

A Review on Antineoplastic Activity of *Aegle Marmelos*

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Abstract: *Aegle marmelos* (L.) commonly known as Bael belonging to the family Rutaceae, has been broadly used in indigenous systems of Indian medicine due to its numerous tremendous therapeutic properties. *A. marmelos* is native to North India, but widely found throughout the Indian Peninsula and in Burma, Ceylon, Thailand, Bangladesh, and Indo-China. It is related to the Hindu Religion and believed that the bael fruit is the symbol of lord Shiva. The leaf of *Aegle marmelos* is top of the demand in the season of 'Sawan'. The bael tree is mostly seen near the temple and other Hindu homes. It is a medium to large sized deciduous glabrous, armed tree with the axillary and globular fruits, short flower and 2.5 cm long alternate trifoliate leaves. The usefulness of *Aegle marmelos* is reference in the Indian ancient system of medicine, every part of the bael tree such as leaf, flower, root, bark, fruits, seed and even its latex are also important in several traditional system of medicine. Phytochemicals from *A. marmelos* such as lupeol, eugenol, citral, cineole and d-limonene possess antineoplastic effects. 1-hydroxy-5,7-dimethoxy-2-naphthalenecarboxaldehyde (Marmelin) present in *A. marmelos* and it inhibiting the growth of epithelial cancer cells (HEp-2, alveolar epithelial carcinoma cells and HCT-116 colon), but not normal cells (mouse embryo fibroblasts). 1-hydroxy-5,7-dimethoxy-2-naphthalenecarboxaldehyde induced TNF- α , TNFR1, and TRADD mRNA and protein expression, G1 cell cycle arrest, and mediated apoptosis through activated caspase-3, which was abrogated when pretreated with caspase-3 inhibitors.

Keywords: latex, marmelos, antineoplastic, carcinoma cells, traditional system of medicine

1. Manuscript

Aegle marmelos, commonly known as bael (or bilior bhel), also Bengal quince, golden apple, Japanese bitter orange, stone apple or wood apple, is a species of tree native to India, Nepal, the Andaman and Nicobar Islands and Myanmar. It is present in Sri Lanka, Thailand and Malesia as a naturalized species. The tree is considered to be sacred by Hindus. Its fruits are used in traditional medicine and as a food throughout its range. The common name "wood apple". [1,2,3]

Scientific classification

Kingdom: Plantae

(unranked): Angiosperms

(unranked): Eudicots

(unranked): Rosids

Order: Sapindales

Family: Rutaceae

Subfamily: Aurantioideae

Tribe: Aurantieae

Subtribe: Balsamocitrinae

Genus: *Aegle* Corrêa

Species: *A. marmelos*

Binomial name *Aegle marmelos* (L.) Corrêa

Synonyms

Belou marmelos (L.) A.Lyons

Crateva marmelos L.

Anatomy of leaf :

The leaf is trifoliate, alternate, each leaflet 5-14 x 2-6 cm, ovate with tapering or pointed tip and rounded base, untoothed or with shallow rounded teeth. Young leaves are pale green or pinkish, finely hairy while mature leaves are dark green and completely smooth. Each leaf has 4-12 pairs

of side veins which are joined at margin. The end leaflet features a long stalk, 0.5-3 cm while side stalks are typically shorter than 0.2 cm.

2. Anticancer activity of AEGLE marmelos L. CORR

Cancer is one of the most life-threatening diseases of the new world. With more than 8.8 million fatalities in the year 2015, it is now more important than ever to find new ways and methods of treatment for this deadly disease. The methods available today maybe more effective than their older counterparts, however, they have debilitating side effects. Hence, it is necessary now that we find methods to incorporate the modern techniques and our knowledge of Ayurveda to find treatment options that are more effective and have fewer side effects. Bael has shown anticancer activity and it is reviewed in this paper. Researches have been done in a direct and indirect manner, where in, effect of bael extracts were seen directly on the cancer cells. [7] *Aegle marmelos*, commonly known as "Ma Toom" in Thai, belongs to the Rutaceae family. Several parts of this plant have been used by the local Thai people in folk medicines. For example, the infusion of dried unripe fruits has been used as anti-diarrhea and anti-dysentery agents, the juice from crushed leaves has been used for the treatment of bronchitis, and the decoction of root barks has also been used as anti-malarial drug. In addition, young leaves are used as vegetable. The chemical investigation of the leaves of this plant has revealed the presence of a number of alkaloids and coumarins. [4] Lupeol, another compound present in *A. marmelos*, possesses antineoplastic effects on various human neoplastic cell lines such as human melanoma 451Lu cells, WM35 cells, B162F2 cells; human epidermoid carcinoma, hepatocellular carcinoma SMMC7721 cells, human

pancreatic adenocarcinoma cells AsPC-120, A431 cells, prostate carcinoma cell lines LNCaP, CWR22R γ 1, and PC-3. [5]. Other phytochemicals like eugenol and citral present in *A. marmelos* has anti proliferative activities. Eugenol have shown cytotoxic effects against malignant HepG2 hepatoma cells, salivary gland tumor cell line (HSG), malignant Caco-2 colon cells, human melanoma cell line, WM1205Lu and B16, nonmalignant human VH10 fibroblasts and normal human gingival fibroblast (HGF), [6] Citral (3,7-dimethyl-2,6-octadien-1-al) has been recently shown to induce apoptosis in several hematopoietic cancer cell lines. Chaouki et al., 2009 report showed that Citral possessed antiproliferative effects, inhibited cell cycle progression in G2/M phase, induced apoptosis of the human breast cancer cell line MCF-7 and decreased the prostaglandin E(2) synthesis.[6]. antineoplastic effects. 1-hydroxy-5,7-dimethoxy-2-naphthalenecarboxaldehyde (Marmelin) present in *A. marmelos* and it inhibiting the growth of epithelial cancer cells (HEp-2, alveolar epithelial carcinoma cells and HCT-116 colon), but not normal cells (mouse embryo fibroblasts). 1-hydroxy-5,7-dimethoxy-2-naphthalenecarboxaldehyde induced TNF- α , TNFR1, and TRADD mRNA and protein expression, G1 cell cycle arrest, and mediated apoptosis through activated caspase-3, which was abrogated when pretreated with caspase-3 inhibitors.[5]

3. Conclusion

Cancer, being a highly virulent disease, makes it important that more and more treatment options are researched and employed to combat the fatalities. Chemotherapy and radiotherapy have made more progress in the past decade and are constantly opening new horizons in search of a cure. It hence becomes imperative that we use our centuries old knowledge of herbal medicine and strive to find a cure. *Aegle marmelos* is a marvellous plant with extraordinary anticancer properties. The aim of this review is to make a note of all the research done with this plant and to note new scopes of research in order to combat this deadly disease with a better view.

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