ORIGINAL ARTICLE

Anthelmintic activity of *Ficus benghalensis*

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The World Health Organization estimates that a staggering two billion people harbor parasitic worm infections. Parasitic worms also infect livestock and crops, affecting food production with a resultant economic impact. Despite this prevalence of parasitic infections, the research on anthelmintic drug is poor. As per WHO, only few drugs are frequently used in the treatment of helminthes in human beings. Anthelmintics from the natural sources may play a key role in the treatment of these parasite infections. In view of this, an attempt has been made to study the anthelmintic activity of roots of *Ficus benghalensis*. In this study, methanolic, aqueous, chloroform, petroleum ether extracts were used and studied for paralysis and death of earthworm. All the extracts were found not only to paralyze (Vermifuge) but also to kill the earthworms (Vermicidal). The aqueous and methanolic extract was found to be more effective to execute the earthworm.

Key words: Anthelmintic activity, *Ficus benghalensis*, pheretima posthuma

INTRODUCTION

Ficus benghalensis (Moraceae, Mulberry family) is commonly known as Banyan tree or Vata or Vada tree in Ayurveda. There are more than 800 species and 2000 varieties of Ficus species, most of which are native to the old World tropics. *Ficus benghalensis* a remarkable tree of India sends down its branches and great number of shoots, which take root and become new trunk. This tree is considered to be sacred in many places in India. Earlier glucoside, 20-tetratriaconthene-2-one, 6-heptatriacontene-10-one, pentatriacontan-5-one, beta sitostirol-alpha-D-glucose and meso-inositol have been isolated from the bark of *Ficus benghalensis*.[1,2] Leaves contain crude protein 9.63%, crude fibres-26.84%, CaO-2.53%, and Phosphorus-0.4%. It yields latex containing Caoytchoue (2.4%), Resin, Albumin, Cerin, Sugar and Malic acid. It is used in Ayurveda for the treatment of Diarrhea, Dysentery and piles,[3,4] teeth disorders,[5] Rheumatism, skin disorders like sores,[6] to boost immune system,[7] as a hypoglycemic.[8-11] The extracts of *Ficus benghalensis* were also reported to inhibit insulinase activity from liver and kidney.[12] Fruit extracts exhibited anti-tumor activity in the potato disc bioassay.[13] Two flavonoid compounds, viz. 5, 7-dimethyl ether of leucopelargonidin 3-0-alpha-L rhamnoside and 5, 3′-dimethyl ether of leucocyanidin 3-0-alpha-D galactosyl cellobioside were obtained from the bark of *F. benghalensis* evaluated for anti-oxidant activity in hyperlipidemic rats.[14] It was also found to inhibit the lipid peroxidation.[15] Various extracts of *Ficus benghalensis* was screened for its anti-allergic and anti-stress potential in asthma by milk induced leucocytosis and milk induced eosinophilia.[16] Other species of Ficus viz. *Ficus inspida*,[17] *Ficus carica*,[17] *Ficus religiosa*[18] was found to be reported to have anthelmintic activity. Based on this, an attempt has been made to evaluate the anthelmintic potency of *Ficus benghalensis*.

MATERIALS AND METHODS

Plant Material

Underground roots of *Ficus benghalensis* were collected from Satara District, Maharashtra, India in the month of October 2007. This plant material was authenticated at the Dept. of Botany, Sinhgad College of Science, STES Campus, Pune and the Voucher herbarium specimen is deposited in the Dept of Pharmacognosy of Sinhgad Institute of Pharmacy, Narhe, Pune. Around 3 kg of fresh root tubers was collected and washed under running tap water, dried and were cut into small pieces of 2-3 cm. These roots were then shade dried (30^0C, 45 % relative humidity) for 15 days and then homogenized to get a coarse powder. This powder was stored in an air tight container and used for further successive extraction.

Preparation of Extracts

Aqueous extract (by decoction method)

160 g of coarse powder of root extracts of *Ficus benghalensis* was boiled with 1300 ml of double distilled water for 1h. Then it was kept at a room temperature for 24h and then filtered through muslin cloth. The filtrate obtained was then concentrated to thick slurry and the residue was again boiled for 1h and filtered. The

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filtrate thus obtained was added to the thick slurry of first step. The resultant solution was boiled again to get a thick concentrated extract. It is then dried and used as a powder. The percentage yield was found to be 9.99 g.

Solvent Extraction

The methanolic, Chloroform, and petroleum extracts of the roots of *Ficus benghalensis* were prepared by soxhletion. In this extraction process, 45 g of dried powder was extracted with 500 ml of methanol, chloroform and petroleum ether separately at 30°C. A total of 50 cycles were run to obtain thick slurry. This slurry was then evaporated to yield a solid extracts of methanol, chloroform and petroleum ether. The percentage yield of methanol, chloroform and petroleum ether was found to be 1.908 %, 0.558 % and 0. 43 % respectively.

Animals

Indian adult earthworms (Pheretima posthuma) were used to study anthelmintic activity. The earthworms were collected from moist soil and washed with normal saline to remove all fecal matter. The earthworms of 3-5 cm in length and 0.1-0.2 cm in width were used for all experimental protocol. The earthworm resembles both anatomically and physiologically to the intestinal roundworm parasites of human beings, hence can be used to study the anthelmintic activity.[19]

Drugs and Chemicals

Albendazole (ABZ Karehealth specialities Pvt. Ltd.), Methanol AR (Thomas Baker Chemical Pvt. Ltd.), Chloroform GR (Loba Chemicals), Petroleum Ether AR (60-80°C, MCC), Diethyl Formamide, DMF, (Thomas Baker Chemical Pvt. Ltd.) were used during the experimental protocol.

Anthelmintic Activity

For the anthelmintic activity of root extracts of *Ficus benghalensis,* Indian adult earthworms (*Pheretima posthuma*) of 3-5 cm in length and 0.1-0.2 cm in width were used. The animals were divided into six groups containing six earthworms in each group. All the extracts of *Ficus benghalensis* were dissolved in minimum quantity of DMF and then the volume was adjusted to 10 ml with normal saline water. All the extracts and the standard drug solution were freshly prepared before starting the experiments. Different extracts and the standard drug solution were poured in different petridishes. All the earthworms were washed in normal saline solution before they were released into 10 ml of respective formulation as follows: Vehicle (5% DMF in normal saline), Albendazole (20 mg/ml). Aqueous extract (20 mg/ml), Methanol extract (20 mg/ml), Chloroform extract (20 mg/ml), Petroleum Ether extract (20 mg/ml). Observations were made for the time taken to paralyze (Paralysis was said to occur when the worm did not revive even in normal saline) and Death (Death was concluded when the worms lost their motility followed with their body colors fading away). All the results were expressed as a mean ± SEM of six animals in each group.

RESULTS AND DISCUSSION

Preliminary Phytochemical analysis showed the presence of carbohydrates, flavonoids, aminoacids, steroids, Saponins and tannins like phytoconstituents in the extracts of *Ficus benghalensis*. Some of these phytoconstituents may be responsible to show a potent anthelmintic activity. From the observations made all the extracts of roots of *Ficus benghalensis* was found to show a potent anthelmintic activity when compared to the standard drug. Aqueous extracts of *Ficus benghalensis* at 20 mg/ml concentration shows paralysis at 3.44 min and death at 4.34 min, whereas methanolic extract shows paralysis at 3.02 min and death at 4.36 min. These two extracts show good anthelmintic activity as compared to other extracts [Fig. 1]. Chloroform at 20 mg/ml causes paralysis at 3.71 min and death at 4.91 min; and petroleum ether at 20 mg/ml shows paralysis at 4.03 min and death after 6.18 min. The standard drug, Albendazole shows paralysis at 2.68 min and death after 5.29 min. All the values are expressed as mean ± SEM (n = 6).

From the above results, it is concluded that all the extracts of roots of *Ficus benghalensis* have potent anthelmintic activity when compared with the conventionally used drug and is equipotent to standard anthelmintic drug. Further studies using *in vivo* models are required to carry out and establish the effectiveness and pharmacological rationale for the use of *Ficus benghalensis* as an anthelmintic drug. The drug may be further explored for its phytochemical profile to identify the active constituent responsible for anthelmintic activity.

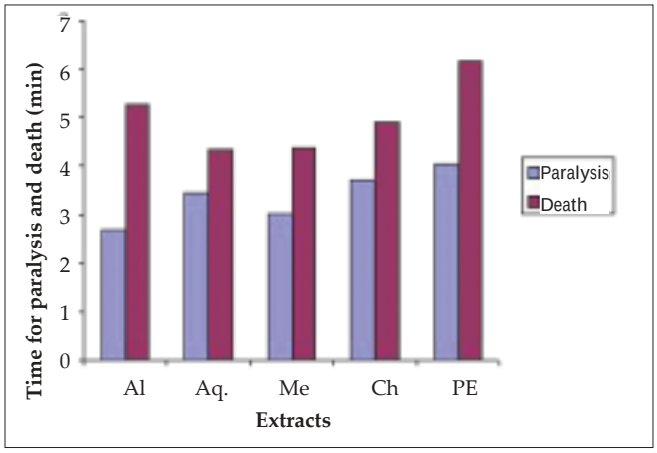

Figure 1: Anthelmintic activity of various extracts of *Ficus benghalensis*

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REFERENCES

1. Subramanian PM, Misra GS. Chemical constituents of *Ficus bengalensis.* Polish J Pharmacol Pharma 1978;30:559-62.
2. The wealth of India, Volume-(F-G). In: A dictionary of Indian Raw materials and industrial products. New Delhi: Council of Scientific and Industrial Research; 2005. p. 24-6.
3. Mukherjee PK, Saha K, Murugesan T, Mandal SC, Pal M, Saha BP. Screening of anti-diarrhoeal profile of some plant extracts of a specific region of West Bengal, India. J Ethnopharmacol 1998;60:85-9.
4. Husain A, Virmani OP, Popli SP, Misra LN, Gupta MM, Srivastava GN, *et al*. Dictionary of Indian Medicinal Plants. Lucknow, India; CIMAP; 1992. p. 546.
5. Aiyer MN, Namboodiri AN, Kolammal M. Pharmacognosy of Ayurvedic drugs. Trivandrum: 1957.
6. Warrier PK, Nambiar VP, Ramankutty C. Indian Medicinal Plants. Vol. 1-5. Madras: Orient Longman Ltd; 1993-1995.
7. Gabhe SY, Tatke PA, Khan TA. Evaluation of the immunomodulatory activity of the methanol extract of *Ficus benghalensis* roots in rats. Indian J Pharmacol 2006;38:271-5.
8. Shrotri DS, Aiman R. The relationship of the post-operative state to the hypoglycemic action studies on *Ficus benghalensis* and *Ficus glomerata*. Indian J Med Res 1960;48:162-
9. Deshmukh VK, Shrotri DS, Aiman R. Isolation of a hypoglycemic principle from the bark of *Ficus bengalensis.* Indian J Physiol Pharmacol 1960;4:182-5.
10. Augusti KT. Hypoglycemic action of bengalenoside: A glucoside isolated from *Ficus benghalensis* Linn., in normal and alloxan diabetic rabbits. Indian J Physiol Pharmacol 1975;19:218-20.
11. Augusti KT, Daniel RS, Cherian S, Sheela CG, Nair CR. Effect of leucopelargonin derivative from *Ficus benghalensis* Linn: On diabetic dogs. Indian J Med Res 1994;99:82-6.
12. Achrekar S, Kaklaji GS, Pote MS, Kelkar SM. Hypoglycemic activity of *Eugenia jambolana* and *Ficus benghalensis*: Mechanism of action. In vivo 1991;5:143-7.
13. Mousa O, Vuorela P, Kiviranta J, Wahab SA, Hiltohen R, Vuorela H. Bioactivity of certain Egyptian *Ficus* species. J Ethnopharmacol 1994;41:71-6.
14. Daniel RS, Mathew BC, Devi KS, Augusti KS. Antioxidant effects of two flavonoids from the bark of *Ficus bengalensis* in hyperlipidemic rats. Indian J Exp Biol 1996;36:902-6.
15. Shukla R, Gupta S, Gambhir JK, Prabhu KM, Murthy PS. Antioxidant effect of aqueous extract of the bark of *Ficus bengalensis* in hypercholesterolaemic rabbits. J Ethnopharmacol 2004;92: 47-51.
16. Taur DJ, Nirmal SA, Patil RY, Kharya MD. Antistress and antiallergic effects of *Ficus bengalensis* bark in asthma. Nat Prod Res 2007;21:1266-70.
17. de Amorin A, Borba HR, Carauta JP, Lopes D, Kaplan MA. Anthelmintic activity of the latex of *Ficus*species. J Ethnopharmacol 1999;64:255-8.
18. Iqbal Z, Nadeem QK, Khan MN, Akhtar MS, Waraich FN. *In vitro* anthelmintic activity of *Allium sativum, Zingiber officinale, Curcurbita mexicana*and *Ficus religiosa*. Int J Agr Biol 2001;3:454-7.
19. Nirmal SA, Malwadkar G, Laware RB. Anthelmintic activity of *Pongamia glabra*. Songklanakarin J Sci Technol 2007;29:755-7.

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