

Ethnobotany and ethnoconservation of *Aegle marmelos* (L.) Correa

Chandra Prakash Kala

National Medicinal Plants Board, Chandralok Building, 36 Janpath, New Delhi 110 001

Email: cpkala@yahoo.co.uk

Received 22 March 2005; revised 20 June 2006

The paper highlights the ethnobotany and ethnoconservation of *Aegle marmelos* (L.) Correa, generally known as *Bael*. Of 66 ethnobotanical uses of *bael* documented, 48 were found to be medicinal and 18 were of other ethnobotanical purposes. The importance of *bael* in ethnomedicine and for religious purposes is of utmost significance. Almost all parts of *bael* tree are used in preparing herbal medicine. The most common use of *bael* is to cure the gastrointestinal disorders. Historically, certain ethnoconservation norms have been set-aside with a view to conserve such an important tree species for its long-term sustainability.

Key words: *Aegle marmelos*, Sacred tree, Indigenous uses, Ethnobotany, Ethnoconservation, Gastrointestinal disorders

IPC Int. Cl.⁸: A61K36/00, A61P1/04, A61P1/06, A61P1/08, A61P1/10, A61P1/14, A61P1/16, A61P3/08, A61P3/10, A61P5/00, A61P5/50, A61P27/00, A61P27/02, A61P29/00

The use of forest products for food and medicine is an ancient global tradition that fulfills the basic needs of human survival. Since early 1990s, the use of forest products for medicine has been emerging as a vital income generating resource for the development of various social groups, hence, there is an increased attention for their long-term sustainability. Evaluating the socioeconomic characteristics of such medicinal plants, their diverse indigenous uses and assessment of traditional values attached with them, in order to their sustainable utilization and management has become the focus of current research programmes. Over the years, the increasing demand of plants for medicine has resulted in their over-harvesting from wild, therefore, attempts are being made for their domestication. There is a paradigm shift in the state of forest products right from their indigenous uses by local communities to the applications of *in-situ* and *ex-situ* conservation techniques. The indigenous communities have played a vital role in understanding the multiple uses of natural resources and their long-term conservation strategies. However, for long time such a valuable ethnobotanical and ethnoconservation knowledge have been ignored. The present study therefore aims to document various indigenous uses of *Aegle marmelos* (L.) Correa, and to explore the ethnoconservation strategies for its long-term sustainability.

Aegle marmelos (L.) Correa (Rutaceae) is a small to medium sized (6-8 m) aromatic tree. It grows

widely in the deciduous forests of Southeast Asian countries such as Thailand, Myanmar and India, ascending to an altitude of 1,200 m in the western Himalaya and also occurs in the Andaman Islands¹. In English, it is known as Bengal quince, golden apple or stone apple. It is known as *bael* and *bilwa* in Sanskrit and by different names such as *maredu* (Andhra Pradesh), *bael* (Bengal), *bil* (Gujrat), *bael*, *bil* (Himachal Pradesh), *bilpatra*, *kumbala*, *malura* (Karnataka), *kuvalam*, *vilwam* (Kerala), *kuvalum* (Tamil Nadu) and *bel* (Uttaranchal). The pulp inside the fruits is yellow and mucilaginous. Dried fruit pulp retains its yellowness, also remains intact and does not contain the constituents required for the preparation of medicinal decoction. Its rind is woody and 4-5 mm thick. Fruit bears numerous seeds embedded in the pulp those are oblong, compressed and white having cotton like hairs on their outer surface. *Bael* fruit takes almost one year to mature. The ripe fruits differ in yielding tannin and possess a distinct aroma.

Methodology

Apart from compilation of existing information on the indigenous uses of *Aegle marmelos* literature survey, semi-structured open-ended questionnaire surveys were conducted among different traditional herbal healers and practitioners of the Ayurveda (*Vaidyas*) across the Uttaranchal state for gathering data on making various medical formulations by using

*bael*¹⁻¹². Crosschecking of data was made by interviewing more than three *Vaidyas* on the particular use and herbal medical formulation. Participant observation method was employed to understand the methods and techniques adopted by *Vaidyas* in preparation of herbal medical formulations. Besides, some interactive workshops were organized and various groups of indigenous people including *Vaidyas* were invited for sharing their knowledge in documenting the ethnobotanical and ethnoconservation knowledge on such parameters.

Ethnomedicinal uses

Bael is one of the most important tree species used in various indigenous systems of medicine in India, China, Burma, and Sri Lanka⁴. *Bael* is used in all *Tridosa- vata* (air), *pitta* (phlegm) and *kapha* (cough). Out of more than 66 ethnobotanical uses of *bael*, 48 are exclusively for medicinal purposes. Almost all parts of *bael* plant are used in preparing medicine

(Table 1). Of different plant parts, fruits are used in curing the highest number of ailments. The medicine is prepared in the form of pills, powder and paste. Ayurveda practitioners commonly use the roots of *bael* as an ingredient of *dasamula* (ten roots), which is useful in recovering the loss of appetite and use fruits in the preparation of *Chyavanprash*. *Bael* fruits regarded as an astringent are frequently used by various ethnic communities for the treatment of diarrhoea, dysentery, constipation, stomachache, intestinal ulcer, diabetes, dyspepsia, heart diseases and cholera due to its digestive and carminative properties. *Bael* is highly valued in Ayurvedic medicine for the treatment of chronic diarrhoea & dysentery and as brain tonic. *Bael* possesses antiviral, antihelminthic antiinflammatory, antibilious, antiparasitical, antipyretic, antiscorbutic, aphrodisiac, aromatic, astringent, digestive, febrifuge, hemostatic, antidiarrhoeal, laxative and nutritive properties. Ripe *bael* fruit is sweet, aromatic and nutritive, whereas fresh fruit is astringent and has laxative properties.

Table 1—Ethnobotanical uses of *Aegle marmelos* (L.) Correa

Plant parts	Ethnobotanical uses
Leaf	Abscess, backache, eye complaints, abdominal disorders, vomiting, cut & wounds, ulcer, dropsy, beriberi, weakness of heart, cholera, diarrhoea, cardio tonic, blood sugar, injuries caused by animals, nervous disorders, hair tonic, acute bronchitis, child birth ^{1,4,5,7,10,12} . Veterinary medicine for wounds, killing worms, fodder for sheep, goat and cattle, stimulation of respiration and contraction of denervated nictitating membrane in anaesthetised cats ^{1,7,9,11} .
Fruit	Astringent, diarrhoea, gastric troubles, constipation, laxative, tonic, digestive, stomachic, dysentery, brain & heart tonic, ulcer, antiviral, intestinal parasites, gonorrhoea, epilepsy ^{1,5,6,7,10} . Toys, edible, jam, preserve ^{3,7,8} .
Root	Dog bite, gastric troubles, heart disorders, intermittent fevers, antiamebic, hypoglycaemic, rheumatism ^{4,10} .
Bark	Stomach disorder, intermittent fevers, heart disorder ^{10,12} .
Seed	Febrifuge ¹ .
Flower	Expectorant, epilepsy ^{5,6} .
Whole plant	Abdominal pain, abscess, astringent, backache, dog bite, breast pain, cholera, constipation, convulsions, cramp, diabetes, diarrhoea, dysentery, fever, eye complaints, gastric trouble, abdominal disorders, jaundice, laxative, nausea, night fever, heart disorders, snakebite, stomach disorder, vomiting, tonic, cut & wounds ^{1,2,4-7,10,12} .
Root, Bark	Fish poison ⁷ .
Seed mucilage	Plaster for walls ¹¹ .
Seed oil	Laxative ⁶ .
Wood	Beads worn by low caste, special couches for rheumatic patients ^{3,8,11} .
Gum around seed	To improve adhesive strength of water paints ¹¹ .
Unripe fruit rind, Bark	Yellow dye ^{8,11} .
Stem	Pestles of oil and sugar mills ^{8,11} .

Bael fruit powder exhibits anti-cancerous and anti-proliferative activities. The combinations of five parts of *bael* such as, fruit, leaf, bark, root and flower is assumed to be effective for certain mental disorders.

Unripe fruit pulp mixed with boiled rice water is taken twice a day to cure vomiting in pregnancy. Unripe fruit pulp mixed with sugar is taken with milk twice daily for curing urinogenital disorders. Half roasted unripe fruit pulp mixed with equal quantity of sugar is taken twice a day to cure dysentery. Unripe fruit pulp powder is taken twice daily to cure abscess. *Bael* leaf extract is taken twice a day to remove the intestinal worms. Leaf poultice is used as remedy in ophthalmia and ulcer. Paste of fresh *bael* leaves is kept on infected part and tied with bandage to cure abscess. Poultice made from leaves is used in the treatment of eye diseases. Leaf juice is reported to have multiple medicinal uses, including control of diabetes. Cooling delicious drink prepared from fruit pulp along with sugar and tamarind diluted with water is useful for health. *Bael* root decoction is given twice daily to cure fever and cold. Extract of *bael* root, *pyaz* (*Allium cepa* Linn.), and *haldi* (*Curcuma domestica* Valetton) mixed in equal proportion is put in the ears to relieve earache and secretion from ears. Root and bark decoction is used in the treatment of intermittent fevers and heart palpitation. Root and stem bark decoction is used in the treatment of fever and various types of heart disorders. *Bael* root is used in the treatment of abdominal pain, heart palpitation and urinary troubles. *Bael* tea is good for health and is used for flatulence, gastrointestinal problems, cough and chronic intestinal diseases in children. Eleven *bael* formulations prepared by different traditional *Vaidyas* reported to cure 15 types of ailments were documented during the present study.

For Hindus, the *bael* is a sacred tree, which they dedicate to the Lord *Shiva* by offering of *bael* leaves. Its three leaflets are assumed to be the symbols of three *gunas* or attributes (e.g. *satva*, *rajas* and *tamas*, literally meanings morality, superiority and immorality, respectively); three Gods (*Brahma*, *Vishnu* and *Mahesh*); and three lives (past, present and future). *Bael* is considered to be extremely auspicious and cultivated around most of the Hindu temples. *Bael* fruits are edible, contain high protein and are used in making tasty aromatic cold drinks and jam. Its fresh juice is bitter and pungent. In Myanmar, *bael* fruits are used in making paints. Fruits are also used as a substitute for soap, as source of essential oils and per-

fumes. The mucilage of *bael* seed is a good cementing material. *Bael* wood is used in building houses, making carts, agricultural implements, pestles, handles of tools and combs. A yellow dye is obtained from the rind of unripe fruits and is used in calico printing. An essential oil is also distilled from the rind. Dried fruits after removing the pulp are used as pill boxes for keeping valuable medicines and sacred ashes. *Bael* stem yields gum, which is used for improving the adhesive potency of water paints. Its wood is suitable for making charcoal.

Ethnoconservation

Since, *bael* has multiple useful properties, its over-exploitation has had historical concerns. In order to prevent its over-exploitation, the ethnoconservationists had attached this tree with the Lord *Shiva* and goddess *Lakshmi* so that people can pay regard to this important useful plant species and avoid destroying it. The traditional herbal healers collect the required plant parts of *bael* at particular season and also chant some mantras just before collection of *bael* fruits, leaves and bark for preparing medicine. They avoid disclosing the medicinal properties of *bael* to anyone in the society. Earlier, the management of important ethnobotanical species such as *bael* was enforced by traditional beliefs, which, even though they are being eroded, have been kept alive in the name of their traditional culture.

Conclusion

Historically, *bael* has been used for number of ethnobotanical purposes. At present, *bael* has become an important source of medicine for curing various human and animal diseases. Apart from exploring possibilities to prepare standardized drugs by using different plant parts of *bael*, production of jam by using its fruits should be promoted as a health tonic at commercial scale. Due to newly acquired high economic values of the ethnobotanical important tree species, people who once used them judiciously became ruthless and destructive collectors. In order to utilize such an important ethnobotanical species judiciously, the National Medicinal Plants Board of the Government of India has placed *bael* in the priority list of 32 medicinal plants. Many projects have been sanctioned by the Board for the cultivation and sustainable utilization of *bael* including two major schemes, such as contractual farming and promotional schemes. During last 3 years, more than 35 projects have been sanc-

tioned by the National Medicinal Plants Board under the promotional schemes for studying various aspects of *bael* which includes *ex-situ* cultivation, *in-situ* conservation, intercropping, large scale propagation, value addition, etc. There is a need for traditional / indigenous institutions to come forward to conserve such an important tree species by formulating and implementing certain regulatory mechanism in collaboration with other likeminded organizations. *Bael* should be encouraged for plantation as an important agroforestry species in order to reduce the over-exploitation of its wild populations.

Acknowledgement

Author thanks Shri BS Sajwan, Chief Executive Officer, National Medicinal Plants Board, Ministry of Health & Family Welfare, Government of India for encouragements and support.

References

- 1 Anonymous, *The Wealth of India: Raw Materials Series*, (Publications and Information Directorate, New Delhi), 1989, 33-34.
- 2 Bailey LH, *The Standard Cyclopedia of Horticulture*, Vol I-III (McMillan Co, New York), 1953.
- 3 Parmar C & Kaushal MK, *Wild Fruits of the sub-Himalayan Region*, (Kalyani Publishers, New Delhi), 1982, 136.
- 4 Kritikar KR and Basu BD, *Indian Medicinal Plants*, Vol I-IV (Bishen Singh Mahendra Pal Singh, Dehradun), 1984, 830.
- 5 Jain, SK, *Dictionary of Indian Folk Medicine and Ethnobotany*, (Deep Publications, New Delhi), 1991, 311.
- 6 Grieve M & Leyel CF, *A Modern Herbal*, (Tiger Books International, London), 1992, 770.
- 7 Gaur RD, *Flora of the district Garhwal North West Himalaya (with ethnobotanical notes)*, (TransMedia, Srinagar Garhwal), 1999, 811.
- 8 Kaushik P & Dhiman AK, *Medicinal Plants and Raw Drugs of India*, (Bishen Singh Mahendra Pal Singh, Dehradun), 1999, 623.
- 9 Anonymous, *International Cyber Business Services*, 2000, (www.holistic-online.com/Herbal-Med/_Herbs/h134.htm).
- 10 Veerappan AK, Srinivasan & Renganathan D, *Cardiotonic effect of Aegle marmelos Corr. on amphibian heart in-situ preparation*, Proc 6th Internet World Congress for Biomedical Sciences, 2000.
- 11 (www.uclm.es/inabis2000/posters/files/133/index.htm)
- 12 George KV, Mohanan N & Nair SS, Ethnobotanical investigations of *Aegle marmelos* (Linn.) Corr. in: *Ethnobotany and Medicinal Plants of India and Nepal*, by Singh V and Jain AP, (Scientific Publishers, Jodhpur). 2003, 29-35.
- 13 Kala CP, Farooquee NA & Dhar U, Prioritization of medicinal plants on the basis of available knowledge, existing practices and use value status in Uttaranchal, India, *Biodiver Conserv*, 13, (2004), 453-469.