

Feronia elephantum Correa: A Potential Traditional Drug

Review Article

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Abstract

There are number of herbal plants used as medicines from the ancient time. Chemical constituents from those plants isolated for wide range of diseased condition utilizes in from the ancient times in Ayurveda, Unani, Siddha etc. systems. *Feronia elephantum* Correa from the family Rutaceae also known as Kaith, Wood apple is one of them which have many chemical constituents with important medicinal purposes and diseases like Diabetes mellitus, ulcer, as diuretic, liver tonic etc. Leaves of the plant are astringent, carminative and prescribed for vomiting, dysentery, hiccough, indigestion and slight bowel affections of children. The fruits are used as dessert, source of beverages and juices. The fruit pulp is used externally as a remedy for certain insect bite. The bark is aromatic and cooling, useful in vitiated conditions of pitta. It is indigenous in South India, Java, Myanmar, Malaysia and Ceylon and cultivated in many parts of India. This plant is already used traditionally in Sri Lanka for many purposes like vomiting, dysentery etc. Chemical constituents isolated from the plant different parts already investigated for many pharmacological and pharmaceutical activities like Anti-ulcer, Antidiabetic, Antimicrobial, Antibacterial, Antioxidant, cytotoxic, Antitumor, Antihistaminic, Hepatoprotective, Antifungal, Antifertility and Anti-inflammatory. This article is an attempt to compile all the details of plant *Feronia elephantum* Correa.

Key Words: Herbal, *Feronia Elephantum*, Pharmacological, Rutaceae, Medicinal.

Introduction

The nature gifted plants or herbs always considered in the medicinal uses from the ancient times in Ayurveda, Unani etc. systems. There are so many medicinal plants available already in market for different disease as well for immune system improvement they are considered more effective with no toxic effects (1). *Feronia elephantum* Correa from family Rutaceae is one of rare medicinal plants also known as Kaith, Wood apple to treat many diseases like Diabetes mellitus, ulcer, as diuretic, liver tonic etc. (2, 3). Leaves of the plant are astringent, carminative and prescribed for vomiting, dysentery, hiccough, indigestion and slight bowel affections of children (4). The fruits are used as dessert, source of beverages and juices. The fruit pulp is used externally as a remedy for certain insect bite (5). The bark is aromatic and cooling, useful in vitiated conditions of pitta (6). Various search

engines like pubmed, Google scholar etc. were used to collect the data and the main aim of this review is to compile all the details of plant *Feronia elephantum* Correa which will serve other researchers and scientists for further investigations of unexplored potentials of this plant and till date there is no review article is available on this plant, In this context, we have deliberated various aspects of plant *Feronia elephantum* Correa.

Taxonomical classification

- **Kingdom:** Plantae
- **Phylum:** Magnoliophyta
- **Class:** Magnoliopsida
- **Order:** Sapindales
- **Family:** Rutaceae
- **Genus:** *Feronia*. (7)

Vernacular names

- **Sanskrit:** Kapittha
- **Hindi:** Kaith, Katbel
- **Bengali:** Kadbel
- **Tamil:** Vila, Vilankay maram
- **Malayalam:** Vilavu, Vilarmatam
- **English:** Elephant Apple, Wood apple, Curd Fruit, Monkey Fruit. (8)

Synonym: *Feronia limonia*. (8)

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Plant description and distribution

It is moderate size slow growing tree, with strait sharp strong spines. The tree grows up to the height of 450 m. The fruits are sour and sweet. It is traditionally consumed as fruit and vegetable in Sri Lanka. It is indigenous in South India, Java, Myanmar, Malaysia and Ceylon and cultivated in many parts of India. (3)

Chemical constituents

The different parts of plant *Feronia elephantum* Correa consists different chemical constituents. The chemical composition of different part is given in the Table 1.

Table No.1: Chemical Constituents present in plant parts of *Feronia elephantum* Correa

Plant Part	Chemical Constituents	References
Fruit	Stigmasterol (Unripe fruit), Coumarins, tyramine derivatives, beta carotene, Vitamins (riboflavin and thiamine)	3, 10
Leaf	Methyl chavicol, essential oil (terpinolen, pinocarone, myrtenal, β -pinene, Z-anethole etc.)	4, 11,12
Bark	2-Propenenitrile, 3-(3.4-dimethoxyphenyl)	6
Root	Monoterpenoid furano coumarin lactone (fernoline), coumarins	13

Pharmacological activities

Anti-ulcer activity

- **Mishra A et al., 2009** Studied *Feronia elephantum* Correa fruit pulp ethanolic extract against the gastric ulceration in rats induced by indomethacin. Standard drug was taken ranitidine for the comparison. The results suggested that the extract decreases the acid concentration of gastric fluid but were not potent as ranitidine and acute toxicity studies didn't show any mortality between the ranges of 250-5000 mg/kg. (9)
- **Muthulakshmi A et al., 2013** Studied *Feronia elephantum* Correa bark and leaf ethanol extract against the gastric ulceration in rats induced by indomethacin. Pretreatment with the extract showed decrease in the ulcerated area as well as volume & acidity of the gastric juice. Results suggested that the plant consist the antiulcerogenic activity. (1)

Antidiabetic activity

- **Gupta R et al., 2009** Studied the anti-diabetic activity of ethanolic extract of unripe fruit of plant *Feronia elephantum* Correa in the streptozotocin induced diabetic male albino rats. The extract significantly reduced the blood glucose level of fasted, fed and streptozotocin induced diabetic rats. Histology of pancreatic β -cells showed degranulation of cells associated with blood glucose lowering was observed. (3)
- **Mishra A et al., 2011** Studied the hypoglycemic as well as antidiabetic potential of methanolic extract of fruit pulp of plant *Feronia elephantum* Correa in glucose loaded animal and alloxan induced diabetic animals.

Results showed the extract decrease the blood glucose level and reduced rate of body loss as compare to the standard metformin. Results showed the methanolic extract of plant have significant antidiabetic activity. (2)

- **Reddy et al., 2019** Studied *in vitro* α -amylase and α -glucosidase inhibition activity of methanolic and aqueous extract of fruit of plant *Feronia elephantum* Correa. All extracts showed inhibitory activity against the α -amylase and α -glucosidase enzymes. The results suggested that the aqueous and methanolic extract of plant fruit can be potential use in diabetic patients. (10)

Antimicrobial and Antibacterial activity

- **Garg S et al., 2001** Studied antibacterial and antimicrobial activity of essential oil obtained from *Feronia elephantum* Correa against ten bacteria and ten fungi using filter paper disc agar diffusion technique. The oil exhibited strong activity against them. The results showed that leaves essential oil have antibacterial and antimicrobial activity. (4)

Antioxidant and cytotoxic activity

- **Nithya N et al., 2010** Evaluated *in-vitro* antibacterial and antioxidant activities of ethanolic extract of fruit of plant *Feronia elephantum* Correa. Antioxidant activity was assessed by estimating total flavonoids, phenols, tannins, total antioxidant activity and iron chelating activity. They also estimated the antioxidant activity against isolated bacteria. Results suggested that the extract have dose dependent and broad spectrum antibacterial activity. (5)
- **Thirugnanasampandan R et al., 2014** Studied essential oil obtained from of leaves of *Feronia elephantum* for antioxidant activity by DPPH free radical, hydroxyl radical scavenging, metal chelating and prevention of deoxyribose degradation, Results suggested that oil can be useful for food preservation and preparation. (11)

Antitumor activity

- **Saima Y et al., 2000** Isolated acidic heteropolysaccharide from the plant chloroform-ethanol extract of *Feronia elephantum* Correa. The preliminary study in the murine model showed significant *in vivo* Ehrlich ascites carcinoma cell growth inhibition. (14)

Antihistaminic activity

- **Chavan S et al., 2014** Studied various extracts of *Feronia elephantum* Correa bark using clonidine induced catalepsy and haloperidol-induced catalepsy in Swiss albino mice. Ethanol extract (50 mg/kg, ip) of the plant significantly inhibited clonidine-induced catalepsy. Thus the antihistaminic activity of *Feronia elephantum* may be due to polar constituents. (15)

Hepatoprotective Activity

- **Mishra M et al., 2017** Evaluated hepatoprotective activity of ethanolic as well as aqueous extract of stem bark and Root of *Feronia elephantum* Correa against CCL4 induced Hepatic Damage in rat. On treatment with extracts at a dose of 50 & 100mg/kg, the altered levels of Biochemical markers of Hepatic Damage were found to

be at normal levels, from which it was concluded that *Feronia elephantum* Correa possess a strong hepatoprotective action against CCL4- Induced Hepatic damage in rats.(16)

Antifungal Activity

- **Balamurugan S et al., 2014** Evaluated anti-fungal activity of *Feronia elephantum* Correa extracts against *Aspergillus niger*, *Penicillium*, *Candida albicans* etc. using Agar well Diffusion assay taking Glucanazole as reference and Found that Methanolic fruit extracts possess strong anti-fungal activity against most of the strains. (17)

Antifertility Activity

- **Muthulakshmi A et al., 2013** Studied the effect of ethanolic extract of *Feronia elephantum* Correa leaf and bark on male reproductive system of albino rats and found that there was a significant decrease in weight of testis, epididymis, and seminal vesicle. Increased FSH and estrogen serum levels as well as decreased LH and testosterone were also observed in hormonal assays. (18)

Anti-Inflammatory Activity

- **Muthulakshmi A et al., 2012** Investigated anti-inflammatory activity of *Feronia elephantum* Correa leaf and bark extracts in animal models by orally administering dose of 200 & 400 mg/kg body weight in test group and control group with 0.5% NaCl (Saline) solution. Results showed that, ethanolic leaf extract possess potent anti-inflammatory activity. (19)

Discussion

Feronia elephantum Correa. Possess Anti-ulcer, Anti-diabetic, Antimicrobial, Antibacterial, Antioxidant, cytotoxic, Antitumor, Antihistaminic, Hepatoprotective, Antifungal, Anti-fertility and Anti-inflammatory. But still there may be number of active constituents, which will be present in various parts of this plant having important unexplored or hidden activities/potential.

Conclusion

This Review provides valuable details of the Plant *Feronia elephantum* Correa, which would be helpful for other researchers and scientists for further investigations and exploring properties present in this plant.

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