

## Original Research Article

# Isolation and Characterization of Medicinal Compounds from Acetone, Ethanol, Methanol Extract of *Aegle marmelos*, (L.) Corr

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## ABSTRACT

In recent times, focus on plant research has increased all over the world and a large body of evidence has collected to show immense potential of medicinal plants used in various traditional systems. Over the last few years researchers have aimed at identifying and validating plant derived substances for the treatment of various diseases. Similarly it has been already proved that various parts of plants such as Leafs, fruits, seeds etc. provide health and nutrition promoting compounds in human diet. The Bael (*Aegle marmelos*) (L. Corr.) is another Indian plant, which has enormous traditional uses against various diseases. The present review aims to compile medicinal values of *Aegle marmelos* generated through the research activity using modern scientific approaches and innovative scientific tools. The effect of the *Aegle marmelos* leaf extract was investigated with various solvent acetone, ethanol and methanol were examined and concluded that the *Aegle marmelos* leaf extract possess alkaloids, emodins, ferric chloride, lead acetate, gelatin, phenolics, volatile oils etc. and it shows the absence for steroids, triterpenes, anthracene glycosides, xanthoproteins etc. Results of present investigation reveal that the employed extracts exhibit potential (Glucose level) diabetics' activity. The plant materials have these beneficial properties which can be used for various medicinal purposes and can use by pharmaceutical company. From the analysis it is true to be said that this medicine can be used to a large extent.

## Keywords

*Aegle marmelos*,  
Pharmacological  
Activities,  
Medicinal  
Values.

## Introduction

*Aegle marmelos* corrie commonly known as Bael (or bel) belonging to the family Rutaceae. Is a moderate sized, slender and aromatic tree. It is Indigenous to India and is abundantly found in the Himalayan tract, Bengal, Central and South India. It is extensively planted near Hindu temples for its wood and leaves which are generally used for worship.

The bark is soft, light grey and globes with woody rind and seeds are numerous. The roots are fairly large woody and often curved. Its fresh leaf juice is used in asthmatic complaints and jaundice. The Chinese used for dysentery, some of the compounds have been screened for bioactivity.

World is endowed with a rich wealth of medicinal plants. Herbs have always been the principal form of medicine in India and presently they are becoming popular throughout the world. As people strive to stay healthy in the face of chronic stress and pollution, and to treat illness with medicines that work in count with bodies own defenses. Medicinal plants have been used to cure a number of diseases. Although this plant is native to Northern India, it is also widely found throughout India Peninsula and in Ceylon, Burma, Thailand and Indo-china. *Aegle marmelos* tree is held sacred by Hindus and offered in prayers to deities lord shiva and Parvathi and thus the tree is also known by the name shivaduma (the tree of shiva). It is therefore widely cultivated and commonly found in the vicinity of temples. All parts of this tree, viz, root, leaf, trunk, fruit and seed are useful in several ailments. The major chemical constituents isolated from *Aegle marmelos* fruit are marmelosin, luvangetin, Psoralen, Tannins, marmin are listed below in the (table 1) and are the major topic.

Nature has provided a complete store house of remedies to cure ailments of mankind. About 80% of the world's population depends wholly or partially on traditional medicine for its primary health care needs (Biswas *et al.*, 2002; Chatopadhyay *et al.*, 2004). According to a survey (1993) of world health organization, the practitioners of traditional system of medicine treat about 80% patients in India, 85% in Burma and 90% in Bangladesh. The medicinal plants are rich in secondary metabolites and essential oils of therapeutic importance. Widely found throughout the Indian Peninsula and in Ceylon, Burma, Bangladesh, Thailand and Indo-China (Purohit *et al.*, 2004) medium to large sized deciduous tree with the auxiliary and 2.5cm long alternate trifoliate leaves short flower and globular fruits.

*Aegle marmelos* has useful effects in our body from the literature survey it has been found that most of the tribal people using the leaves for anti-diabetic, analgesic, anti-inflammatory, antipyretic, anti-cholesterol, anti-helminthic and antimicrobial activities. *Aegle marmelos* all parts of the tree are used in Ayurvedic preparation for various ailments. The unripe dried fruit is astringent, digestive and stomachic used to cure diarrhoea and dysentery (Watt, 1889). The ripe fruit is a good and simple cure for dyspepsia and the unripe and half-ripe fruits improve appetite and digestion (Jain, 1968; Jauhari *et al.*, 1969). The roots and the bark of the tree are used in the treatment of fever and to control pain in the abdomen. They are also useful in the disorders of Vata, pitta and kapha (Kirtikar and Basu, 1935). The leaves are made into a poultice and used in the treatments of ophthalmic. The rind of the ripe fruit is also sometimes used as a medicine (Dastur, 1962). Due to its high medicinal value this plant is being exploited to a larger extent by the drug and pharmaceutical industries. Micro propagation of elite genotype may play an important role in solving the problem through rapid multiplication. We report here an efficient propagation method for large-scale cultivation of this valuable tree species.

Wood apple is (*Aegle marmelos* L.) is an important tree species. There is wide genetic variability in terms of shape and size of the fruit (Bhati *et al.*, 1992). The plant has capacity to adapt successfully to a wide range of habitats from arid, semiarid, xerophytes to mesophytic soil. Almost all parts of the tree are used in preparing herbal medicine (Kala, 2006), an astringent, a digestive and stomachic used to cure diarrheal and dysentery (Watt, 1889).

The ripe eagle marvels fruit is used for curing dyspepsia (Jauhari *et al.*, 1969)

anaemia, asthma jaundice, diarrhea and typhoid. The *Aegle marmelos* leaves used in the treatment of diabetes. Medicinal plants are the local heritage with global importance. Herbal medicine or phytotherapy is the science of using herbal remedies to treat the diseases. The leaves are bitter and are used as a remedy for ophthalmia, ulcer, dropsy, cholera and beriberi. Plants have been utilised as a natural source of medicinal compounds since thousands of years.

## Materials and Methods

### Collection of plant materials

The plants were collected from Thanjavur district, Ariyalur district and Tamil Nadu state in India. The collected leaves were washed. Under running tap water to eliminate dust and other foreign particles and to cleanse the leaves thoroughly and dried.

### Preparation of plant extracts

Collected plants were cleaned, shade dried and ground as powder form. Then the samples were extracted by using different solvents. (Acetone, Ethanol and Methanol) in Soxhlet apparatus and concentrated by

using rotator evaporator.

## Qualitative Phytochemical Evaluation

The shade dried powder and various extracts of the leaves of *Aegle marmelos* were subjected to chemical tests for its active constituents. Identification of the chemical constituents was carried out on the same extract used in pharmacological tests according to the methodology proposed by (Chatopadhyay *et al.*, 2004) and (Upadhyay *et al.*, 2004)

## Result and Discussion

The main focus of the present work was phytochemical investigation of *Aegle marmelos*. The secondary metabolites were extracted from the leaves of *Aegle marmelos* through Soxhlet apparatus and screened by biochemical tests and identified the medicinal compounds. (Table 1)

The acetone extract showed the presence of fatty acids, FeCl<sub>3</sub>, volatile oil, alkaloids, emodins, phenolics, lead acetate and gelatin. It shows the absence of flavonoids, xanthoprotein, carbohydrates, steroids, anthracene, etc.

**Table.1** (Preliminary phytochemical screening of Acetone, Ethanol, Methanol *Aegle marmelos*)

Name of the test	<i>Aegle marmelos</i> Acetone extract	<i>Aegle marmelos</i> Ethanol extract	<i>Aegle marmelos</i> Methanol extract
Alkaloids	+	+	+
Emodins	+	-	+
Flavonoids	-	-	+
Steroids & Triterpenes	Both are absent	Both are absent	Both are absent
Phenolics	+	+	+
Volatile oils	+	+	+
1.FeCl <sub>3</sub>	+	+	+
2. Lead acetate	+	+	+
3.Gelatin solution	+	+	+
Anthracene Glycosites	-	-	-
Carbohydrates	-	-	-
Xanthoprotein	-	-	-

The ethanolic extracts were showed the presence emodins, FeCl<sub>3</sub>, alkaloids, emodins, phenolics, ferric chloride, lead acetate, gelatin result. The triterpenes, fatty acids, flavonoids, steroids, anthracene, xanthoprotein, carbohydrates are absence.

The methonolic extract was showed presence of alkaloids, emodins, xanthoprotein, carbohydrates, lead acetate, ferric chloride, phenolics, FeCl<sub>3</sub>, The steroids, triterpenes, anthracene are absence.

Man cannot survive on the earth for long life without plant Kingdom because the plant products and their active constituents play an important role (Sudharaneshwari and Radhika, 2007). Bael has enormous traditional uses against various diseases and many bio active compounds have been isolated from this plant also (Maity *et al.*, 2009).

The present study clearly indicated some of the important medicinal compounds of *Aegle marmelos*. Hence it is concluded that all the plant extract showed the better in hibitory effect in *Aegle marmelos*.

## References

- Biswas, K., Chatopadhyay, I., Banerjee, R.K., Bandhopadhyay, U. 2002. "Biological Activities and Medicinal Properties of neem (Azadirachta indica), *Curr. Sci.*, 82 Page No. 1336.
- Chatopadhyay, I., Biswas, K., Bandhopadhyay, U., Banerjee, R.K. 2004. "Turmeric and Curcumin: Biological actions and medicine of applications", *Curr. Sci.*, 87, Page No. 44.
- Badam, L., Bedekar, S.S., Sonawane, K.B., Joshi, S.P. 2002. "Invitro antiviral activity of Bael (Aeglemarmelos Corr.) Upon human Coxsacki viruses B1-B6, *J. Commun. Dis.*, 34 Page No.88.
- Gupta, A.K., Tondon, N. 2004. "Review on Indian medicinal plants", Indian council of medicinal research, NewDelhi, 312.
- C.S.I.R. 1985. "The wealth of India" National Institute of Science communication and Information Resources", Volume- I (A), 86.
- Purohit, S.S., Vyas, S.P. 2004. "In: Aeglemarmelos Correa ex Roxb, (Bael), Medicinal plant cultivation- A scientific approach", Agrobios, Jodhpur, 2004. P.P. 498-504.
- Maity, P., Hansda, D., Bandyopadhyay, U., Mishra, D.K. 2009. "Biological activities of crude extracts of chemical constituents of Bael, Aegle marmelos(L.) Corr." *Indian J. Experimental Biol.*, Vol 47, p.p. 849-861.
- Saswati Parichha. 2004. "Bael (Aegle Marmelos): Nature's Most Natural Medicinal Fruit", Orissa Review.
- Kar, A., Choudhry, B.K., Bandhopadhyay, N.G. 2003. "Comparative evaluation of hypoglycemic activity of some Indian medicinal plants in all oxandiabetic rats" *J. Ethnopharmacol.*, 84, Page No.105-108.
- Lampronti, I., Martello, D., Bianchi, N., Borgatti, M., Lambertini, E., Piva, R., Jabbars, S., Choudhuri, M.S., Khan, M.T., Gambari, R. 2003. "In Vitro anti proliferative effect on human tumor cell lines of extracts from the bangladesi medicinal plant *Aegle marmelos* Correa." *Phytomedicine*, 10, Page No. 300-308.
- Karunanayake, E.H., Welihinda, J., Sirimanne, S.R., Sinnadorai, G. 1984. "Oral hypoglycemic activity of some medicinal plants of Sri Lanka" *J. Ethnopharmacol.*, 11 Page No. 223-231. <http://www.hort.purdue.edu/newcrop/parmar/01.html/> accessed on 30.11.10, <http://www.indiamart.com/company/1753104/products.html> / Accessed on 30.11.10

- Upadhyaya, S., Shanbhag, K.K., Suneetha, G., Naidu, B.M., Upadhyaya, S. 2004. "A study of hypoglycemic and antioxidant activity of *Aegle marmelos* in alloxan induced diabetic rats", *Ind. J. Physiol. Pharmacol.*, 48, Page No. 476-480.
- Marzine, P.S., Gilbert, R. 2005. "The effect of an aqueous extract of *A.marmelos* fruits on serum and tissue lipids in experimental diabetes", *J. Sci. Food Agriculture*, 85(4), Page No.569-573.
- Sundaram, E.N., Raddy, Uma Maheswara, P., Singh, K.P. 2009. "Effect of Alcoholic Extracts of Indian Medicinal Plants on the Altered Enzymatic Activities of Diabetic Rats", *Indian J. Pharmaceutical Sci.*, 71(5): Page No.594-598.
- Kuttan, R., Sabu, M.C. 2004. "Antidiabetic activity of *Aegle marmelos* and its relationship with its antioxidant properties", *Indian J. Physiol. Pharmacol.*, 48(1): Page No.81-88.
- Hema, C.G., Lalitha kumara, K. 1999. "Screening of Pharmacological actions of *Aegle marmelos*", *Indian J. Pharm.*, 20, Page No.80-85.
- Singanani, V., Singanani, M., Begum, H. 2007. "The hepatoprotective effect of bael leaves (*Aegle marmelos*) in alcohol induced liver injury in albino rats"; *Int. J. Sci. Technol.*, 2(2): Page No. 83-92.
- Singh, R., Singh, H., Rao. 2008. "Hepatoprotective effect of the pulp/seed of *Aegle marmelos* correa ex Roxb against carbon tetrachloride induced liver damage in rats" *Int. J. Green Pharmacy*, Page No.232.
- Maheshwari, V.L., Joshi, P.V., Patil, R.H. 2009. "In vitro antidiarrhoeal activity and toxicity profile of *Aegle marmelos* Correa ex. Roxb. Dried fruit pulp", *Natural Product Radiance*, Vol 8 (5), Page No.498-502.
- Kaur, S., Kaur, P., Walia, A., Kumar, S. 2009. "Antigenotoxic Activity of Polyphenolic Rich Extracts from *Aegle marmelos* (L.) Correa in Human Blood Lymphocytes and *E.coli* PQ 37"; *Rec. Nat. Prod.*, 3: 1, Page No. 68-75.
- Citarasu, T., Rajajeyasekar, R., Venkatmalingam K., Dhandapani, P.S., Peter Marian, M. 2003. "Effect of wood apple *Aegle marmelos*, Correa (Diacotyledons, Sapindales, Rutaceae) Extract as an antibacterial agent on pathogens infecting prawn (*Penaeus indicus*) larviculture", *Indian J. Marine Sci.*, 32(2): Page No.156-161.
- Arul, V., Miyazaki, S., Dhananjayan, R. 2005. "Studies on the anti-inflammatory, antipyretic and analgesic properties of the leaves of *Aegle marmelos* Corr.", *J. Ethnopharmacol.*, 96(4): Page No.159-163.
- Ghangale, G.R., Surve, V.S., Anbarasan, K., Gatne, M.M. 2008. "Evaluation of *Aegle marmelos* (Bael) for anti-inflammatory activity in rats" *J. Bombay Veterinary College*, Volume: 16, Issue: 1.
- Shankarananth, V., Balakrishnan, N., Suresh, D., Suresh pandian, G., Edwin, E., Sheeja, E. "Analgesic activity of methanol; extract of *Aegle marmelos* leaves", *Fitoterapia*, Vol-78, Issue 3, Page No. 258-259.
- Patil, R.H., Chaudhary, B., Settipalli, S. 2009. "Antifungal and Antiaflatoxigenic activity of *Aegle marmelos* Linn.", *Pharmacognosy J.*, Volume 1, No.4.
- Rana, B.K., Singh, U.P., Taneja, V. 1997. "Anti-fungal activity and kinetics of inhibition by essential oil isolated from leaves of *Aegle marmelos*", *J. Ethnopharmacol.*, 57: Page No.29-34.
- Pitre, S., Srivastava, S.K. 1987. "Pharmacological, microbiological and phytochemical studies on the root of *Aegle marmelos*", *Fitoterapia*, 58: Page No.194.
- Latica, V., Costa, L. 2005. "Evaluation of anticancer potential used in Bangladesh folk medicine", *J. Ethnopharmacol.*, 99(1): Page No. 21-38.
- Jagetia, G.C., Venkatesh, P., Baliga, M.S.

2005. "Aeglemarmelos (L.) Correa inhibits the proliferation of transplanted Ehrlichascites carcino main mice", *Biol. Pharm. Bull.*, 28(1): Page No.58-64.
- Jagetia, G.C., Venkatesh, P. 2005. "Radio protection by oraladministrationof *Aegle marmelos* (L.) Correa in vivo." *J. Environ. Pathol. Toxicol. Oncol.*, 24, Page No.315-332.
- Jagetia, G.C., Venkatesh, P., Archana, P., Krishnan, B.R., Baliga, M.S. 2006. "Effects of Aeglemarmelos (L.) Correa on the peripheral blood and small intestine of mice exposed to gamma radiation", *J. Environ. Pathol. Toxicol. Oncol.*, 25: Page No.611-624
- Sur, T.K., Pandit, S., Pramani, k.T. 1999. "Antispermatogeticactivityofleavesof *Aegle marmelos*, Corr. in albino rats: A preliminary report", *Biomedicine*; 19, Page No.199-202.
- Pramanik, T., Sur, T.K., Pandit, S., Bhattacharyya, D. 2002. " Effect of *Aegle marmelos* leaf on rat sperm motility: An invitro study", *Indian J. Pharmacol.*, 34: Page No.276-277.
- Remya, M., Sharma, R.C., Shoaib, H., Asad, U.J.R., Singh, S. 2009. "Invitro effect of Aeglemarmeloson human sperm motility" *J. Med. Plants Res.*, vol.3(12): Page No. 1137-1139.
- Goel, R.K., Maiti, R.N., Manickam, M., Ray, A.B. 1997. "Antiulceractivityofnaturally occurring pyrano coumarin and isocoumarins and their effect on prostanoid synthesis using human colonic mucosa", *Indian J. Exp. Biol.*, 35, Page No. 1080-83.
- Dhuley, J.N. 2007. "Investigation on the gastroprotective and antidiarrhoeal properties of *Aegle marmelos* unripe fruit extract", *Hindustan Antibiot Bull*, 45-46,41.
- Panda, S., Kar, A. 2006. "Evaluation of the antithyroid, antioxidative and antihyperglycemic activity ofscopoletinfrom *Aeglemarmelos*leavesin hyperthyroidrats", *Phytother. Res.*, Vol- 20(12), Page No.1103-5.
- Veerappan, A., Miyazaki, S., Kadarkaraisamy, M., Ranganathan, D. 2007. "Acute and subacute toxicity studies of Aeglemarmelos Corr., an Indian medicinal plant".*Phytomedicine*, 14(2-3): Page No.209-15.
- Subramaniya, B.R., Malliga, R.M., Malathi, G.K., Anbarasu, K., Devaraj, S.N. 2009. "Effect of Aqueous Extract of *Aegle marmelos* Fruit on Adherence and  $\beta$ -Lactam Resistance of *EnteropathogenicEscherichiacoliby* DownRegulatingOuterMembrane Protein C", *American J. Infectious Dis.*, 5(2): Page No.161-169.
- Kumar, R., Kumar, A., Prasa, C.S., Dubey, N.K., Samant, R. 2008. "Insecticidal activity *Aeglemarmelos*(L.)Correa essential oil against four stored grain insect pests" *Internet J. Food safety*, Vol.10, Page No.39-49
- Kamalakkannan, N., Prince, S.M.P. 2003. "Effect of *Aegle marmelos* Correa. (Bael) fruit extract on tissue antioxidant sinstreptozotocin diabeticrats". *Ind. J. Exp. Biol.*, 41: Page No.1285-1288.
- Vimal, V., Devaki, T. 2004. "Linear furanocoumarin protects rat myocardium against lipid peroxidation and membrane damage during experimental myocardial injury. *Biomed. Pharmacother.*, 58: Page No.393-400.