root are used to cure a variety of diseases. The *A. marmelos* contains Number of biologically active compounds which are isolated from various parts of *A. marmelos*. The isolated compounds are Alkaloids, Terpenoids, Vitamins, Coumarins, Tannins, Carbohydrates, Flavonoids, Fatty Acids, Essential Oils and some other miscellaneous compounds. Which are responsible for various pharmacological activities such as Antioxidant, Antibacterial, Antifungal, Antidiarrheal, Antidiabetic, Cytoprotective, Hepatoprotective, Antifertility, Anticancer, Antiviral and Wound Healing along with other several medicinal propertie. It is wounder plant and will indeed be the life saving plant of the 21st century. This review mainly focused on several phytochemical and reported pharmacological studies of *Aegel marmelos.*

REFERENCES

1. Jhansi Lakshmi, Syamala. R Santhosh Kumar Ranajit. A Review On Pharmacological Effects Of Bilwa: *Aegle Marmelos L*. (Rutaceae) Journal home page: Am. J. PharmTech Res., 2021; 11(2): ISSN: 2249-338.
2. Ghumare Pramila, Dattatraya Jirekar. A Review on Pharmacological Properties of *Aegle marmelos* Int. J. Pharm. Sci. Rev. Res., November–December. 2020; 65(2): 07: 40-43 ISSN 0976.
3. Ghutale sakshi hanuman Prajakta kailas, shinde Aishwarya Avinash, Musmade Deepak Sitaram *aegle marmelos*: multieffective V medicinal treewww.ijcrt.org 2020 ijcrt, september 2022; 8(9). issn: 2320-2882.
4. Kirbag, S. E. V. D. A., Zengin, F. and Kursat, M. Antimicrobial activities of extracts of some plants. Pakistan journal of botney, 2009; 41(4): 2067-2070.
5. Ansari, P., Afroz, N., Jalil, S., Azad, S. B., Mustakim, and Hannan, J. M. A. Antihyperglycemic activity of *Aegle marmelos (L.)* corr. Journal of Pediatric Endocrinology and Metabolism, 2017; 30(1): 37-47.
6. Sheng Y., Zheng S., Ma T., Zhang C., Ou X., He X., Xu W., Huang K. Mulberry leaf alleviates streptozotocin-induced diabetic rats by attenuating NEFA signaling and modulating intestinal microflora. Sci. Rep., 2017; 7: 12041. doi: 10.1038/s41598-017-12245-2.
7. Vijay D. Havaldar, et al, A Systematic Review on *Aegle marmelos* (Bael), Research Journal of Pharmacognosy and Phytochemistry, January - March, 2020; 12(1).
8. Kausik Bhar, Sumanta Mondal, Padilam Suresh, An Eye-Catching Review of *Aegle marmelos L.* (Golden Apple), Pharmacogn J., 2019; 11(2): 207- 224.
9. Desai nilesh V et al, A review on *aegle marmelos*: A potential medicinal tree International research journal of pharmacy, 2012; 3(8).
10. Mujeeb F, Khan AF, Bajpai P, Pathak N. Phytochemical Study of *Aegle marmelos*: Ch Pharmacognosy Magazine, 2017; 13(52): 791-800.