World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(RESEARCH ARTICLE)

Check for updates

A study of analgesic effect of medicinal plant *Ficus heterophylla* in Swiss albino mice

Majedul Hoque *, Md Mahabur Rahman and Md Nasir Uddin

Department of pharmacy, Jahangirnagar University, Dhaka-1342, Bangladesh.

World Journal of Advanced Research and Reviews, 2023, 19(03), 516–523

Publication history: Received on 30 July 2023; revised on 09 September 2023; accepted on 12 September 2023

Article DOI: https://doi.org/10.30574/wjarr.2023.19.3.1804

Abstract

Ficus heterophyllus are readily available and used in Bangladesh without the required regulation or inspection. Eastern Asia, comprising southern China, India, Sri Lanka, Myanmar, Thailand, Cambodia, Laos, Vietnam, Malaysia, and Indonesia, is the original home of the *Ficus heterophylla* Linn tree. It grows in tropical and subtropical areas of India and is utilized in traditional medicine for a number of different things. It is a member of the Moraceae family and typically grows as a shrub up to 3 metres tall. It is often being occurred in open places, particularly flood-margins of rivers. To demonstrate the claimed therapeutic effect for this plant we conducted pharmacological studies. By conducting three studies, we found that it has significant analgesic and other therapeutic effects. Analgesic study with hot plate, formalin and Acetic acid induced pain test, *Ficus heterophyllus* showed very highly significant, no significant and moderate significant analgesic effect in different dose respectively.

Keywords: *Ficus heterophylla*; Moraceae; Botanical description; Analgesic effect

1. Introduction

Due to traditional acceptability, a lack of contemporary healthcare infrastructure, and the expensive cost of pharmaceutical pharmaceuticals as well, medicinal plants play important roles in the primary healthcare systems of numerous poor countries. the effectiveness of herbal remedies against certain illnesses that cannot be contemporary medicinal medications are used to treat. [1] These metabolites occur in latex, leaves, fruit, stem, and roots of different species[2]. The Indian Ficus plants possess remarkable analgesic, antimicrobial anti-arthritic, anticancer, neuroprotective and antidiabetic properties[3-7]. The majority of Indian Ficus species are trees, shrubs, herbs, climbers, and evergreen and deciduous trees. When broken, the waxy, palmately complex, reticulate leaves release white or yellow latex. Few Indian Ficus species are epiphytes, but several have aerial roots. Different parts (bark, fruit, leaves, roots, and latex) of Ficus plants are used in the treatment of leprosy, nose bleeding, cough, paralysis, liver diseases, chest pain, and piles[8-9]. A perennial source of medicinal plants found in nature has been a valuable source of medicines for humans. In underdeveloped nations, more than 80% of the population relies on traditional medicines for medical care. It has been known for thousands of years that medicinal plants are beneficial in treating a variety of ailments. The medicinally useful plants were located, their biochemical profiles were extracted, and formulations for medical use were created[10-11] The *Ficus heterophylla* L. fig tree is native to eastern Asia, including southern China, India, Sri Lanka, Myanmar, Thailand, Cambodia, Laos, Vietnam, Malaysia, and Indonesia. It thrives in tropical and subtropical regions of India and is used for a variety of purposes in traditional medicine. It is a member of the Moraceae family and lives as a shrub, often lying flat or reaching heights of three metres[12].

* Corresponding author: Majedul Hoque

Figure 1 Leafs, Fruits and Branches of *Ficus heterophylla*

1.1. Analgesic effect of *Ficus heterophylla*

Indian Ficus species possess analgesic activity[13]. Pain is a common manifestation of many human disorders. Opiates and non-steroidal anti-inflammatory medicines (NSAIDs) have historically been used to treat these illnesses, but they have a number of negative side effects, including gastrointestinal problems, kidney damage, and respiratory issues[14-15]. The effects of *Ficus heterophylla* semen methanol extract (MEXS) on lipopolysaccharide (LPS)-induced nitric oxide (NO), prostaglandin E2 (PGE2), and tumour necrosis factor (TNF) generation in RAW 264.7 cells were assessed in a study. According to data, MEXS is a powerful inhibitor of NO, PGE2, and TNF- production. It does this by preventing nuclear factor kappa B (NF-B) DNA binding activity and the translocation of NF-B to the nucleus, which are both necessary for NF-B's anti-inflammatory effects. Additionally, the analgesic effects of MEXS (100, 200 mg/kg/day, p.o.) were demonstrated in an acetic acid-induced abdominal constriction test and hot plate test, and the anti-inflammatory and anti-nociceptive activities of MEXS (100, 200 mg/kg/day, p.o.) decreased acute paw oedema generated by carrageenan in rats[16].

1.2. Botanical Description

Ficus heterophylla is a shrub that can be up to 3 metres tall or commonly lies prostrate. For use locally as food and medicinal, the herb is gathered from the wild. Each species of fig tree has an unique method of fertilization that depends on a single, extremely specialized type of wasp, which is wholly dependent on that particular fig species to reproduce. The trees produce three different types of flowers: male, female with long and short styles, often known as the gall flower. The structure we typically think of as the fruit actually contains all three types of flowers[17]. *Ficus heterophylla* is a species of fig plant that is native to western Malaysia, southern China, Indo-China, and India. It is a member of the Moraceae family. It could go by the name v b in Vietnam. F. scabrella Roxburgh; *Ficus heterophylla* var. scabrella (King)[18].

1.3. Scientific Nomenclature, source: wikipedia

Kingdom:	Plantae
Clade:	Tracheophytes
Clade:	Angiosperms
Clade:	Eudicots
Clade:	Rosids
Order:	Rosales

Family:	Moraceae
Genus:	*Ficus*
Subgenus:	*F.* subg. *Sycidium*
Species:	***F. heterophylla***

Binomial name

Ficus heterophylla

2. Materials and method

2.1. Plant material

The plant samples were collected from the fruit of *Ficus heterophyllus*

2.2. Preparation of the extract

We extracted the *Ficus heterophylla* leaves by separating and cleaning it well. After being cleaned, leaves were dried in the shade. The process of drying the leaves continued until they were thoroughly dried and ready to be ground. We dried the leaves, then used a mechanical blender to grind them into a fine powder, which we then transferred into an airtight container with the appropriate labelling. Afterward, the powdered and dried leaves were removed. Employed the Soxhlet equipment to be blended with methanol, ether, and water in that order. A 20gm powder of plant specimen leaves was weighed and subsequently extracted for 24 hours by soxhelation with 200 ml of methanol (60–80 °C), ether, and aqueous solution. The fruits parts were air dried at room temperature under shade for 9 to 14 days and then crushed into coarse powder with a pestle and mortal. The powdered fruit was exhaustively extracted with methanol using soxhlet apparatus. The solvent in both cases were removed at reduced pressure.

2.3. Animals

To conduct this study we used Swiss albino male mice (28-35g). We kept all these animals maintained under laboratory conditions of temperature, humidity and light, and they were allowed free access to food and water. All experiments were conducted in accordance with animal use ethics as accepted internationally.

2.4. Drug

Diclofenac tablet (100 mg/body weight) and Tramadol 50 mg/kg,

We fed them as a standard.

2.5. Dose and Route of Administration

The mice were administered at a dose of 250 mg/kg body weight of Ficus heterophyllus which was considered as 1X dose and another 500 mg/kg body weight of Ficus heterophyllus which considered as 2X dose.

The route of administration was per oral (p.o).

2.6. Analgesic effect evaluation

2.6.1. Hot plate test method

Principle

Similar to the tail flick test, the hot plate test measures how animals react to pain. Typically, centrally acting analgesics are tested using the hot plate and tail-flick procedures, while peripherally acting medications perform poorly in these tests but respond well to the acetic acid-induced writhing test.

By analysing the body's response to heat-induced pain, the hot plate test is used in fundamental pain research and to assess the efficiency of analgesics. Eddy and Leimbach made the suggestion in 1953. They employed a behavioural nociception paradigm in which unpleasant thermal stimuli cause actions like jumping and hind paw licking to be

produced. Licking is a quick reaction to unpleasant thermal stimuli and a clear sign of nociceptive threshold. Jumping entails an emotional element of escape and is a more complex response with a latency.

Procedure

To hold the animal on the heated plate surface, we used a clear glass cylinder. A thermo-regulated water-circulated pump was used to control the hot plate's temperature.

The distance between the instant the animal is placed on the hot plate surface and the instant it licks its paw or hops off to protect itself from thermal pain is known as the time of latency.

2.6.2. Formaldehyde Induced leaking test

Principle

The larger formalin dose caused the paw swelling to occur in two phases, each accompanied by an increase in vascular permeability. Pretreatment with capsaicin but not xylocaine reduced this oedema. By injecting RP67580 30 minutes before or after formalin, it was decreased.

Procedure

The amount of time the animal spent licking a hindpaw after receiving a 1 or 5% formalin injection was timed. Two separate phases of intense licking activity were discovered based on the reaction pattern: an early response (0–5 min after injection) and a late response (20–30 min after injection).

2.6.3. Acetic acid test

Principle

Using irritating agents like phenylquinone and acetic acid to inflict pain of peripheral origin on mice, the writing test is a chemical procedure. The test compound's analgesic effectiveness can be derived from a decrease in the frequency of writhings.

Procedure

Inducing an inflammatory reaction in the abdominal cavity causes acetic acid to activate nociceptors as a result. Acetic acid is administered intraperitoneally into animals, causing a painful reaction and acute peritoneal inflammation.

3. Result

3.1. Hot plate test

We have done this test to identify if there is any analgesic effect of the agent .The hot-plate test also utilize latency measurement to asses acute, cutaneous pain sensitivity. The hot plate test is also quick and relatively inexpensive way to asses acute, thermal pain, and an advantage over tail /tail withdrawal is the opportunity to test thermal sensitivity un –confounded by stress induced analgesia.

After completing this test we found that herbal medicine containing plant *Ficus heterophylla* shows statistically very highly significant effects in 60 min, highly significance in 120 min and significance in 180 min on analgesic property mark for standard dose

During 1X dose, it shows statistically highly significant effects on analgesic property only during 60 min mark for IX dose.

During 2X dose, it shows statistically significance result found in this test.

Table 1 Effect of FH 1x and FH 2xon the latency time on hot plate test in mice

Group	Latency time (Mean±SEM)				
	0 min	30 min	60 min	120 min	180 min
Control	2.0±0.34	2.17±0.17	1.17±0.17	1.33±0.21	1.17±0.17
STD (Tramadol 50mg/kg)	2.0±0.37	2.83±0.31	3.33±0.42***	2.83±0.31**	2.00±0.26*
FH 1x	2.66±0.37	2.0±0.00	2.83±0.31**	2.33±0.42	1.50±0.22
FH 2x	1.5±0.22	2.33±0.21	3.16±0.22*	2.83±0.00	1.67±0.22

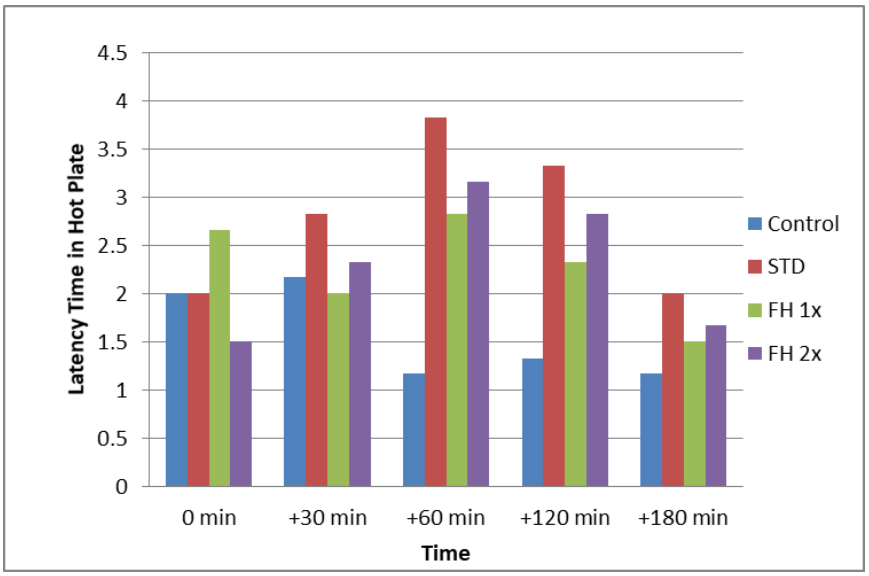

Figure 2 Effect of FH 1x and FH 2x on the latency time on hot plate test in mice

3.2. Formalin induced analgesic property test

We done This test also to identify the analgesic property of the agent. But the pain is induced with ingestion of formalin to the subject. Moderate, ongoing pain from damaged tissue is caused by formalin administration. This distinguishes it from the majority of conventional nociception tests, which depend on short stimuli of threshold strength.

During standard dose, although the mean values increased, there was no statistically significant result found that ensures analgesic property of *Ficus heterophylla*.

During IX dose, although the mean values increased, there was no statistically significant result found that ensures analgesic property of *Ficus heterophylla*.

Also during 2X dose, there is no significant result either. Although the mean value increased with increased dose

Table 2 Effect of FH 1x and FH 2x in the formalin induced paw licking test.

Group	Licking Time (Mean±SEM)	% inhibition of algesia
Control	65.67±15.00	00
STD(Tramadol 50mg/kg)	39.83±9.74	
FH 1x	58.83±13.78	
FH 2x	55.93±4.16	

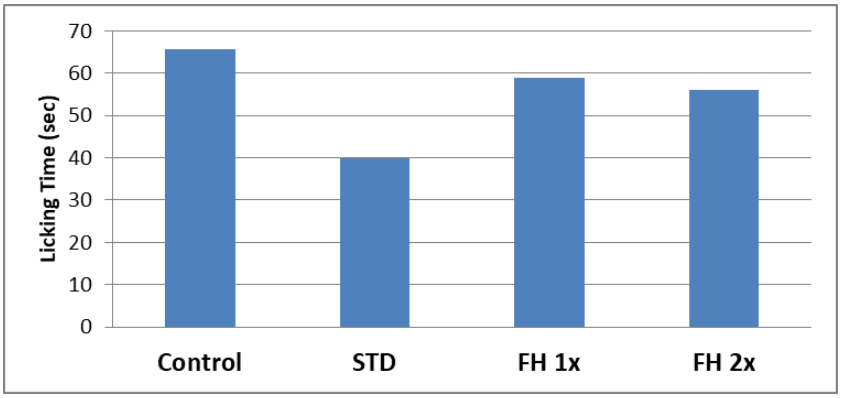

Figure 3 Effect of FH 1x and FH 2x in the formalin induced paw licking test

3.3. Acetic acid Induced writhing test for analgesic property

We have done this test to identify the analgesic property of the agent. But the pain is induced with ingestion of Acetic acid to the subject. When acetic acid is administered, wounded tissue produces mild, ongoing pain.

During standard dose, it shows statistically highly significant result that ensures analgesic property of Ficus heterophyllus.

During IX dose, although the mean values increased, there was slightly significant result found that ensures analgesic property of Ficus heterophyllus.

Also during 2X dose, the result is almost same. And the mean value slightly increased with increased dose

Table 3 Effect of FH 1x and FH 2x in the acetic acid induced writhing test

Group	Number of Writhing (Mean ±SEM)	% inhibition of algesia
Control	16.67±2.12	00
STD (Diclofenac-Na, 100 mg/kg)	4.83±1.20**	
FH 1x	10.17±2.86	
FH 2x	11.67±2.77	

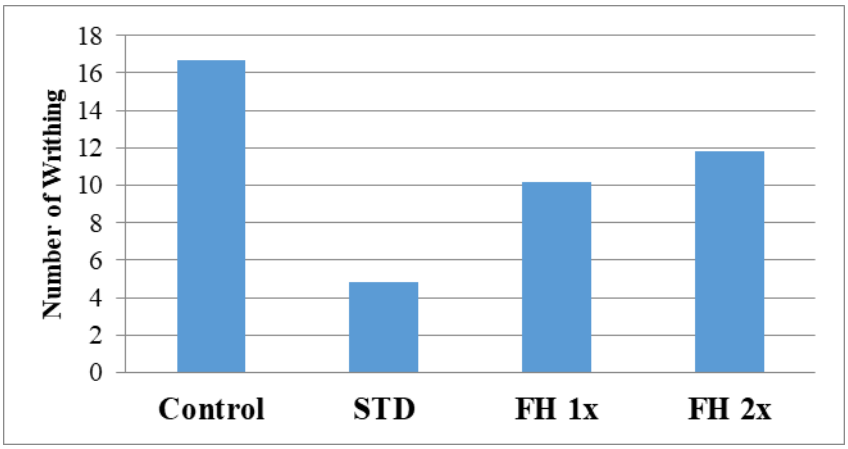

Figure 4 Effect of FH 1x and FH 2x in the acetic acid induced writhing test

4. Discussion

After analysing all the aforementioned test, we found that there is a significant effect except formalin induced test, for the agent Ficus heterophyllus as an analgesic agent. There was better significance correlation. Thus, we can say it is likely that, Ficus heterophyllus will reduce pain in the body.

5. Conclusion

Taking into account all the pharmacological data obtained, the results suggest that the *Ficus heterophylla* extract have significant effect as analgesic agent. However, further studies and more research will be necessary to clarify this.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Statement of ethical approval

All the animals were used in accordance to animal care guidelines and no experiments were performed in a private place or organization.

Statement of informed consent

All author have read the manuscript and given consent for publication.

Author contribution statement

All authors listed have significantly contributed to the development and the writing of this paper.

Availability of data and materials

The data and materials used to support the findings of this study are publicly available.

References

[1] Abdullahi, A.A., 2011. Trends and challenges of traditional medicine in Africa. African J. Trad. Complement. Altern. Med. 8, 115–123.

[2] Shahinuzzaman, M., Akhtar, P., Amin, N., Ahmed, Y., Anuar, F.H., Misran, H., Akhtaruzzaman, M., 2021. New insights of phenolic compounds from optimized fruit extract of Ficus auriculata. Sci Rep 11, 12503

[3] Mahajan, M.S., Gulecha, V.S., Khandare, R.A., Upaganlawar, A.B., Gangurde, H.H., Upasani, C.D., 2012. Anti-edematogenic and analgesic activities of Ficus benghalensis. Int J Nutr Pharmacol Neurol Dis 2, 100–104.

[4] Patil, V.V., Patil, V.R., 2011. Evaluation of anti-inflammatory activity of Ficus carica Linn. leaves. Indian J Nat Prod Resour 2, 151–155.

[5] Thite, A.T., Patil, R.R., Naik, S.R., 2014. Anti-arthritic activity profile of methanolic extract of Ficus bengalensis: Comparison with some clinically effective drugs. Biomed Aging Pathol 4, 207–217.

[6] Ramakrishna, V., Preeti Gupta, K., Setty, O.H., Kondapia, A.K., 2014. Protective effect of Ficus bengalensis L. extract against H2O2 induced DNA damage and repair in neuroblastoma cells. Free Rad Antioxidants 4, 3–7.

[7] Anjum, N., Tripathi, Y.C., 2019a. In vitro alpha-amylase and alphaglucosidase inhibitory activities of fruits of Ficus auriculata Lour. Int. J. Pharma. Bio. Sci. 10, 134–141.

[8] Kirtikar, K.R., Basu, B.D., 1995. In: Indian Medicinal Plants, Vols IIV. International Book Distributors, Dehra Dun, India.

[9] Khanom, F., Kayahara, H., Tadasa, K., 2000. Superoxide-scavenging and prolyl endopeptidase inhibitory activities of Bangladeshi indigenous medicinal plants. Biosci Biotech Biochem 64, 837–840.

[10] Sofowora A. Medicinal plants and traditional medicine in Africa: Wiley; 1993.

[11] Gupta R, Bajpai KG, Johri S, Saxena A. An overview of Indian novel traditional medicinal plants with antidiabetic potentials. Afr J Trad CAM. 2008; 5(1):117.

[12] Rastogi RP, Mehrotra B, Pastogi RP. Compendium of Indian medicinal plants: Central Drug Research Institute; Publications & Information Directorate; 1995.

[13] Marasini, D.R., Pandey, J., Sharma, L.P., Paudel, L., Gyawali, R., Rokaya, R.K., Giri, P.M., Khadka, R.B., Aryal, P., Bhan, R., 2020. Analgesic activity of bark and leaves of Ficus religiosa L. from Nepal. Int J Pharm Pharm Sci 12, 32–35.

[14] Domaj, M.I., Glassco, W., Aceto, M.D., Martin, B.R., 1999. Antinociceptive and pharmacological effects of metanicotina, a selective nicotine agonist. J Pharmacol Exp Ther 291, 390–398.

[15] Farshchi, A., Ghiasi, G., Malek Khatabi, P., Farzaei Hossein, N.A., 2009. Antinociceptive effect of promethazine in mice. Iran J Basic Med Sci 12, 140–145.

[16] Singh, M.P. and Saxena, S., Phytochemical analysis and antimicrobial efficacy of methanolic extract of some medicinal plants at Gwalior region. Journal of Pharmacy Research, 2011, 4.

[17] https://tropical.theferns.info/viewtropical.php?id=Ficus+heterophylla

[18] Phạm Hoàng Hộ (2003) Cây Cỏ Việt Nam: an Illustrated Flora of Vietnam vol. II publ. Nhà Xuất Bản Trẻ, HCMC, VN