DOI: 10.21276/sjmps.2017.3.3.4

Saudi Journal of Medical and Pharmaceutical Sciences
Scholars Middle East Publishers
Dubai, United Arab Emirates
Website: http://scholarsmepub.com/

ISSN 2413-4929 (Print)
ISSN 2413-4910 (Online)

Original Research Article

Phytopharmacological Screening of *Feronia limonia* Linn

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Abstract: From very old days to recent civilization, human species depends on most of the natural resources for smooth running of their life. In nature specifically plants has a key source of drugs and its remedies. Feronia Limonia belonging to family Rutaceae is well known in Indian traditional systems for its traditional uses. Various parts of the plant like leaves, fruits, roots, bark have an astringent, constipating, tonic for liver and lung, diuretic, carminative, and cardiotonic effect and these are traditional uses. Various chief phytoconstituents like alkaloids, phenolic compounds, triterpenoids, tannins, steroids etc. have been isolated from Feronia Limonia. But only few pharmacological activities like antimicrobial, antiviral, antitumour, antifungal etc. activities have been scientifically reported. From huge traditional uses documented in various traditional system of medicine and presence of vital phytoconstituents make Feronia Limonia an important plant to be studied scientifically to prove a variety of traditional uses. In present work we look at Feronia Limonia description, traditional medicinal uses, and phytoconstituents and anthelmintic activity of its leaves. Five concentrations (10, 25, 50, 75 and 100 mg/ml) of aqueous extract of leaves Feronia Limonia were studied for an anthelmintic activity on adult Indian earthworms Pheretima Posthuma in a bioassay, which involved the determination of time of paralysis and time of death of the worms using Piperazine citrate as reference standard. The results indicated that 100 mg/ml concentration of Feronia Limonia leaves was more significant than that of other concentration.
Keywords: Feronia Limonia, pharmacological, phytoconstituents, anthelmintic etc

INTRODUCTION

Morphology

Feronia Limonia Linn is a deciduous, slow-growing, tree belonging to the family Rutaceae. Its leaves bark and fruits have medicinal values and used as traditional medicines for centuries due to their antimicrobial [1] antifungal [2] and insulin secretogouge activities. The fruits are round to oval, 5-12.5 cm wide, with a hard, woody, grayish-white, about 6 mm thick, pulp brown, odorous, resinous, astringent, acid or sweetish, with numerous small, white seeds scattered through it. The fruits are used in India as a liver and cardiac tonic, and when unripe, as an astringent means of halting diarrhea and dysentery and effective in treatment for cough, sore throat and diseases of the gums. The pulp is a good antidote for snakebites [3].

Taxonomical Classification: [4]
Division: Plantae
Class: Magnoliophyata
Order: Sapinadales
Family: Rutaceae
Genus: Limonia
Part used: Fruits, gum, leaves, bark and pulp are used traditionally [5].

Synonyms: Limonia Elephantum (Correa) Panigrahi, Limonia acidissima L., Schinus Limonia L [6].

Indian name:[7]
Beng.: Kayat Bael, Kavataleal,
Eng.: Wood Apple,
Guj.: Kotha, Kondhu ,
Hindi.: Kaitha,
Kan.: Bekalu, Belada, Belalu,
Mar.: Kavatha,
Punj.: Kainth,
Tam.: Vilamaram, Vilangai,
Tel.: Velaga,
Urdu.: Kaith.

Growth and Distribution

This plant is found in throughout the India [8], also cultivated in Bangladesh, Pakistan and Srilanka [9]. Propagation is done by seed and vegetative method [10]. But high rate of seedling mortality and out breeding nature of this plant account for poor regeneration and inferior germplasm. To overcome this, in vitro propagation through axillary bud proliferation has been developed [11-12].

ETHNOMEDICAL USES

Various parts of Feronia limonia have been utilized against various diseases and disorders in ethnomedicine.

Unripe Fruits

The unripe fruits are sour, aromatic, astringent, constipating, and alexipharmic and are useful in diarrhoea, dysentery, pruritus and pharyngodynia. The unripe fruit is astringent to the bowels; removes itching of the body also useful in whooping cough [5-6, 8, 9, 13].

Ripe Fruits

The Feronia limonia ripe fruits cures cough, dysentery, heart diseases, vomiting; removes biliousness, "vata", "tridosah", and blood impurities, fatigue, thirst, asthma, tumours, opthalmia, leucorrhoea, scurvy the juice cures earache. According to Yunani the fruits are cardiotonic, liver tonic and the lungs tonic, diuretic, strengthening the gums; the juice is good for stomtitis, and sore throat, topically it relieves pain due to stings of wasps and other insects. The fruit pulp is applied on the surface as a medicine for the bites of venous insects. Pulp is used to tone the breast, in amoebiosis, vermifuge and against diabetes [5, 7, 9, 10, 12].

Leaves

The leaves are used as antiemetic, hiccough and dysentery as carminative, cardiotonic, and expectorant, purgative, also useful in anorexia, bronchitis, calculus, cough, diarrhoea, gastropathy, and hiccup. The juice of leaves given to children suffering from stomach troubles [8, 9, 15, 12].

Gum

The gum is demulcent and constipating, and is useful in diarrhoea, dysentery, gastropathy, haemorrhoids and diabetes [4, 7, 8, and 13].

Barks

The bark is useful in pitta and certain liver diseases [16].

PHYTOCHEMISTRY

Preliminary Phytochemical screening

Preliminary Phytochemical screening was performed by the standard method of Kokate [17] and Harborne [18]. The compounds screened include alkaloids, phenolics compounds, flavonoids, tannins, triterpenoids, saponins, glycosides, gums & mucilage, carbohydrates, proteins & amino acids, lipids & fats.

PHARMACOLOGICAL ACTIVITIES

- Antibacterial Activity [19-21]
- Antilarvicidal Activity [22]
- Antitumor Activity [23]
- Antifungal Activity [24]
- CNS Depressant and CVS Depressant Activity [25]

ANTHELMINTIC ACTIVITY

MATERIAL AND METHODS

Plant material

The leaves of Feronia Limonia have been collected from the local area of Shahada, Dist.-Nandurbar (Maharashtra). This plant was authenticated by Dr. Santosh Tayade, Dept. of Botany, Art's, Science and Commerce College, Lonkheda, Shahada, Dist-Nandurbar (MS).

Preparation of extract

Collected leaves were dried and crushed to a coarse powder and extracted by maceration. Extract was dried over anhydrous sodium sulphate and solvent was removed in vacuum at 40°C by using rotary evaporator. The aqueous extract was subjected to preliminary phytochemical testing for the presence of different chemical classes of compounds [26].

Worms Collection and Authentication

Indian earthworms Pheretima Posthuma (Annelida) were collected from the water logged areas of soils. Indian earthworms were identified at Department of Zoology, P.S.G.V.P. Mandal's, Shahada, and Maharashtra.

Anthelmintic activity

The Anthelmintic activity was carried as per the method of Ajaiyeoba et al. with necessary modifications [27]. The assay was performed on adult Indian earthworm Pheretima Posthuma, due to its anatomical and physiological resemblance with the intestinal round worm parasite of human being [28, 29]. Because of easy availability, earth worms have been used widely for initial evaluation of anthelmintic compounds in vitro [30]. 50 ml. of formulation containing different concentration of crude aqueous extract (10, 25, 50 75 and 100 mg/ml in distilled water) were prepared and 6 adult worms of same type were placed in it. Time for paralysis was noted, when no movement of any sort could be observed except when the worms were shaken vigorously. Time for death of worms were recorded after ascertaining that worms neither moved when shaken vigorously nor when dipped in warm water (50°C). Piperazine citrate (10 mg/ml) was used as reference standard while distilled water as control.

Statistical Analysis [31, 32]

The data presented as Mean ± SEM. The activities of both the leaves extracts were compared with the control. All the extracts showed significantly higher duration of paralysis and death. Values of $P<0.001$ were considered statistically significant.

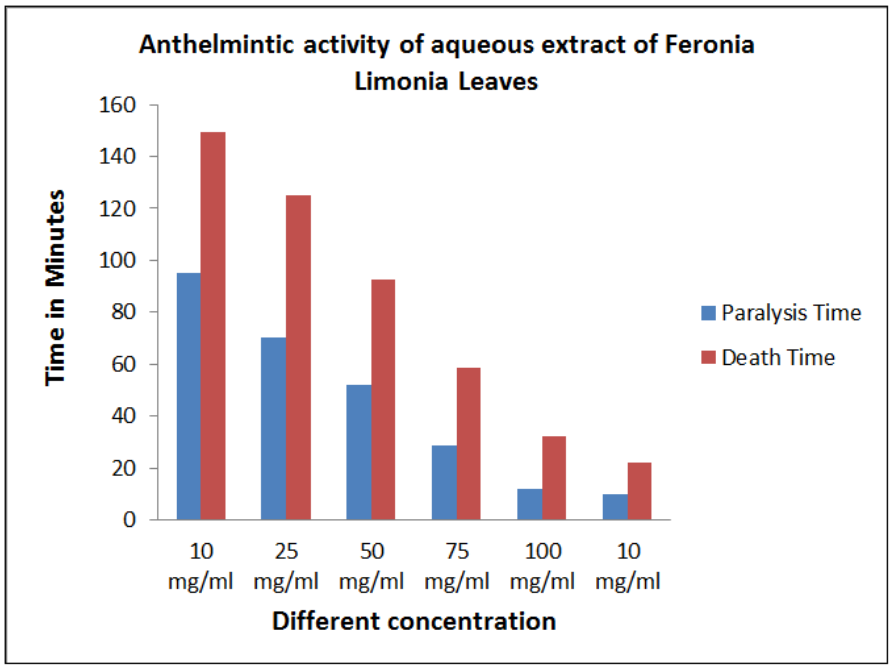
RESULTS AND DISCUSSION

Preliminary phytochemical screening has shown the presence of saponins, tannins, proteins, carbohydrates and flavonoids in aqueous extract of plants. From Table 1, it is observed that 100 mg/ml conc. of leaves Feronia Limonia shown potent anthelmintic activity while 50 mg/ml conc. taken more time for death of worms. The results are compared with the standard drug Piperazine citrate. Further study regarding isolation and characterization of active principles are responsible for activity and establishment of possible mechanisms of action are currently under progress.

Table-1: Anthelmintic activity of aqueous extract of Feronia Limonia Leaves

Test Substance	Concentration in mg/ml	Time taken for Paralysis (P) and Death (D) of worms in minute	
		Pheretima Posthuma	
		P	D
Vehicle	-	-	-
Aqueous extract	10 mg/ml	95.36± 2.4	149.26 ± 2.8
Aqueous extract	25 mg/ml	70.14± 3.2	125.12 ± 4.6
Aqueous extract	50 mg/ml	52.10± 1.7	92.56 ± 2.4
Aqueous extract	75 mg/ml	28.44± 2.2	58.44 ± 3.8
Aqueous extract	100 mg/ml	12.12± 4.2	32.37 ± 1.2
Piperazine citrate	10 mg/ml	10.32± 3.6	22.25 ± 1.0

All values are Mean ± SEM; n=6 in each group. Values are significantly different from reference standard (Piperazine citrate) *p<0.05; **p<0.01; ***p<0.001



Graph: Anthelmintic activity of aqueous extract of Feronia Limonia Leaves

Acknowledgement

Authors are thankful to Shri K. N. Patil for providing worms for research purposed and P. S .G. V. P. M's College of Pharmacy, Shahada, Dist-Nandurbar for providing necessary facilities

CONCLUSION

In this article we have selected the plant Feronia limonia (L.) for reviewing it traditional uses, investigated phytochemical and pharmacological activities like anthelmintic. From the review it is clear that although the plant is exhaustively used for various ailments in ehtnopharmacology as well as having various important chemical constituents but not well studied scientifically for its pharmacological activities. This article provide ready to use material for the growing pharmacologist if they want to work on the plants. Wood apple is an endangered tree species but equally a valued plant for its suitable for eating fruits and vast medicinal properties. If some of the phytochemical from wood apple will be proved for its traditional uses, the cultivation of the plant can be done even on the barrel land, and it will be a good profitable business for the farmers as well.

REFERENCES

1. Khewkhom, N., Greger, H., & Shangchote, S. (2008). Antimicrobial activity of 16 plant extracts of the Rutaceae family against phytopathogenic fungi. In Agricultural Sci. J.
2. ADIKARAM, N. B., Abhayawardhane, Y., Gunatilaka, A. L., Bandara, B. R., & Wijeratne, E. K. (1989). Antifungal activity, acid and sugar content in the wood apple (Limonia acidissima) and their relation to fungal development. Plant pathology, 38(2), 258-265.
3. Gupta, R., Johri, S., & Saxena, A. M. (2009). Effect of ethanolic extract of Feronia elephantum Correa fruits on blood glucose levels in normal and streptozotocin-induced diabetic rats.
4. Panda, H. (2002). Medicinal plants cultivation & their uses. ASIA PACIFIC BUSINESS PRESS Inc.
5. Chatterjee, A., & Pakrashi, S. C. (1991). The treatise on Indian medicinal plants: vol. 1. New Delhi: Publications and Information Directorate, CSIR 172p.-illus., col. illus.. ISBN 8172360118 En Icones. Includes authentic Sanskrit slokas in both Devnagri and Roman scripts. Plant records. Geog, 6.
6. Mukherjee, P. K., & Wahile, A. (2006). Integrated approaches towards drug development from Ayurveda and other Indian system of medicines. Journal of ethnopharmacology, 103(1), 25-35. Nambiar, V. P. K. (1993). Indian medicinal plants: a compendium of 500 species (Vol. 5). Orient Blackswan.
7. Guha, D. N., Sensarma, P., & Pal, D. C. (1999). A lexicon of medicinal plants in India. Naya Prokash, Calcutta, 1st Publication, 1, 389.
8. Prajapathi, N. D., Purohit, S. S., Sharma, A. K., & Kumar, T. (2003). A handbook of medicinal plants: A complete source book. Agrobios, India, 396.
9. Krishnamurthi, A. (1969). The Wealth of India: Raw Materials: Vol. VIII. Ph-Re. The Wealth of India: Raw Materials: Vol. VIII. Ph-Re.
10. Hiregoudar, L. V., Murthy, H. N., Hema, B. P., Hahn, E. J., & Paek, K. Y. (2003). Multiple shoot induction and plant regeneration of Feronia limonia (L.) Swingle. Scientia Horticulturae, 98(4), 357-364.
11. Dymock, W., Warden, C. J. H., & Hooper, D. (1890). Pharmacographia Indica: A history of the principal drugs of vegetable origin, met with in British India (Vol. 1). K. Paul, Trench, Trübner & Company, ld.
12. Nadkarni, K. M. (Ed.). (1996). [Indian materia medica]; Dr. KM Nadkarni's Indian materia medica: with Ayurvedic, Unani-Tibbi, Siddha, allopathic, homeopathic, naturopathic & home remedies, appendices & indexes. 1 (Vol. 1). Popular Prakashan.
13. Joshi, S. G. (2000). Medicinal plants. Oxford and IBH publishing.
14. Gill, A. S., Bisaria, A. K., & Shukla, S. K. (1998). Potential of agroforestry as source of medicinal plants. Current Concepts of Multidiscipline Approach to the Medicinal plants (Part I), 12, 1-28.
15. Govil, J. N. (Ed.). (1998). Current Concepts of Multidiscipline Approach to the Medicinal Plant (Vol. 12). Today and Tomorrow Publisher.
16. Dave, R., Nagani, K., & Chanda, S. (2010). Pharmacognostic studies and physicochemical properties of the Polyalthia longifolia var. pendula leaf. Pharmacognosy Journal, 2(13), 572-576.
17. Robards, K., & Antolovich, M. (1997). Analytical chemistry of fruit bioflavonoidsA review. Analyst, 122(2), 11R-34R.
18. Garg, S. C. (2001). Antimicrobial activity of the essential oil of Feronia elephantum Correa. Indian Journal of Pharmaceutical Sciences, 63(2), 155.
19. Geda, A., & Bokadia, M. M. (1980). Antimicrobial activity of essential oils on human pathogenic bacteria. Science & Culture, 46(1), 33-35.
20. Sharma, G. P., Jain, N. K., & Garg, B. D. (1979). Antibacterial activity of some essential oils.
21. Rahuman, A. A., Gopalakrishnan, G., Ghouse, B. S., Arumugam, S., & Himalayan, B. (2000). Effect of Feronia limonia on mosquito larvae. Fitoterapia, 71(5), 553-555.
22. Saima, Y., Das, A. K., Sarkar, K. K., Sen, A. K., & Sur, P. (2000). An antitumor pectic polysaccharide from Feronia limonia. International Journal of Biological Macromolecules, 27(5), 333-335.
23. Gupta, C., & Singh, V. P. (1982). In vitro antifungal effect of the essential oils of some medicinal plants. Science and Culture.
24. Patel, B. D., Shrivastava, R., & Uppadhyay, R. K. (1982). Phytochemical and pharmacological studies of root and root bark of Feronia limonia (L.) Swingle. Indian journal of forestry.
25. Kokate, C. K. (1986). Practical pharmacognosy. Vallabh Prakashan, New Delhi, 111.
26. Ajaiyeoba, E. O., Onocha, P. A., & Olarenwaju, O. T. (2001). In vitro anthelmintic properties of Buchholzia coriaceae and Gynandropsis gynandra extracts. Pharmaceutical Biology, 39(3), 217-220.
27. Mulla, W. A., Thorat, V. S., Patil, R. V., & Burade, K. B. (2010). Anthelmintic activity of leaves of Alocasia indica Linn. International Journal of PharmTech Research, 2(1), 26-30.
28. Vigar, Z. Atlas of Medical Parasitology. 1984.
29. Sollmann, T. (1918). Anthelmintics: Their efficiency as tested on earthworms. Journal of

Pharmacology and Experimental Therapeutics, 12(3), 129-170.
30. Metcalfe, C. (2001). Biostatistics: A Foundation for Analysis in the Health Sciences. 7th edn.
31. Wayne W. Daniel, Wiley, 1999. No. of. pages: xiv+ 755+ appendices. Price:£ 28.95. Statistics in Medicine, 20(2), 324-326.
32. Liberman, A. M., Cooper, F. S., Shankweiler, D. P., & Studdert-Kennedy, M. (1967). Perception of the speech code. Psychological review, 74(6), 431.