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AEGLE MARMELOS: MULTIEFFECTIVE MEDICINAL TREE

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Abstract:

Present generations is a fast moving generation no doubt about the potency of allopathic medicine ,they provide fast result ,but the darkest side of this medicine is their several side effects and contraindications.On the other hand the plants are good substitution for those medicines because of their less or no side effects and their ability to cure the problem from their root. Aegle marmelosLinn as locally known as bell belonging family Rutaceae. It is medium sized tree growing throughout the forest of India of altitude 1200 meter.A number of chemical constituents and various therapeutic effects of leaves of Aegle marmelos have been reported by different scientist. Extensive investigations have been carried out on different parts of Aegle marmelos and as a consequence, varied classes of compound viz., alkaloids, coumarins, terpenoids, fatty acids and amino acids have been isolated from its different parts. potential pharmacological activity of the leaves are hypoglycemic, antiinflammatory, antimicrobial, anticancer, radioprotective, chemopreventive and anti-oxidative activity.

Key Words: *Aegle marmelos*, Bael, Herbal medicine, Phytochemical and Pharmacological.

Introduction:

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-China. 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.[4] Bel is a sacred tree native to India and has great aesthetic value among Hindus as tree is worshiped in rituals by masses. The plant is also known by different names as stone apple or wood apple, bili, bilva patra, Bengal quince or golden apple.[4] The plant is mentioned as Tripatra in ancient Indian scriptures such as Yajurveda and Mahabharata.[5] Its leaves are ternate and scented named as tripatras and are used in enchantments. The plant is also figured in Aranyakas and Hindu Sahintas. This plant is as old as Hindu civilization and has great aesthetic, cultural, and medicinal value.

Plant profile:

Fig.1 Aegle marmelos.

Scientific classification:

Kingdom	Plantae
Clade	Tracheophytes
Clade	Angiosperms
Clade	Eudicots
Clade	Rosides
Order	Sapinadales
Family	Rutaceae
Genus	Aegle
Species	A.marmrlos

Different name:

English (Bael fruit, Indian bael, holy fruit, golden apple, elephant apple, Indian quince, stone apple);Burmese (Opesheet, ohshit, bel Indian); German(Belbaum, Schleimapfelbaum); French (Oranger duMalabar, cognassier du bengale, bel Indian);Gujrati (Billi); Hindi (baelputri, bela, sriphal,kooralam); Indonesian (maja batuh, maja);Japanese (modjo); Thai (matum, mapin, tum);Vietnames (tar imam, mbau nau) Arab (Bull,Quiththa el hind); Urdu (bel); Tamil (Vilvam);Sanskrit (Bilwa, sriphal); any few other names arethere to identify bael tree in different parts of world.[7,8]

Botanical description:

Aegle marmelos is a slow-growing sharp tree and medium in size, about 12 to 15 meter in height with short trunk, thick, soft, flaking bark, and the lower ones drooping. Tree is armed with straight sharp axillaries thorns, 2.5 cm long, ferete, and leaflets 5- 10 by 2.5-6.3 cm, ovate or ovate-lanceolate, flower greenish white, sweet scented about 2.5 cm across, 2 sexual. New foliage is glossy and pinkish-maroon in colour. [7]Mature leaf emits a disagreeable odour when bruised. Fragment flowers, in clusters of 4 to 7 along young branch lets, have 4 recurved, fleshy petals, green outside, yellowish inside and 50 or more greenish-yellow stamens. The fruits are round, pyriform oval, or oblong, 5-20 cm in diameter, may have a thin, hard, woody shell or a more or less soft rind, grey green until the fruit is fully ripe, when it turns yellowish.[10],[7].

Parts of plants:[4]

1. Bark
2. Leaf
3. Flower
4. Fruit
5. Seeds

Bark:

Fig.2 Bark of Aegle marmelos.

The bark is pale brown or grayish, smooth or finely fissured and flaking, armed with long straight spines, 1.2–2.5 cm singly or in pairs, often with slimy sap oozing out from cut parts. The gum is also described as a clear, gummy sap, resembling gum arabic, which exudes from wounded branches and hangs down in long strands, becoming gradually solid. It is sweet at first taste and then irritating to the throat .

Leaf:

Fig.3 Leaves of Aegle marmelos

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 the margin.

Flower:

Fig.4 Flower of Aegle marmelos

The flowers are 1.5 to 2 cm, pale green or yellowish, sweetly scented, bisexual, in short drooping unbranched clusters at the end of twigs and leaf axils. They usually appear with young leaves. The calyx is flat with 4(5) small teeth. The four or five petals of 6–8 mm overlap in the bud.

Fruit:

Fig.5 Fruit of Aegle marmelos.

The bael fruit typically has a diameter of between 5 and 12 cm. It is globose or slightly pear-shaped with a thick, hard rind and does not split upon ripening. The woody shell is smooth and green, gray until it is fully ripe when it turns yellow. Inside are 8 to 15 or 20 sections filled with aromatic orange pulp, each section with 6 (8) to 10 (15) flattened-oblong seeds each about 1 cm long, bearing woolly hairs and each enclosed in a sac of adhesive, transparent mucilage that solidifies on drying.

Seeds:

Seeds numerous, embedded in the pulp, oblong, compressed, white, having cotton-like hairs on their outer surface. seeds numerous, oblong, compressed, embedded in sacs covered with thick, orange coloured sweet pulp root bark is 3 to 5 cm thick covered, with creamy yellowish surface.[11]

Fig.6 Seeds of Aegle marmelos.

Phytoconstituents:

Various chemical constituents were found in bael like alkaloids, coumarins, steroids, polysaccharides, tannins, carotenoids etc.

Alkaloid: Agelin, aegelenine, marmeline, dictamine, fragrine, O-methylhalfordinine, Oisopentanylhalford iniol, N-4-methoxy styryl cinnamide.

Coumarin: Marmelosin, marmesin, imperatorin, marmin, alloimperatorin, methylether, xanthotoxol, scoparone, scopoletin, umbelliferone, psoralen and marmelide.

Polysaccharide: Galactose, arabinose, uronic acid and L-rhamnose was obtained on hydrolysis.

Tannin: Tannin was also present in leaves and fruit as skimmianine. Carotenoids were also reported, which import pale colour to fruit.

Flavonoids: It mainly includes Rutin,Flavon,Flavon -3-ols, Flavons glycosides .

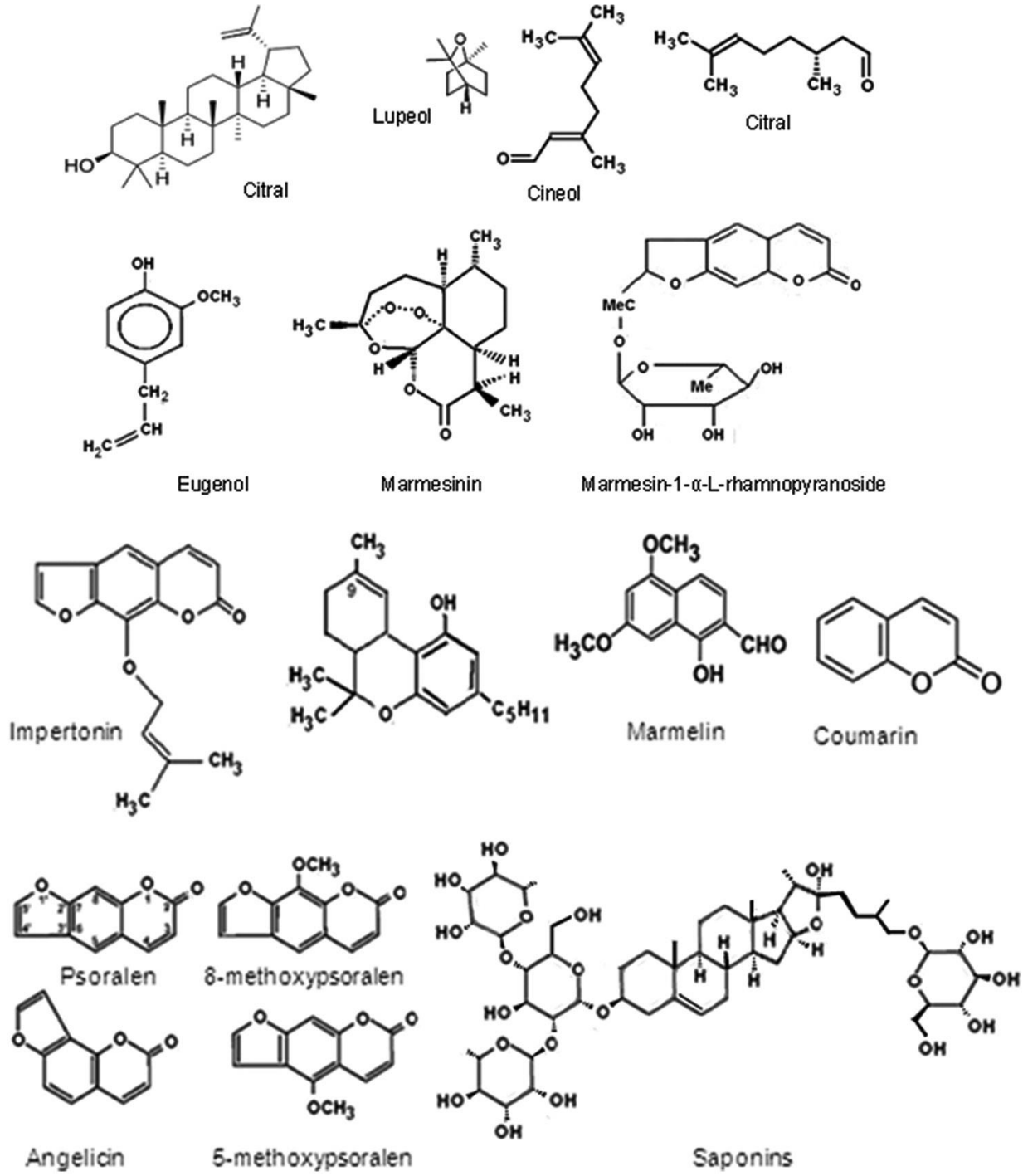

Fig .7 Major constituents isolated from various plant parts of *A. marmelos.[6]*

Parts of plants with their properties:

The Bael is a holy plant and its all parts are very useful, generally it is seen that if one part of any plant show any pharmacological effect then there is a major possibility that the other part give the same or related activity. The same principle is applied here with the bael tree.The pharmacological uses of different parts of *Aegle marmelos* is listed in the table-1[12,13,14,15]

Sr.no	Parts of plant	Uses
1.	Leaves	Anti inflammatory, Ulcer, Cause Sterility, or abortion, laxative, asthma,Opthalmia and eye affection, expectorant, cold and respiratory infection, backache, abdominal disorder, vomiting, cut and wounds, dropsy, beriberi, weakness of heart, cholera, diarrhea, cardiac tonic, control blood sugar, nervous disorders, hair tonic, acute bronchitis, veterinary medicine for wound healing, anti worms, stimulation of respiration.
2.	Root- bark	Intermittent fever and fish poison, palpitation, melancholia, anti dog bite, gastric troubles, heart disorders, fever, antiamoebic, hypoglycemic, rheumatism.
3.	Flower	Stomach tonic, anti dysenteric, Antidiabetic, diaphoretic and as a local anesthetic, epilepsy and as an expectorant.
4.	Fruit	Dysentery, diarrhea, gastric troubles, constipation, laxative, tonic, digestive, stomachic, brain and heart tonic, ulcer, antiviral. Treatment of rectum inflammation, antiviral, sweet, cooling, aromatic, nutritive, dysentery. Astringent, dysentery, stomachache in diarrhea, tonic, digestive, demulcent, treatment of piles.
5.	Seed	Antibacterial, antifungal.

Table 1. Parts of plant with their properties.

Marketed products:

Food: The fruits can be eaten either freshly from trees or after being dried. If fresh, the juice is strained and sweetened to make a drink similar to lemonade. It can be made into sharbat , a very popular summer drink in almost every household. If the fruit is to be dried, it is usually sliced and sun-dried. The hard leathery slices are then immersed in water. The leaves and small shoots are eaten as salad greens.[17]

Timber: It is aromatic when freshly cut. It is gray white ,hard but not durable and use for making carts and also fot the constructions.

Gum and resins: The gum enveloping seeds are most wid fruits especial when unripe. They are used as household glue and is employed as adhesive by jwellers.

Poison: Their leaves are said to cause abortion and sterility in womens. These bark is use as fish poisons in the Celebes.

Fig.8 marketed product.

Pharmacological Activities:

Antidiabetic Activity:
Diabetes mellitus is a common metabolic disease around the world. A large percentage of the global population is suffering from the same.The modern life style like taking stress and several fast food consumption, and alcohol drinking are the responsible for it. Leaf extract has been used in Ayurvedic system of medicine for diabetes. It enhances the ability to utilize the external glucose load in the body by stimulation of glucose uptake similar to insulin.

Anticancer Activity:
Gastric ulcer resulted from persistent erosion and damage of the stomach wall that might become perforated and develop into peritonitis and massive haemorrhaage as a result of inhibition of synthesis of mucus, bicarbonate and prostaglandins Bael inhibits in vitro proliferation of human tumors cell lines including the lecukenic K562, Tlymphoid3. Most of the potent anti cancer drug are expensive, mutagenesis, and teratogenic. Administration of extract in 400 mg/kg has shown anticancer effect in animal model of Ehrich ascites carcinoma.

Cardio Protective Activity:
The leaf extract of *Aegle marmelos* has preventing effects in isoprenaline induced myocardial infarction in rats. The activity of creatine kinase and lactate dehydrogenase was significantly increased in serum and decrease significantly in heart of isoprenaline-treated rats. Use of bael as a cardiac depressant and in palpitation has also been reported .

Antimicrobial and Antifungal:
Anti microbial drugs are used in medicinal practice for treating food borne disease. Use of medicinal plants extract that are rich in antimicrobial compound could be an alternative way to eliminate these bacteria. The extract of *Aegle marmelos* posses antimicrobial activity. It has been found active against various species such as *Staphylococcus aureus, epidermidis, Proteus vulgaris.*

Radio Protective Activity:
Treatment with extract of bael reduces the severity of symptoms of radiation induced mice. The radio protective action might be due to free radical scavenging and arrest of lipid per oxidation accompanied by an elevation in glutathione concentration in liver, kidney, stomach and intestine 3. Its activity has also been evaluated in cultured human peritoneal blood lymphocytes.

Antipyretic and Analgesic:
Bael extract exhibit antipyretic and analgesic activity, as it has shown a significant inhibition of a carrageenan induced paw edema, cotton pellet granuloma and paw itching in mice and rats . The use of other synthetic antipyretic drugs is not as safe as the herbal one. That's the reason why Bael is useful in treatment of fiver and pain . Antipyretics reduce body temperature in fever but do not cause hypothermia in normothermic individual. Fever during infection is produced through the generation of pyrogens including, ILs, TNFα, interferon which induced PGE2 production in hypothalamus- rise its temperature set point.

Constipation:
Constipation is a problem due to the loss of water from the fesses, that's why the person feel difficulty, the ripe fruit of *Aegle marmelos* is a great remedy for the constipation patient, as it is a rich source of fiber, and fiber are essential for the forcing the GIT material towards the excretion. The fiber of bael cleans the intestine. Its regular use up to three months help in the evacuation of even the old accumulated fecal matter from the bowels. In the villages it is mostly consumed as a energy food and in the summer season its ripe pulp is mixed with water or milk to serve as a great drink and as well as a treatment for the constipation suffering person .

Peptic Ulcer:
An 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.pylori* bacteria, 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 leaves is an effective remedy for peptic ulcer.

Respiratory Infection:
The oil obtained from the leaves of *Aegle marmelos* is useful in the treatment of the cold and respiratory infection. The juice extracted from leaves is mixed with equal quantity of sesame oil and heated thoroughly; a few seeds of black pepper and half a teaspoonful of black cumin are added to the hot oil and then it is removed from the fire and stored for use in future .

Antioxidant and Hepatoprotective Activity:
Oxidative stress is produced during normal metabolic process in the body as well as induced by
a verity of environmental and chemical factor, which cause a generation of a various reactive free radical and subsequent change in DNA and lipids.. The reducing capacity of a compound may serve as a significant indicator of its potential antioxidant activity There are two possible mode of work of antioxidant. One is by getting oxidized itself or by creating a protective layer around the active constituents of the material. The antioxidant activity present in the *Aegle marmelos* confirms the hepatoprotective activity in the same, and it has also been reported .

Diarrhoea and Dysentery:
The unripe and half ripe fruit of bael is most effective remedy for the diarrhoea and dysentery. Generally the ripe fruit is used for this purpose, but the dried fruit powder is also showed the same activity 3. Gastrointestinal infections encompass a wide variety of symptoms and recognized infectious agent. Among the GI infections the diarrhoea is a common symptom of the intestinal disorder and has remained a global threat to human health. It cause morbidity and mortality with over 1000 million episode and over 4 million death annually in children under five year age.

Wound Healing Activity:
Effect of topical and intrperitonial administration of methanolic extract of *Aegle marmelos* ointment and injection was studied respectively on two types of wound models in rats, the excision and incision model. Both the injection and ointment of the methanolic extract of *Aegle marmelos* produced a significant responds in both. The extract facilitates the healing process as evidence by increasing in the tensile strength in the incision model. The result was also comparing to those of slandered drug nitrofurazone.

Miscellaneous Properties:
Bael tree is a holy tree and it has several of medicinal properties, some of them have been evaluated and others are on the line for their turns to come. Apart from the activity listed above there is little more important activity. The leaves of *Aegle marmelos* are useful in the treatment of the jaundice and leucorroea, conjunctivitis and defenses. Fruits give energy and nutrition.

Nutritional Uses:

Bael, *Aegle marmelos,* is one of the most useful Indian medicinal plants; it has numerous of use in day to day life. Physicochemical studies prove that bael fruit is rich in nutritional value, and this is being used from several years ago. Bael pulp is a rich source of glucose, sugar, and fiber. In the traditional medicine system the pulp of bael is used as an energy drink with milk. That drinks is very useful to excrete the hair from the stomach. Other nutritive elements of bael are-protein, fat, minerals, fibers, carbohydrates, calcium, phosphate, potassium, iron, vitamins A, vitamin B1, nicotinic acid, riboflavin, vitamin C .[16,17]

Medicinal uses:[9]

•Bael‘s fruit serves as stool binding. In fact it is used in condition like diarrhea, dysentery etc.

• Powder of bael leaves has anti diabetic effect.

• Juice of bael leaves with black pepper i.e. kali marich taken three times a day is helpful in jaundice.

• Syrup made of pulp of bael fruit, with tamarind is useful in burning sensation on skin, diarrhea, yellow coloration of skin, nausea etc.

• When there is pain and redness in eyes, poultice of bael leaves applied on eyes gives good result.

• Muarraba of bael gives appreciable result in diarrhea, especially when there is bleeding.

• Bael’s pulp used with jaggery gives results in blood disorders.

• In excessivebleeding and problem of leucorrhoea, juice of bael leaves with cumin seed (jeera) and milk • Local application of one part of dry powder of Bael fruit and two parts of mustard oil are useful in burn.

• Ripened fruit of bael is one of a good laxative. Pulp of ripened fruit or in the form of a sharbat /syrup is useful in constipation. Brijyoget al.

• In stress, insomnia and feeling of nervousness milk boiled with bark of bael tree give good result.

• Oil prepared by boiling bael’s soft leaves with cow urine, sesame oil and goat milk in the ratio of 1: 4:8 is useful in ear diseases.

• Bael leaves soaked overnight in water and strained water is drunk in the morning gives relief in pain and discomfort in peptic ulcers.

• Bilva fruit powder is useful in irritable bowel syndrome and it has stomachic.

• The extract of bael leaves is useful in conjunctivitis, deafness and leucorrhea.

• The young leaves and shoots of bilva tree are used as food in Thailand. They have nutritional value.

- The leaf extract has been reported to have antispermatogenic effect and were used a fertility control in Bangladesh.
- Ayurvedic texts hold that Aegle marmelos pacifies vata, kafa and enhances jatharagni i.e. digestive fire
- Ripened fruit of Bael is difficult to digest and is full of doshas, so its use if not specified should be avoided.
- Paste of bael with shunthi, pipali and marich (black pepper) is useful in jaundice .

Conclusion:

On this fast moving generation, man wants to stay ahead and never wants to be in the last row. Because of these neck cutting competition, we face new and complex heath related problem, and day by day we are getting addicted with them like side effect and adverse effect. On the other hand the herbal drugs like *Aegle marmelos* (Bael) is much more valuable and safe comparatively those chemical. Looking upon the wide prospect of Bael tree, one should either cultivate it or try to preserve it for the proper utilization and to discover the new and effective herbal medicine. Bel contains diverse bioactive components in leaves, flowers, fruits, wood, root, and bark which show multiple biological activity and high therapeutic importance. Plant contains coumarins, marmelosin, marmesin, imperatorin, marmin, alloimperatorin, methyl ether, xanthotoxol, scoparone, scopoletin, umbelliferone, psoralen, and marmelide and marmenol, aegelin, aegelenine, marmeline, dictamine, fragrine which show different biological activities such as anticancer, antioxidant, antimicrobial, anti-plasmodial, and hepatoprotective.

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Refrences:

1.Pharmacognosy Text book by C.K. Kokate, S.K Gokhale, Nirali Prakashan

2.Indian medicinal plants by K.R Kirtikar abd B.D Basu, Reprint, 2nd edition International book distributors, Dehera Dun , Vol 2 1998

3.Indian Material medica by K.M Nadkarni , Popular Prakashan Pvt. Ltd, Bombay, 1954.

4.Brijesh S, Daswani P, Tetali P, Antia N, Birdi T. Studies on the antidiarrhoeal activity of *Aegle marmelos* unripe fruit: validating its traditional usage. BMC Complement Altern Med. 2009;9(1):47.

5. Purdue Horticulture. Hort Purdue Edu; 2012.

6. Bel plant: A source of pharmaceuticals and ethno medicines,Ravi Kant Upadhyay ,International Journal of Green pharmacy Oct-Dec2015 ,9 (4) 204-219.

7.Dhankhar Sandeep, Ruhil S, et al, *Aegle marmelos* Correa: A Potential Source of Phytomedicine. Journal of Medicinal plant Research 2011, 5(9):1497-1507.

8.Veerappan A, Miyazaki S, et al, Acute and Sub acute Toxicity Studies of Aegale Mamelos Corr, An Indian Medicinal Plant. Phytomedicine 2007, 14: 209-215.

9. Sharma Ganesh N, Dubey Susheel K, et al, International Journal of Current Pharmaceutical Review and Research, 2011, 1(3):12-22. 14.

10. Lambole Vijay B, Murti Krishna, et al,Phytopharmacological Properties of *Aegle marmelos* as a Potential Medicinal Tree: An Overview. International journal of Pharmaceutical Review and Research 2010, 5(2):67-71.

11. A Review on Aegle marmelos : phyto-pharmacological prospective Brijyog*1 , Laliteshwar pratap singh1 , Anup maiti2Vol -6, Issue-1, January-March 2017, 16-30.

12. S. Balakumar, S Rajan, et al, Antifungal Activity og *Aegle marmelos* (L) Correa Leaf Extract onDermatophytes. Asian Pascific Journal of Tropical Biomedicine, 2011, 11:309-312.

13. Devi K, Sivraj A, Kumar P Vinoth,Ahmed et al: Hypolipidemic Effect of *Aegle marmelos* Leaf Extract in Streptozotocin Induced Diabetic Male Albino Rats. International Journal of Pharma Tech Research, 2010, 2(1): 259-265.

14. Rajan S, Gokila M, et al: Antioxident and Phytochemical Properties of *Aegle marmelos* Fruit Pulp. International Journal of Current Pharmaceutical Research, 2011, 3:65-70.

15.Aegle marmelos : A Review on its Medicinal Properties Pushpendra K.Patel*1,Jyoti Sahu 1,Lokesh Sahu 2, Nareendra K.1,Prajapati, B.K Dubey 1 Int. J.Pharm Phytopharmacol Res,2012,1(5):332-341 .

16. Sharma Prabodh Chander, Bhatia Vivek, et al, A Review on Bael Tree, Natural Product Radiance, 2007, 6(2):171-178.

17. Maity Pallab, Hansda Dhananjay, et al, Indian Journal of Experimental Biology, 2009; 47:849-861.

18. Arumugam Sevugan, Kavimani Subramanian, et al, Antidiabetic Activity of Leaf and Callus Extract of *Aegle marmelos* in rabbit, Science Asia, 2008,34:317-321.

19. Singanan Vinodhini, Singanan Malairajan, et al, The hepatoprotective Effect of Bael Leaves in Alcohol Induced Liver Injury in Albino Rats. International Journal of Science and Technology, 2007; 2:83-92.

20. Rao Ch. V, Amresh SK Ojha, et al, Analgesic, Anti-Inflammatory and Antiulcerogenic Activity of the Unripe Fruit of *Aegle marmelos*. Acta Pharmaceutical Turcica 2003, 45:85-91.

21. Arul Veerappan, Miyazaki Shigeru, et al, Studies of the Anti-Inflammatory and analgesic properties of the Leaves of *Aegle marmelos* Corr., 2005, 96: 159-163.

22. Joshi PV, Patil RH, et al, In Vitro Anti diarrhoeal Correa ex Roxb. Dried Fruit Pulp. Natural Product Radiance 2009, 8:498-502.

23. Arul V, Miyazaki S, et al, Mechanism of the Contractile Effect of the Alcoholic Extract of *Aegle marmelos* Corr. On Isolated Gunia Pig Ilem and Tracheal Chain. Phytomedicine, 2004, 11:679-683.

24 . Yadav kukdeep, Singh Narender: In Vitro Propagation and Biochemical Analysis of field Established Wood Apple. Analele Universitatii Oradea- Fascicula Biologie 2011, 18(1):23-28.

25. Saharah Vikas Anand, Principles of Pharmacognosy, 1st edition, Agrobios publication, Jodhpur, 2008, 11-12.

26. Rangari Vinod D, Pharmacognosy and Phytochemistry, 2nd edition, Vol-1. Career Publications, Nasik, Maharastra, 2008, 6-8.

27. Miller Lucinda G, Murrag Wallace J, Herbal Medicinal A Clinicians Guide. Viva Book Private Limited, New Delhi,
2005, 20- 25.

28. Sardana S, Sharma OP, Fundamental of Pharmacognosy. 1st edition, Birla Publication, New Delhi, 2009, 280-283.

29.Behl PN, Srivastava G, Herbs useful in Dermatological Therapy, 2nd edition, CBS Publishers and Distributers, New Delhi, 2002, 17-19.

30. Indian herbal Pharmacopoea Mumbai, Indian Drug Manufacturers Assosiation; 2002.

31.Qadry Js, Editor Pharmacognosy. Ahmedabad: BS Shah Prakashan; 2004-05.