

Limonia Acidissima L. A Versatile Nutritional and Medicinal Plant: A Review

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Abstract: Plant provides a major resource for a large number of traditional medicines that have been in existence for thousands of years in existence for thousands of year in a country like India. Ayurveda one of the oldest medicinal systems in the world provides leads for a vast number of therapeutically useful components. The combination of traditional and Morden knowledge can produce better source of the active constituent for treatment of disease with fewer side effects. In today's era herbs play vital role in every industry due to their different properties. The article shows the important of limonia acidissima L. In different diseases and treatment limonia acidissima also known as wood apple belonging to family "Rutaceae".



Keywords: Limonia Acidissima L, Wood Apple, Active Constituents, Pharmacological Activities , Nutritional and Medicinal Properties

I. INTRODUCTION

Due to increasing awareness among the people towards natural product. Natural medicine is attracting more attention then allopathic system. There are no of herbs which are used for their medicinal and cosmetic properties. One of the herb attracting eye is limonia assidimosa. It can be well grown in drought prone and semi – aride regions. The productive age of plant is believed to be 12 – 17 years. India is one of the leading countries in Asia in terms of wealth of traditional knowledge system related to use of plant species. In India there is about 75000 different medicinal plants present.

A wood apple fruit contains several beneficial nutritional and medicinal properties. In Indian traditional system wood apple is known to curve diseases like diarrhoea, wound, asthma, tumour and cardiac disability.

Wood apple is enormous source of anti – oxidant and has potential to scavenge free radicals in human body. Both ripe and unripe fruit is known to possess excellent medicinal properties.

There are number of herbs which are used for their medicinal and cosmetics properties, Limonia Acidissima L. is one of them. Different parts of Limonia Acidissima L. are responsible for different medicinal as well as cosmetics properties.

Kingdom	Plantae
Sub – Kingdom	Tracheobionta
Superdivision	Spermatophyta
Division	Magnoliophyta
Class	Magnoliophyta
Sub - class	Rosidae
Order	Sapindales
Family	Rutaceae
Genus	Limonia L.
Species	L. acidissima
Synonyms	Feroniaele phantom correa, Feronia limonia (L.) Swingle, Schinus limonia L.

Table 1: Taxonomy

Fruit composition	Amount
TSS	9.40 – 16.00
Titrateable Acidity	0.83 to 2.76 %
Total Sugar	4.08-4.47 %
Vitamin C	1.68 to 3.40 mg/ 100g
Protein	6.3 g/100 g
Total Carbohydrates	15.6 g/100 g
Moisture	72%
Total Phenol	235 mg/100g
Antioxidant Capacity	1412.55 µg/g
P (%)	0.037 – 0.078
K (%)	1.29 – 1.86
Ca (%)	0.11 – 0.39
Mg (%)	3.18 – 5.92
Na (%)	3.07 – 7.54
Pectin (%)	1.39 – 1.65

Table 2: Fruit Composition of wood apple

II. MEDICINAL USES

1. The fruit is used in India as a liver tonic and also used to treat cardiac problems.
2. The half – ripe fruit is perhaps the most effective remedy for dysentery. To treat diarrhoea or piles the mashed pulp of the seeds.
3. An infusion of wood apple leaves is an effective remedy for peptic ulcer wood.
4. In Ayurveda all parts of the wood apple plant are used to cure snake bites.
5. The root of bale tree is used as domestic remedy to check several kinds of ear problem.

III. PHARMACOLOGICAL PROPERTIES:

Antidiabetic Activity: The 'Feronia gum' present in the trunk and branches of the wood apple tree are good for diabetic people as it can control the flow and secretion of sugar level in blood. By regulating the insulin and glucose levels, the fruit prevents spikes and plunges in our body.

Anti-diabetic activity of 95% ethanolic extracts of unripe wood apple fruits was evaluated on streptozotocin-induced diabetic rats at 250mg/kg body weight and found that it considerably lowers blood glucose levels of fasted, fed, and streptozotocin-induced diabetic rats (Gupta *et al.*,2009). Hypoglycemic effects are also observed on alloxan-induced

diabetic rats. Methanolic extract at 1.75g/kg body weight is effective in prevention of hyperglycemia (Mishra and Garg, 2011). A 21 day trial of wood apple bark at dose of 200mg/kg and 400 mg/kg body weight of methanolic extract reduces blood glucose level by 39% and 54.5% respectively (MohanaPriya *et al.*, 2012). A similar effect was found by alloxan induced rat which was measured by blood serum levels (Ilango and Chitra, 2010). Anitha *et al.* (2015) also determined significant lowering of fasting and post prandial blood sugar level after consumption of fruit juice for 90 days.



Antiulcer and Wound Healing: It was found that that wood apple fruit pulp is effective against indomethacin-induced gastric ulcer in rats. At 500mg/kg it inhibits gastric ulceration by reducing gastric HCl concentration through increasing intra-gastric pH (Mishra *et al.*, 2009). Wound healing activity of methanolic fruit extract increased by tightening wound-breaking strength, decreased epithelization period, increased wound contraction, and increased granulation tissue weight and hydroxyproline concentration at 400 mg/kg of the extract (Ilango and Chitra, 2010). *L. acidissima* extracts significantly protect the gastric mucosa against ethanol induced injury by the reduction in the mucosal lesions on dose dependent manner. The phenolic compounds presents in the fruit are responsible for protection against ulcer on gastric wall and leucocytes infiltration of submucosal layers at 400 mg/kg leaf extract (Aneesha *et al.*, 2018).

Anticancer: Wood apple has shown to have anti-cancer properties. Many anti-cancer agents are derived from wood apple that inhibit the growth of tumour, inhibit the cancer cell growth and prevent the spread of cancer cells to other parts of the body. Furthermore, it also prevents the multiplication of cancer cells, especially in case of breast cancer. The presence of flavonoids in wood apple has also shown to have anti-malignant effect. The presence of antioxidants has found to neutralize cancer causing free radicals. So many health-promoting factors found in wood apple makes it a perfect fruit to fight against cancer.



Anti Diarrhoeal Activity: Plants have various useful chemical constituents which are used in the treatment of diarrhea. The anti diarrhoeal activity and gastrointestinal motility reducing activity of alcoholic and aqueous extract of bark of *Limonia acidissima* Linn, was evaluated. In the gastrointestinal motility test, the both extracts, showed ant diarrhoeal activity in the concentration of 200mg/kg compared with the control group. Ethanolic extract showed a significant anti diarrhoeal activity and significantly decreased the propulsion of charcoal meal through the gastro intestinal tract.



Anti Microbial Activity: It was found that ethanolic extract of *Limonia acidissima* L. leaves possess abroad spectrum of activity against Gram-positive and Gram-negative bacterial strains responsible for the most common bacterial diseases. The antibacterial activity was evaluated against Gram-negative and Gram-positive bacteria by agar well diffusion method. Methanol extract showed good antibacterial activity with the high inhibition zones while chloroform extract exhibited mild to moderate activity and hexane extract was found to be less active.

Anti Oxidative Property: The crude methanol extract of the stem bark of *Limonia acidissima* L. and it's different organic soluble partitionates were screened for antioxidant activities³⁰. The antioxidant (free radical scavenging) activity of the partitionates on the stable radical 1, 1-diphenyl- 2- picrylhydrazyl (DPPH) was determined. The chloroform soluble fraction (CL) of crude methanolic extract showed the highest free radical scavenging activity. At the same time the pet ether soluble fraction (PE) also exhibited strong antioxidant potential. The methanolic extract of *Limonia* fruit was also screened for their free radical scavenging properties by Ferric reducing antioxidant power (FRAP) assay and DPPH radical scavenging assay. In vitro antioxidant activity of different extracts from leaves of *Limonia acidissima* has been well documented.

Diuretic Activity: The methanolic extract of leaves has Significantly increase urine output. The extent of urination and electrolyte excretion namely Sodium, potassium and chloride ions depend on extraction method. It was found that Microwave assisted extraction (MAE) has better activity as compared to Bath Sonicator extraction (BSE) (Parial *et al.*,2009).

Promotes Detoxification: It assists in detoxifying the body by promoting the elimination of toxins as a result of liver metabolism. It increases diuresis to speed up the removal of water-based waste. The natives of Indian regions traditionally use wood apples to help you recover from hangovers after heavy drinking. It helps to deal with the alcoholic metabolites. In addition, wood apples help to protect the liver from inflammation.

Other Usage: Wood apple fruit can be eaten plain or mixed into a Variety of beverages and desserts, or preserved as jam. The scooped-out sticky pulp, is eaten raw with or without sugar, or is blended with coconut milk and palm-sugar syrup and frozen as an ice cream. In Indonesia, wood apple is mixed with honey and eaten in breakfast. In Thailand, leaves are eaten in salads while in India the pulp is used in savory chutneys. The wood serves as fuel.

Sr. No	Parts	Disease	Constituents
1	Fruit	Antidiabetic Anticancer Detoxification Ulcer	Thiamine, Riboflavin, Acidissimin, Acidissiminol
2	Leaves	Diuretic Antimicrobial Antioxidant	Alkaloides - Psoralene, Bergapten, Flavones - Orientin, Vitexin Essential oil – Thymol (dodicanoic acid 19.34% , alpha pinene 4.025, Carvacrol 3.86% ,Camphoric acid 3.25%, caryophyllene oxide 3.06 %
3	Seed	Antidiarrhoeal Antidiabetic Dysentry	Fixed oil , carbohydrate, amino acids, protein
4	Unripe fruit	Antidiabetic	Stigmasterol
5	Trunk	Antidiabetic	Feronia gum
6	Bark	Antidiarrhoeal Antioxidative	Thymol.
7	Roots	Antidiabetic Anticancer Wound healing	Lactones - Feronia lactone, geranylumbelliferone, frenolin. Coumarin - Aurapten, marmesin, bergapten, xanthotoxin, osthol, xanthyletin, 6-methoxy-7-geranyloxy coumarin, osthenol. Quinolone alkaloid - 1-methyl-4-methoxy-2-quinolone

Table 3

Combinations Increasing Efficacy

1. Wood apple cures the problem of indigestion and constipation if it is consumed daily (not more than a cup) with jaggery for 2 – 3 months.
2. When consumed with black pepper and salt regularly will help in removing toxins from the body. This cleanses the colon.
3. Wood apple pulp along with jaggery effective against fatigue and loss of energy

IV. CONCLUSION

Limonia Acidissima L. Have different medicinal as well as well as nutritional properties. A complete ripe fruit can be directly consumed. Limonia Acidissima has different medicinal uses. It is used as anti – diarrhoeal, as well as diuretic. Leaves of wood apple are anti – diabetic.

Another then medicinal properties wood apple also shows various pharmacological activities like wound healing, Anti – oxidant and Anti bacterial properties explained in this article. Essential oil extract from leaves of wood apple gives anti-bacterial activity.

V. ACKNOWLEDGEMENT

We excess our thanks and gratitude to trustee of Samarth Rural Educational Institute's and Samarth College of Pharmacy, Belhe with their valuable guidance and support.

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