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# AN UPDATED REVIEW OF PHARMACOLOGICAL STUDIES ON *FICUS BENGALENSIS* LINN.

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**Keywords:**

*Ficus bengalensis* Linn., Botanical description, Traditional uses, Pharmacological activities

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**ABSTRACT:** In olden days, plants have been an ever dependent source of medicine. Ayurveda, Siddha, Unani and Homeopathy have mentioned the use of plants in the treatment of various human diseases. *Ficus bengalensis* Linn. (Banyan tree) Moraceae is a plant that is widely distributed in India. The English name Banyan is given by the Britishers to this tree because under the tree Banias *i.e.* the Hindu merchants used to assemble for business. To the Hindus it is sacred and worshipped with special prayers on Vata Sawitri day. This plant is reported to possess many useful pharmacological activities also *viz.* anti-inflammatory, antihyperglycemic, antidiabetic, anti-arthritic, antihyperlipidemic, hypo cholesterolemic, analgesic, anti-bacterial, antifungal, larvicidal, anti-diarrhoeal, antimutagenic, anti-oxidant, cytotoxic, hepatoprotective, antiallergic and immuno-stimulatory. The aim of present review is an effort to give a detailed survey of the literature on its traditional uses, pharmacological activities and other commercial uses.

**INTODUCTION:** Plants have been playing the role of major source of drugs in Indian as well as other ancient systems of medicine in the world. Earliest descriptions of curative and preventive properties of medicinal plants found in Rig-Veda, Charaka Samhita and Sushrusha Samhita give extensive details on various medicinal herbs. India having an ancient heritage of traditional medicine, by the means of Materia Medica, provides a great deal of information on the traditional aspects of therapeutically important natural products obtained from herbs.

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Indian traditional medicines have their roots well spread in various systems of medicines including Ayurveda, Siddha, Unani and Homeopathy. The herbal drugs are primarily evaluated on the basis of their phytochemical and pharmacological aspects [1]. *Ficus bengalensis* (FB) (Moraceae) 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 [2].

It is endemic to Bangladesh, India and Sri Lanka. It is also known as Bengal fig, Indian fig and East Indian fig, Indian Banyan or simply banyan (English), also borh, nyagrodha (Sanskrit), Bat, Bargad and Bar (Hindi). The English name Banyan is given by the Britishers to this tree because under the tree Banias that is, the Hindu merchants used to assemble business.

The triad Ganges, the Himalayas and the banyan tree symbolize the images of India, for this reason it is considered as National Tree. Ficus means fig and bengalensis means belonging to or is of Bengal [3].

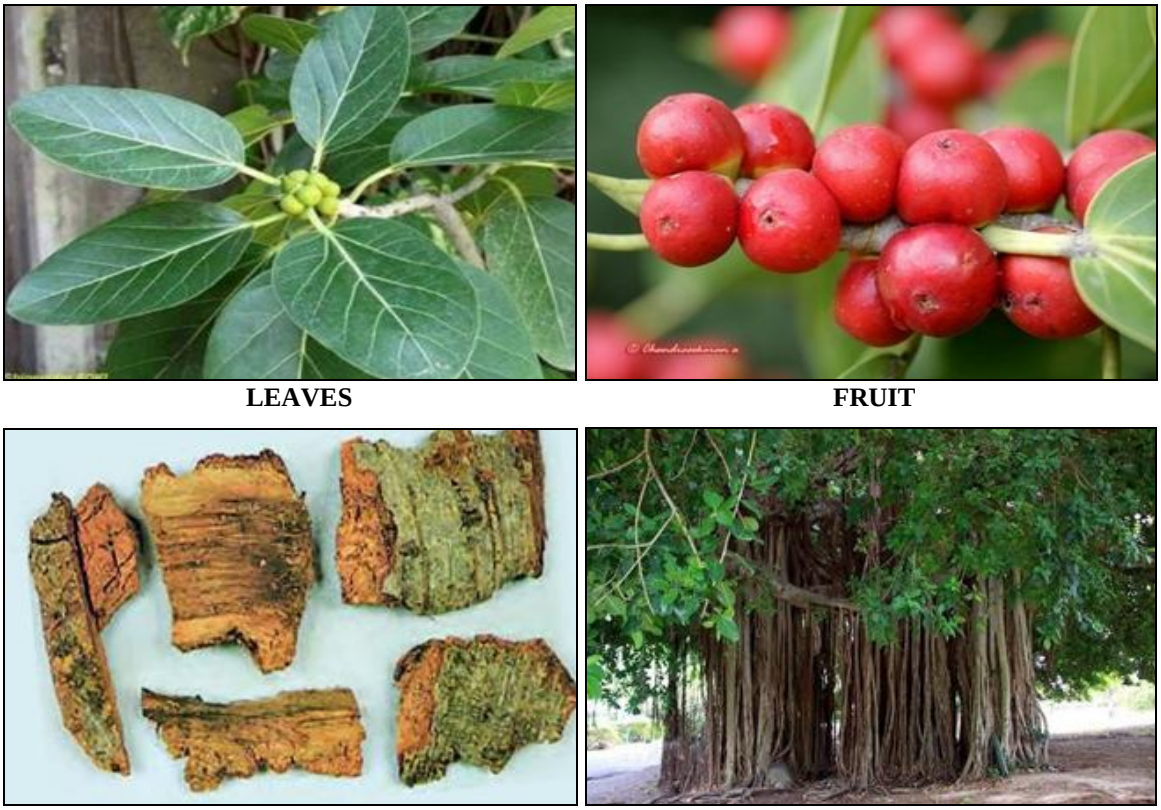
**Taxonomic Classification of *F. bengalensis*: [4]**

| | |
|---|---|
| Kingdom | : Plantae |
| Kingdom | : Subkingdom |
| Plantae | : Tracheobionta |
| Super division | : Spermatophyta |
| Division | : Magnoliophyta |
| Class | : Magnoliopsida |
| Subclass | : Hamamelidae |
| Order | : Urticales |
| Family | : Moraceae |
| Genus | : Ficus |
| Species | : *F. bengalensis* |

**Botanical Description:** It is a very large tree upto 30 m in height, found throughout the year. It grows in an evergreen environment, except in dry localities where it is a leafless for a short time. It is hardy and drought-resistant; withstands mild frost. It is epiphytic when young. It develops from the seeds dropped by birds on old walls or on the other trees and is therefore, considered destructive to forest trees, walls and buildings [4, 5, 6, 7, 8].

It has widely spread branches having many aerial roots functioning as prop roots. The bark gives greenish white appearance; leaves are simple, alternate, often in clusters at the ends of the branches, stipulate, 10 to 20 cm long in length and 5 to 12.5 cm broad. Leaves are broadly elliptic to ovate in shape, entire, and are strongly 3 to 7 ribbed from the base.

The fruit recacles are axillary, sessile, occurring in pairs, globose in shape, brick red in colour when ripe, and enclose male, female and gall flowers; fruits are small, enclosed in the common fleshy receptacles [5].



**LEAVES** **FRUIT**

**BARK** **TREE**

**FIG. 1: *FICUS BENGALENSIS* LINN.**

**Traditional Uses:** *Ficus benghalensisis* commonly called nyagrodha. Ancient Nighantus and modern Pharmacopoeias of Indian. Medicine contains much valuable information about the pharmacological properties of various parts of *Ficus benghalensis*. The tree is regarded everywhere, as a symbol of peace and harmony [9]. According to Ayurveda, *F. bengalensis* is astringent to bowels; useful in the treatment of ulcers, vomiting, vaginal complains, fever, different kinds of inflammations, and

leprosy. According to Unani system of medicine, the latex of this plant is aphrodisiac, tonic, vulnerary, and a maturant. The latex also lessens the inflammations, hence useful in piles, nose-diseases, gonorrhea, *etc*. The aerial root is found to be useful in syphilis, biliousness, dysentery, and in treating the inflammation of liver, *etc* [10].

Milky juice is used for targeting pains, rheumatism, lumbago and bruises. For the treatment of spermatorrhea, 2 drops of fresh latex in a lump of sugar are taken once daily on empty stomach early in the morning. Seeds are cooling and tonic in nature [11, 12, 13]. The leaf-buds of *Ficus benghalensis* are astringent in nature. Infusion of leaves is given in diarrhoea and dysentery, poultice of hot leaves is applied on abscesses. The bark is astringent and tonic and used in diabetes and leucorrhoea, lumbago, sores, ulcers pains and bruises [12].

In the traditional system of medicine, the plant is used for various health problems and disease. Therefore, the aim of the study is to present an overview of traditional, medicines investigations carries out on the plant [15].

**Improving Fertility:**

- Edible part: Buds of *Ficus benghalensis* have been taken for improving fertility.

**Leucorrhoea:**

- Bark, fruit and milk of *Ficus benghalensis* is useful for leucorrhoea.
- Bark of *Ficus benghalensis* with 'Triphla' powder have been taken up 20 days with the help of honey to cure Leucorrhoea.
- The bark of this plant after boiling with water locally used to cure leucorrhoea.

**Toothache:**

- Bark of *Ficus benghalensis* and gum of *Accasia catachu* with black pepal locally use as a pest is cure tooth problem, pyria problem and clean teeth clearly.

**Improving Memory:**

- Bark of *Ficus benghalensis* after drying and cruising take 5 to 6 g powder with cow milk it improved memory.
- The bark of *Ficus benghalensis*, whole plant of Bramhi (B.N.) and after cruising take 21 days daily it improved memory power.
- The young twigs of *Ficus benghalensis* cruised and prepare 21 tablets take one tablets daily with cow butter. It improved memory power.

**Dysentery:**

- The extracted drop of *Ficus benghalensis* aerial roots with honey daily three times it care dysentery.
- The young twigs of *Ficus benghalensis* cruised and take twice a day with the help of cure dysentery.

**Pimples:**

- The milk of *Ficus benghalensis* is useful to cure pimples.
- Arial root of *Ficus benghalensis* and puls of (masoor) greed with milk and put locally on pimples it cure pimples.
- Leaf extract of *Ficus benghalensis* with butter potted on pimples it cure pimples.
- Arial roots of *Ficus benghalensis* with gulab jal potted locally on pimples it cure pimples.

**Piles:**

- The bark of *Ficus benghalensis* after boiling with water mixed sugar and cow butter take 10 to 20 days early morning to cure piles.

**Arthritis:**

- The milk of *Ficus benghalensis* locally use for Arthritis.

**Gyanic Disorder:**

- 5 to 10 drops of *F. benghalensis* milk with take with sugar candy up to 20 days before sunrise.

**Hair fallings:**

- Arial roots of *Ficus benghalensis* with black til (B.N.) after cruising mixed in coconut oil use locally in hairs it cures hair falling.

Some important Ayurvedic marketed formulations formulated from *F. bengalensis* are Nyagrodhaadi churnam (Bhaishajya Rutnavali), Saarivaadya Chandanaasava, Dineshavalyaadi Taila (Sahasra-yoga) [13].

Charaka prescribed aqueous extract of leaf buds of Nyagrodha (*Ficus benghalensis*) mixed with sugar and honey for checking diarrhoea; milk processed with the aerial roots or leaf buds of Nyagrodha in hemorrhages and bleeding piles; a decoction of leaf buds and aerial roots of Nyagrodha, mixed with honey, was given for checking vomiting and thirst; also during fevers with burning sensation (Astaanga Hridaya, Vrindamaadhava, Vaidya-manorama) [14].

**Pharmacological Activities:**

**Antihyperglycemic and Antidiabetic Activity:** Antihyperglycemic activity of α-amyrin acetate, isolated from aerial roots of *F. bengalensis* was testified in STZ-induced diabetic rats and in db/db mice at dose level of 50 mg/kg p.o. Anti-hyperglycemic results were compared with the same dose of metformin. *α*-amyrin acetate caused 22.3% improvement of glucose tolerance in normoglycemic rats and 35.6% (comparable to metformin 37.8%) fall in blood glucose of STZ-induced diabetic rats. Multiple dose oral administration in db/db mice, lowered blood glucose level on day 3, 5, 7 and 10 by 18.7%, 27.1%, 40.0% and 51.6% respectively, comparable to the effect of metformin *i.e*. 17.8%, 30.5%, 39.4% and 52.5% respectively. Average anti-hyperglycemic effect of *α*-amyrin acetate on glucose tolerance in db/db mice was calculated to be around 35.6%, comparable to that of metformin 43.2% [16].

In a comparative study, using glibenclamide (5 mg/kg) as reference standard, ethanolic extract of stem bark showed relatively more hypoglycemic activity in alloxan induced diabetic rats than that of aerial roots, at same dose level *i.e.* 100 mg/kg [17]. Inhibitory activities of the aqueous extracts of the heat treated and untreated stem bark was studied on α-amylase, α-glucosidase and sucrase. Honda and Hara method was used to evaluate inhibitory potential [18]. Both heat treated and untreated extracts showed significant inhibitory activities. Heat treated extracts showed $IC_{50}$ values of 77 and 141 µg/ml and untreated extracts showed $IC_{50}$ values of 158 and 193 µg/ml for *α*-glucosidase and sucrase respectively. This is the possible mechanism of antidiabetic effect of this plant [19]. Oral administration of aqueous extract to fed, fasted and glucose loaded diabetic rats significantly decreased the blood glucose level at 5 h and restored the levels of serum electrolytes, glycolytic enzymes and hepatic cytochrome P-450 dependent enzyme systems and decreased the formation of liver and kidney lipid peroxides at the end of 12 weeks. The aqueous extract of *Ficus benghalensis* at a dose of 500 mg/kg/day exhibits significant antidiabetic and ameliorative activity shown by histological studies in normal and streptozotocin induced diabetic rats.

Antidiabetic and ameliorative potential of aqueous extract of the stem bark at dose level of 500 mg/kg/day p.o. was studied in streptozotocin induced diabetic rats by using tolbutamide (100 mg/kg/day p.o.) as reference standard. Results revealed the hypoglycemic activity comparable to that of tolbutamide and restoration of hepatic cytochrome P-450 dependent enzymes (PNPH, PROD and EROD), kidney and liver lipid peroxidation (malondialdehyde and hydro-peroxides) and glycolytic enzymes to near normal levels; also decrease in the levels of serum electrolytes (potassium, sodium and calcium) was observed. Histological examination revealed reduction in swelling and inflammation of pancreatic tissue [20].

In another study, using the same extract and experimental conditions, results with regard to total protein (g/dl), albumin (g/dl), urea (m mol/l), uric acid (m mol/l), creatinine (µ mol/l), Hb (g/dl), RBC, WBC and platelets were almost equivalent to that of tolbutamide [21]. Antidiabetic effect of aqueous extract of *F. bengalensis* aerial roots at dose level of 300 mg/kg p.o. was studied in streptozotocin induced diabetic rats using glipizide (2.5 mg/kg p.o.) as reference standard. Results revealed 43.8% reduction in BGL of normal rats at 6 h. 40.7%, 54.8% and 51.7% improvement in glucose tolerance of normal, sub diabetic and mild diabetic rats respectively, was observed at 3 h during GTT [22].

Aqueous extract of the stem bark at dose level of 50 mg/kg/day p.o. when tested on normal, alloxan recovered, mildly diabetic and severely diabetic rabbits caused improvement in glucose tolerance in alloxan recovered and mildly diabetic rabbits. It also caused 55.8% and 68% fall in FBG in mildly diabetic and severely diabetic rabbits respectively [23]. In a comparative study performed on alloxan

induced diabetic rats, ethanolic extract of fruit, at a dose of 120 mg/kg/day p.o., showed more diabetic activity than that of aerial root and stem bark. Glibenclamide at a dosage of 0.5 mg/kg/day p.o. was used as reference standard [24].

A partially purified preparation from aqueous extract of the stem bark demonstrated significant hypoglycemic and hypocholesterolemic effect on diabetic rabbits. $ED_{50}$ and $LD_{50}$ were determined to be 10 mg/kg and 1000 mg/kg p.o. respectively. For chronic toxicity studies, 50 mg, 100 mg and 150 mg/kg of this preparation, about 5, 10 and 15 times of the $ED_{50}$ value respectively, were given to diabetic rats for three months. Fall in FBG, cholesterol and triacylglycerol and improvement in GTT were similar to those of normal control group. Weight gain and values of SGOT, SGPT, S. alkaline phosphatase, serum protein, blood urea, serum cholesterol, hemoglobin, total leukocyte count, differential count were not affected. So, partially purified aqueous extract of stem bark is nontoxic and safe even in a dose of 5, 10 and 15 times of the $ED_{50}$, but the crude extract is hepatotoxic [25].

*F. bengalensis* (Banyan tree) is one of the common herbs used in Tribal Belts of Midnapur (West) District of Bengal for the treatment of diabetes. A decoction of bark is to be prepared and consumed twice daily in a dose of 40 to 80 ml [26]. So *F. bengalensis* is known to have a considerably good hypoglycemic activity. A dimethoxy derivative of leucocyanidin 3-O-beta-D-galactosylcellobioside isolated from the bark of *F. bengalensis* Linn. demonstrated antidiabetic action. Antidiabetic activity of ethanolic extract of *F. bengalensis* was performed on male Albino alloxan-induced diabetic rats. Oral administration of the ethanolic extracts of the fruit, aerial root and bark of *F. bengalensis* for 21 days produced significant hypoglycemia or decrease in blood glucose as 31.73, 18.33 and 28.84%, respectively. The study reveals that the ethanolic extract of the fruits produces maximum reduction in blood glucose level as compared to the extract of aerial root or bark of *F. bengalensis*. Histopathological studies were made for both untreated and treated diabetic rats. Untreated diabetic rats showed almost complete destruction of pancreatic beta cells due to alloxan. Diabetic rats which were treated with ethanolic extract of the fruits showed almost normal cells. It seems that extract either protected the cells from the toxic effect of alloxan or the cells recovered after the initial injury [27].

Diabetes mellitus is a metabolic disorder characterized by hyperglycemia and its occurrence is increasing fast in most of the countries. Herbal medicine derived from plant extracts have been utilized increasingly for the treatment of various disorders like diabetes mellitus. The study was designed to evaluated the antidiabetic activity of methanolic extract of *H. bengalensis* L. Kurz (MEHB) in alloxan induced diabetic rats and chick model. Alloxan (120 mg kg-1) was used to induce diabetes in rats and the blood glucose levels were estimated by using commercial kit in the market. The methanolic extract of *H. bengalensis* was administered to diabetic rats as single dose for one day at a dose of 100 and 200 mg $kg^{-1}$. The extract produced a significant reduction ($p<0.01$) of blood glucose levels at a dose of 100 and 200 mg $kg^{-1}$ in diabetic rats. It also showed a beneficial effect on the lipid profile in alloxan induced diabetic rats. These results showed that methanolic extract of *H. bengalensis* produced a dose dependant anti-hyperglycemic activity in rats [28].

Evaluation of hypoglycemic activity of extract of bark and leaf of *Ficus bengalensis* Linn. in alloxan induced diabetic Albino rats and comparison with standard antihyperglycemic drug glibenclamide. Aqueous extracts of bark and leaf of *Ficus bengalensis* were evaluated for hypoglycemic activity. Albino rats were divided into six groups of six-animals each. Diabetes was induced by using alloxan monohydrate (160 mgkg.b.wi.p). Control group was treated with normal saline 0.5ml; second group was treated with glibenclamide 5 mg-kg as a standard antidiabetic drug. Remaining groups were treated with different doses (150 and 300 mg kg. b.w) of bark and leaves of *F. bengalensis* for a period of 28 days. Fasting glucose level estimated by using Glucometer on days 3, 7, 14, 21 and 28. An aqueous extract of *F. benglensis* Linn. produced significant reduction in the fasting blood glucose in diabetic rats. At the dose of 300mg/ kg of bark showed significant fall in blood glucose level as compared to other doses of extract. Post-prandial reduction in the blood glucose levels on day 3 after 3 h of drug administration was significant (p =

0.007) with bark 300 mg as compared to other doses. This is however, highly significant (p = 0.0001) when compared with standard drug glibenclamide. The current small sample size study shows relevant antidiabetic potential for *Ficus bengalensis*. Further, studies are required to elaborate the antidiabetic activity and mode of hypoglycemic action of *F. bengalensis* [29].

**Antibacterial Activity:** Extract from fruits exhibits antitumor activity in the potato disc bioassay. None of the tested extracts showed any marked inhibition on the uptake of calcium into rat pituitary cells GH4C1. The extracts of the four tested *Ficus species* had significant antibacterial activity [30].

In 2007, aqueous and ethanolic extracts of *F. bengalensis* were investigated for antibacterial activity against *Pseudomonas aeruginosa*, *Proteus mirabilis*, *Stapylococcus aureus*, *Bacillus cereus*, *Alcaligenes faecalis* and *Salmonella typhimorium*. The ethanolic extract showed considerable antibacterial activity against *Pseudomonas aeruginosa*, *Proteus mirabilis* and *Bacillus cereus*. It also showed certain antibacterial effects against *A. faecalis* and *S. typhimorium* but it was inactive against *S. aureus*. Aqueous extract of *F. bengalensis* had no antibacterial activity against any of the six bacterial strains investigated. From the results of experiment it was concluded that ethanolic extract of *F. bengalensis* has great potential as antimicrobial compound against microorganisms and it can be used for the treatment of infectious diseases caused by resistant microorganisms [31]. *Actinomyces viscosus* belongs to group of Actinomycetes. It is gram positive, aerobic, non sporing rod shaped bacteria. It is frequently encountered in high proportion of smooth tooth surface and gingiva.

Various experiments were performed to check the antibacterial activity of *F. bengalensis* against *A. viscosus*. These show that the extract of *F. bengalensis* bark of 0.08 mg/ml to 0.1 mg/ml have better antibacterial activity [32]. Antibacterial activity of methanolic extract of the stem bark determined by disc diffusion method at the dose of 200 mg/ml against enterotoxigenic *E. coli* was comparable to that of standard drug amikacin at the dose of 10µg/disc [33]. Antibacterial activity of hydro-alcoholic (70% methanol) extract of the stem bark at concentration of 0.01-0.10 mg/ml was testified against *Actinomyces viscosus* using cup plate diffusion method and broth dilution technique. MIC was found to be 0.08 mg/ml and zone of inhibition at this concentration was 9.4 mm. No zone of inhibition was found at concentration of 0.01-0.07 mg/ml [34]. Antibacterial activity varies with a change in environmental conditions and geography [35].

In the present investigation the antimicrobial efficiency of cotton fibers' loaded with silver nano particles (AgNPs) was studied which are developed by "green process" using natural extracts, of *Eucalyptus citriodora* and *Ficus bengalensis*. The formation of AgNPs on the cotton fibres was observed by UV-vis spectrophotometer. The size of silver nano particles was found to have 20 nm. The structure and morphology of silver nano particles formed on the cotton fibres were confirmed by electron microscopy. The antibacterial activity of cotton fibres loaded with silver nanoparticles was evaluated against gram-negative *Escherichia coli* (*E. coli*) bacteria. The results suggest excellent antibacterial activity by the incorporation of 2% leaf extracts on cotton fibres. These fibres have also exhibited superior antibacterial activity even after several washings indicating their usage in medical and infection prevention applications [36].

Catechin and genistein, isolated from methanol extracts of the leaves of Sudanese varieties *F. bengalensis* were testified for their antimicrobial activity by using disc diffusion method at dose level of 100 µg/ml. Streptomycin sulphate and nystatin at dose level of 25 µg/discs and 50µg/discs respectively, were used as reference standard. Both compounds showed antibacterial activity, comparable to that of streptomycin and nystatin, against *B. cereus* and *Pseudomonas aeruginosa*. No antifungal activity was found against *Aspergillus ochraceus*, *Sacchromyces cereviseae*, *Candida lipolytica* and *Sacchromyces lipolytica* [37].

Antibacterial activity of aqueous extracts of the stem bark, leaf and root was evaluated by agar diffusion technique. Among the three extracts, stem bark extract showed maximum antibacterial activity against *Bacillus subtilis, Pseudomonas aeruginosa, K. pneumonia, Stapylococcus aureus and Escherichia coli* [38].

*In-vitro* antibacterial activity of banyan (*Ficus benghalensis*) fruit on the basis of inhibition zone. The aqueous, methanol and ether extract of fruit was used to test its antibacterial activity by disk diffusion method against *E. coli*, *S. typhi* and *L. acidophilus*. Results obtained show the positive antibacterial activity of aqueous extract of fruits for all the three bacteria and highly response showed against *E. coli*. Methanol extract of fruit extract was most effective for *E. coli* and no response showed against *S. typhi* and *L. acidophilus*. Ether extract of fruit show the positive antibacterial activity for all the three bacteria and highly bactericidal for *L. acidophilus* [39].

Medicinal plants have been used as an alternative source and remedy from centuries for treating human diseases because they contain numerous active constituents of therapeutic value. The methanolic and DMSO extracts of various plant parts *viz.* prop roots, stems, leaves, and fruits of *Ficus benghalensis* var krishnae (C.DC) C.DC. has been studied for antibacterial activity against the pathogenic bacteria *Bacillus subtillis*, *Escherichia coli* and *Pseudomonas aurignosa*. Ampicillin antibiotic disc was used as standard. Various selected parts of *F. benghalensis* var. krishnae in methanolic and DMSO extract were observed positive minimum inhibition zone against *E. coli*, *P. aurignosa* and *Bacillus subtillis* [40].

**Hypolipidemic Activity:** The water extract of *F. bengalensis* bark has been reported to possess hypocholesterolaemic and hypolipidaemic effects [41]. In 1995 hypolipidemic effect of water extract of the bark of *F. bengalensis* was investigated in alloxan induced diabetes mellitus in rabbits. Treatment for one month (50 mg/kg body weight/day) brought down the level of total serum cholesterol (TC) in sub diabetic and diabetic rabbits from 82 ± 11 and 118 ± 10.6 mg% to 42.7 ± 3.1 mg% and 51.7 ± 4.7 mg%, respectively. Low density lipoprotein cholesterol and very low density lipoprotein cholesterol also came down [42].

Hypolipidemic and antioxidant effect of aqueous extract of the stem bark at dose level of 50 mg/ kg/day p.o. was studied in hypercholesterolaemic rabbits (rabbits fed with cholesterol suspended in groundnut oil at a dose of 100 mg/kg/day, for 6 weeks). Results of this study revealed a decrease in triacylglycerol, serum cholesterol and LDL+VLDL cholesterol by 54%, 59% and 60% respectively, increase in levels of catalase, glutathione reductase, superoxide dismutase and glutathione peroxidase 30%, 22%, 36% and 90% respectively, compared to untreated animals [43].

Administration of α-amyrin acetate, isolated from aerial roots of *F. bengalensis*, to db/db mice for 10 consecutive days decreased triglycerides, cholesterol and LDL-C by 21.5%, 24.1% and 21.2%; increased HDL-C and HDL-C to TC ratio by 21.0% and 59.1% respectively. It is concluded that α-amyrin acetate improves plasma lipid profile not only by lowering total plasma cholesterol and LDL-C levels significantly but also by increasing HDL-C level and HDL-C/TC ratio [44].

Diabetes mellitus is a metabolic disorder and associated with many other metabolic functional alterations. The bark of *Ficus bengalensis* and other plants are reported as antidiabetic and hypolipidemic due to presence of flavonoids and sterols. Based on literature survey, tribal information and chemical constituents, the present study is undertaken to observe the hypolipidemic potential of leaves and fruits of *Ficus bengalensis* because they also contain the same active constituents. Hence, the leaves and fruits may have same activity like bark. To study the object, different doses of ethanolic extract of leaves and fruits of *Ficus bengalensis* was given to alloxan induced diabetic rats [45].

**Hepatoprotective Activity:** Hepatoprotective effect of leucopelargonin derivative, isolated from the bark of *F. bengalensis*, at dose level of 100 mg/kg/day i.p. was evaluated in $CCl_4$ induced hepatotoxic rats, using Vitamin E at dose level 50mg/kg/day i.p. as reference standard. Result with regard to decrease in biochemical parameters like total cholesterol, HDL, LDL, FFA, TAG; decrease in the activities of glucose 6- phosphate dehydrogenase, HMGCoA reductase in the liver and enzymes like ALT, ALP and AST in serum and liver; increase in the levels of antioxidant enzymes in liver; inhibition of fatty infiltration and fibrosis, was comparable to that of Vitamin E [46].

Methanolic extract of the aerial root was tested for hepatoprotective activity against isoniazid-

rifampicin induced liver injury in rats using Liv 52 at dose level of 10mg/kg p.o. as reference standard. Results of MEFB at dose level of 100, 200 and 300 mg/kg p.o. with regard to bilirubin level, total protein level, albumin level, AST and ALT were almost same as that of Liv 52. Histopathological results with regard to hepatocytic necrosis, inflammation and neutrophil infiltration were also comparable to that of Liv 52 [47].

The study was made to investigated the protective effect of methanolic extract of *Ficus benghalensis* Linn., Moraceae, on isoniazid-rifampicin-induced hepatotoxicity in rats. Rats were divided into six different groups; group 1 served as a control, group 2 received isoniazid and rifampicin (100 mg/kg, i.p.), in sterile water, groups 3, 4 and 5 received 100, 200 and 300 mg/kg bw, p.o. methanolic extract of *F. benghalensis* and group 6 received Liv 52. All the treatment protocols followed 21 days and after rats were sacrificed blood and liver were used for biochemical and histological studies, respectively.

Administration of isoniazid and rifampicin caused a significant elevation in the levels of liver marker enzymes ($p<0.05$ and $p<0.01$) and thiobarbituric acid reactive substances ($p<0.001$) in experimental rats. Administration of methanolic extracts of *F. benghalensis* significantly prevented isoniazid-rifampicin-induced elevation in the levels of serum diagnostic liver marker enzymes and TBARS level in experimental groups of rats. Moreover, total protein and reduced glutathione levels were significantly ($p<0.001$) increased in treatment group. The effect of extract was compared with a standard drug, Liv 52. The changes in biochemical parameters were supported by histological profile. It is to be concluded that the methanolic extract of *F. benghalensis* protects against isoniazid and rifampicin-induced oxidative liver injury in rats [48].

The hepatoprotective activity of water extract of *Ficus benghalensis* (Family Moraceae) bark was studied against ethanol (3g/kg, 20% w/v p.o. once daily for 28 days) induced liver damage in rats. Ethanol produced significant changes in various liver parameters. It increased the biochemical parameters like AST, ALT, ALP, total bilirubin and decreased the levels of albumin and total protein along with changes in histological parameters (damage to hepatocytes). Treatment with water extract of *Ficus benghalensis* bark (at a dose of 400mg/kg, p.o. daily for 28 days) significantly prevented the biochemical and histological changes induced by ethanol, indicating the recovery of hepatic cells. The activity of extract was also comparable to that of silymarin, a standard hepatoprotective drug. These results demonstrate that the water extract of *Ficus benghalensis* bark is found to have significant beneficial effect on ethanol induced hepatotoxicity in Wistar rats in reference to liver function tests performed [49].

**Anti-inflammatory Activity:** This review explores medieval, ancient and modern sources for ethno pharmacological uses of *Ficus* (fig) *species*, specifically for employment against malignant disease and inflammation. The close connection between inflammatory/infectious and cancerous diseases is apparent both from the medieval/ancient merging of these concepts and the modern pharmacological recognition of the initiating and promoting importance of inflammation for cancer growth. Also considered are chemical groups and compounds underlying the anticancer and anti-inflammatory actions, the relationship of fig wasps and fig botany, extraction and storage of fig latex, and traditional methods of preparing fig medicaments including fig lye, fig wine and medicinal poultices [50].

The ethanolic (300 mg) and petroleum ether extracts (600 mg/kg/day) of *Ficus benghalensis*, significantly reduced ($P<0.05$) carrageenan-induced paw edema in rats. The ethanolic and petroleum ether extracts showed a greater anti-inflammatory effect compared with the standard drug indomethacin. The results indicated the ethanolic extract of *F. benghalensis* exhibited more significant activity than petroleum ether in the treatment of inflammation [51].

Anti-inflammatory activity of bark of young plant of *F. bengalensis* was compared with that of mature plant using carrageenan induced hind paw edema for acute inflammation and cotton pellet induced granuloma for chronic inflammation, in rats. Ethanolic, chloroform and petroleum ether extracts at dose level of 300 and 600 mg/kg/day p.o. were studied using indomethacin at dose level of 10 mg/kg/day p.o. as standard drug.

Ethanolic extract of younger plant at dose level of 300 and 600 mg/kg/day p.o. caused 37.64% and 69.04% reduction in paw volume after 3 h, while mature plant caused 55.03% and 65.54% reduction respectively, in carrageenan induced paw edema model. In cotton pellet granuloma model, ethanolic extract of younger plant at dose level of 300 and 600 mg/kg/day p.o. caused 19.27% and 39.03% reduction in paw volume after 3 h, while mature plant caused 14.12% and 34.25% reduction respectively. So, younger plant possesses relatively more anti-inflammatory activity than mature plant. Chloroform and petroleum ether extracts did not possess significant anti-inflammatory activity [52]. Anti-inflammatory activity of methanolic extract of the stem bark and the leaf in carrageenan induced and formalin induced hind paw edema in rats, was comparable to that of potent drugs *i.e*. diclofenac sodium and aspirin [53, 54, 55, 56].

According to Ayurveda, it is astringent to bowels; useful in treatment of biliousness, ulcers, erysipelas, vomiting, vaginal complains, fever, inflammations, leprosy. According to Unani system of medicine, its latex is aphrodisiac, tonic, vulernary, maturant, lessens inflammations; useful in piles *etc*. The study was evaluated of anti-inflammatory property of the aqueous, chloroform and alcoholic extracts of the bark by *in-vitro* methods. *In-vitro* method was estimated by human red blood cell membrane stabilization (HRBC) method. Results showed significant anti-inflammatory property of the different extracts tested. The methanolic extract at a concentration of 200 mg/ml. showed potent activity on comparing with the standard drug diclofenac sodium [57].

**Analgesic and Antipyretic Activity:** Many attempts have been made to study various pharmacological actions of this plant especially its analgesic and antipyretic activity. Recently Jain Vika *et al*., made a valuable effort in this aspect. They utilized Albino rats to check analgesic activity of *F. bengalensis* and antipyretic activity was studied in Brewer's Yeast induced pyrexia in rats. To study analgesic activity the rats were kept on fasting for 24 h. Then aqueous, ethanol, chloroform and petroleum ether extracts of *F. bengalensis* and also aspirin were administered orally (100 mg/kg) 60 min prior to the commencement of the reaction time. Finally the animal models were subjected to hot plate and tail immersion analgesic activity. The ethanolic extract showed more significant analgesic activity as compared to other extracts. In case of antipyretic activity animals were fevered by injection of Brewer's Yeast suspension (10 mg/kg) sub-cutaneously in back below the nape of neck. All above mentioned extracts were fed to fevered rats.

Ethanolic extract showed significant decrease in elevated body temperature while other extracts did not show the significant decrease in elevated body temperature. So it is concluded that ethanolic extract of *F. bengalensis* shows analgesic and antipyretic activity similar to those observed for non-steroidal analgesic drug aspirin. The phyto-chemical analysis showed the presence of flavonoids, alkaloids, triterpenoids and tannins that might be responsible for its activity [58]. Analgesic activity of methanolic extract of the leaf and the stem bark in Acetic acid induced writhing and Eddy's hot plate method in rats, was comparable to that of potent drugs *i.e*. diclofenac sodium and aspirin [54, 55, 56].

**Antioxidant Activity:** *F. bengalensis* possesses antioxidant activity which is mostly due to phenolic compounds [59]. Anti-oxidant and free radical scavenging activity of methanolic and acetone: water (70:30) extracts of *F. bengalensis* aerial roots was studied. Antioxidant potential of the methanol extract, estimated by using potassium ferric cyanide reduction method, was comparable to that of tannic acid. DPPH free radical scavenging activity (%) of the 70% acetone and methanol extracts was about 50, nearer to each other, at concentrations of 46.79µg and 39.3µg respectively.

The values of TAA determined by $ABTS^{\cdot+}$ radical cation scavenging activity of the 70% acetone and methanol extracts were 6182.7 and 6096.1 µmol/g respectively. Hydroxyl radical scavenging activity (%) of the 70% acetone and methanol extracts at concentration of 250 µg was 24.2 and 32.4 respectively. Linoleic acid peroxidation inhibition of both extracts was comparable to that of α-tocopherol. Antihemolytic activity (%) and metal chelating activity (mg EDTA/g sample) of 70% acetone and methanol extracts was 75.0, 70.5 and 19.9, 7.4 respectively [60]. Antioxidants protect the body against oxidative stress by neutralizing free

radicals and reactive oxygen species (ROS) for example, superoxide radicals, hydroxyl radicals, hydrogen peroxide radicals, *etc*. Body has antioxidant defense system (AODS) that include superoxide dismutase (SOD) and catalase, *etc*. Sometimes prolonged exposure to infection may result in irreversible oxidative damage to the body and the body needs exogenous supply of antioxidant from some natural sources. Flavonoids, flavonols and terpenoids are favorite choices among natural antioxidants.

Antioxidant activity and phenolic contents of *F. bengalensis* was observed [61]. In their experiment aqueous extract of fresh aerial roots of *F. bengalensis* showed good antioxidant activity due to the presence of phenolics and flavonoids. Phenolics are the phytochemicals that provide natural intake of antioxidants. Out of all phenolics, flavonoids have diphenyl propane structure with different degrees of oxidation, hydroxylation and substitution. They normally occur in plants as glycosides and are a rich source of antioxidant. They found that *F. bengalensis* showed high flavonol to total phenolics ratio and high flavonoid to total phenolics ratio but it exhibited very low antioxidant activity. It might be due to the presence of certain other factors which could impede antioxidant efficacy of flavonoids in root extract of *F. bengalensis*. A research on the antioxidant potential of various central medicinal plants explored that the maximum antioxidant activity is exhibited by the aerial roots of *F. bengalensis*. Phytochemical assay showed the presence of flavonoids and tannins that might be responsible for the antioxidant activity of *F. bengalensis* [62].

The extract was investigated for its antioxidant activity by 1, 1-diphenyl, 2-picryl hydrazyl (DPPH) radical scavenging activity, hydroxyl radical scavenging activity, reducing capacity, hydrogen peroxide activity, total phenolic content using Folin-Ciocalteu's phenolic reagent. The extract showed maximum scavenging of DPPH radical (96.07%) at 250 $\mu gmL^{-1}$ concentration and hydrogen peroxide (69.23%) at 1000 μgmL-1 concentration. The extract shows good results when compared with other compounds. This shows the scavenging activity of the extract [63]. Anti-oxidant activity of the methanolic extract of the bark of *Ficus bengalensis* (MFB) were studied at doses of 100, 200 and 300 mg/kg (i.p) using the Freund's Complete Adjuvant induced arthritis model, the Formalin induced arthritis model and the Agar induced arthritis model. The extract produced marked inhibitory effect on edema especially on secondary immunological arthritis and caused graded inhibition of both phases of Formalin-induced pain. The study was validates the traditional use, demonstrating that the methanolic extract of bark of *Ficus bengalensis* possesses dose dependent anti-rheumatic activity in all the models with a possibility of acting through the central and peripherally mediated activities. The DPPH and hydrogen peroxide model demonstrated positive antioxidant activity in a concentration dependent manner (100 μg/ml) [64].

Methanolic extract of *F. benghalensis* leaves was evaluated for the presence of carbohydrates, proteins, phenolic compounds, oil and fats, saponins, flavonoids, alkaloids and tannins by using standard protocols. Antioxidant activity of the extract was screened by 2, 2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay, total antioxidant assay, iron chelating assay and reducing power assay.

Cytotoxic activity of the extract was tested by brine shrimp lethality assay. Estimation of total phenolic content was performed by Folin-Ciocalteau reagent method and estimation of total flavonoid content was performed by aluminium chloride method. Chromatographic detection of polyphenolic compounds was estimated by High Performance Thin Layer Chromatography (HPTLC) and High Performance Liquid Chromatography (HPLC). *Ficus benghalensis* showed the presence of carbohydrates, phenolic compounds, oil and fats, saponins, flavonoids, alkaloids, proteins and tannins as major phytochemical groups. The extract exhibited significant antioxidant activity in all methods performed. The extract also found to exhibit significant cytotoxic activity towards brine shrimp larvae. Extract exhibited significant amount of polyphenolic compounds which were further characterized by HPTLC which showed the presence of six bands of polyphenolic compounds. Further analysis of extract with HPLC showed the presence of gallic acid, rhein, anthraquinone, gallocatechin, theaflavin-3, 3'-digallate and flavone.

The results of the study emphasize that the methanolic extract of *F. benghalensis* is a good source of antioxidant compound and can be used in the field of therapeutics [65].

**Anti-diarrhoeal Activity:** Ethanol extract of four different plants of the Khatra region of the Bankura District of West Bengal, India were evaluated for anti-diarrhoeal activity against different experimental models of diarrhea in rats. The extracts of *F. bengalensis* Linn. (hanging roots) showed significant inhibitory activity against castor oil induced diarrhea and PGE2 induced enter pooling in rats. The extract also showed significant reduction in gastrointestinal motility in charcoal meal tests in rats. The results obtained show its medicinal use as anti-diarrhoeal agent [66].

Anti-diarrhoeal effect of ethanolic extract of *F. bengalensis* hanging roots (EEFB) was evaluated at dose level of 400 mg/kg p.o. against castor oil induced diarrhea, PGE2 induced enter pooling and GI motility in charcoal meal test in rats using diphenoxylate (5 mg/kg p.o) and atropine (0.1 mg/kg i.p) as reference standards. In castor oil induced diarrhea, mean defecations per animal in 4 h, treated with diphenoxylate and EEFB were 1.37 and 2.21 respectively and mean number of wet faeces per animal were 0.0 and 1.96 respectively. In PGE2 induced enteropooling, volume of intestinal fluid in PGE2 and PGE2+EEFB was 2.97 and 1.25 ml respectively. Movement of charcoal meal with atropine and EEFB was 34.2 and 50.2 respectively [67].

The study was to determined the antidiarrhoeal effect of methanolic extract of two commonly used medicinal plants, *Ficus bengalensis* - leaf and *Mangifera indica* - stem bark and root bark using Swiss albino mice against castor oil-induced diarrhoea. The extracts were subjected to phyto-chemical screening and subsequent TLC analysis for the identification of active phytoconstituents. The mice were treated with the extract at a dose of 3, 7.5 and 15 mg/kg b.wt.p.o. Castor oil was administered after 30 min. The stool consistency was observed for a period of 4 h. Phytochemical analysis of the methanol plant extracts proved the presence of steroids, flavonoids, triterpenes, phenols, sugar and tannins. The methanol plant extracts significantly reduced the total number of stool and number of diarrhoeal stool in a dose-dependent manner when compared with the untreated control. The phyto-constituents responsible for antidiarrhoeal activity may have acted by increasing colonic water and electrolyte reabsorption or by inhibiting intestinal motility. Thus the plants have shown to exhibit potent antidiarrhoeal activity proving its ethnomedicinal usage [68].

**Antiatherogenic Activity:** One month treatment of alloxan diabetic dogs with aglycoside, *viz*. leucopelargonin derivative (100mg/kg/day) isolated from the bark of *F. bengalensis* decreased fasting blood sugar and glycosylated hemoglobin by 34 and 28%, respectively. Body weight was maintained in both the treated groups while the same was decreased significantly by 10% in the control group. In cholesterol diet fed rats, as the atherogenic index and the hepatic bile acid level and the faecal excretion of bile acids and neutral sterols increased, the HMGCoA reductase and lipogenic enzyme activities in liver and lipoprotein lipase activity in heart and adipose tissue and plasma Lecithin-Cholesterol Acyltransferase LCAT activity and the incorporation of labelled acetate into free and ester cholesterol in liver decreased significantly [69].

**Antitumor Activity:** Fruit extracts exhibited anti-tumor activity in the potato disc bioassay. None of the tested extracts showed any marked inhibition on the uptake of calcium in to rat pituitary cells GH4C1. The extracts of the four tested *Ficus species* had significant antibacterial activity, but no antifungal activity. The results of this preliminary investigation support the traditional use of these plants in folk medicine for respiratory disorders and certain skin diseases [70]. The extract from fruit exhibited anti-tumor activity in the potato disc bioassay. The other tested extracts showed no marked inhibition on the uptake of calcium in to rat pituitary cells GH4C1. The extracts of the four tested *Ficus species* had no significant antifungal activity. The results support the traditional use of these plants in folk medicine for respiratory disorders and certain skin diseases [71].

**Immunostimulatory Effect:** The aqueous extract of *F. bengalensis* aerial roots was evaluated for immunostimulatory activity, using *in-vitro* poly

morphonuclear (PMN) function test and hypersensitivity and hemagglutination reactions in rats. Maximum percentage phagocytosis *i.e*. 64% was observed at 1.0 mg/ml, compared to 34% in the control. Maximum early and delayed hypersensitivity reactions and an increase in the antibody titer in rats were observed at a dose of 100 mg/kg p.o. for five days [72]. Immunostimulatory effect of the aerial roots was testified by using feed containing 5% aerial root powder, in fish models *(Channa punctatus*). Levels of ALT and AST remained almost same. Serum lysozyme, SOD, phagocytotic index, %age phagocytosis, total serum protein, nitric oxide and immunoglobulin increased significantly [73]. In another study, the hydroalcoholic extract of the leaves and its four fractions (*n*-hexane, chloroform, *n*-butanol and water) showed prominent immunostimulatory activity in phagocytosis of killed *C. albicans* and candidacidal assay [74].

**Immunomodulatory Activity:** To evaluated the immunomodulatory activity of the aerial roots of *Ficus benghalensis* (Family Moraceae).Various extracts of the aerial roots of *Ficus benghalensis* were evaluated for potential immunomodulatory activity, using the *in-vitro* polymorphonuclear leucocyte (human neutrophils) function test. The methanol extract was evaluated for immunomodulatory activity in *in-vivo* studies, using rats as the animal model. The extracts were tested for hypersensitivity and hemagglutination reactions, using sheep red blood cells (SRBC) as the antigen. Distilled water served as a control in all the tests. The successive methanol and water extracts exhibited a significant increase in the percentage phagocytosis versus the control. In the *in-vivo* studies, the successive methanol extract was found to exhibit a dose related increase in the hypersensitivity reaction, to the SRBC antigen, at concentrations of 100 and 200 mg/kg. It also resulted in a significant increase in the antibody titer value, to SRBC, at doses of 100 and 200 mg/kg in animal studies. The successive methanol extract was found to stimulate cell mediated and antibody mediated immune responses in rats. It also enhanced the phagocytic function of the human neutrophils, *in-vitro* [75].

The aqueous extract of the aerial roots of *F. bengalensis* was evaluated for its effect on both specific and nonspecific immunity. This extract exhibited a significant increase in percentage phagocytosis by human neutrophils in the *in-vitro* tests. It exhibited promising immunostimulant activity at doses of 50, 100, 200 and 400 mg/kg body weight in sheep red blood cells (SRBC), induced hypersensitivity reaction and hemagglutination reaction in rats. The aqueous extract was found to stimulate the cell mediated and antibody mediated immune responses. Per oral administration of the aqueous extract for five days produced a dose related increase in early (4 h) and delayed (24 h) hypersensitivity reactions in rats. The maximum response was observed at a dose of 100 mg/kg. Increase in the dose beyond 100 mg/kg did not result in further increase in the immune response [76].

**Anti-arthritic Activity:** Anti-arthritic activity of methanolic extract of the stem bark (MESB) at dose level of 400 mg/kg/day p.o was studied in formalin and Complete Freund's adjuvant (CFA) induced arthritis in rats by using arthritis score, oxidative stress, radiographic pattern of hind legs and biomarkers viz. lipid peroxidation, antioxidants (non-enzymatic and enzymatic), nitricoxide, serum lysosomal enzymes (ALT, AST, and LDH), connective tissue biomarkers (sialic acid, hydroxyproline and glucosamine) and pro-inflammatory mediators (IL-6 and TNF-α). Diclofenac sodium, dexamethasone and methotrexate at dose level of 10, 0.03 and 0.007 mg/kg/day p.o. respectively were used as reference standards. Anti-arthritic activity of MESB was slightly better than that of diclofenac sodium and less effective than that of dexamethasone and methotrexate [77].

The study was carried out to evaluated the anti-arthritic activity of ethanol and aqueous extract of root of *Ficus benghalensis* on Freund's adjuvant induced arthritis in rats. The crude ethanol and aqueous root extract was administered orally at dose of 300 mg/kg body weight for 28 days. Indomethacin at dose of 10 mg/kg bodyweight was used as standard drug. The paw volume was measured on days 7, 14, 21 and 28. At the end of day 28$^{th}$ the animals were anaesthetized with anesthetic ether and blood was collected from retro-orbital route to all the groups of animals and various haematological parameters such as hemoglobin content, total WBC, RBC and

erythrocyte sedimentation rate (ESR) were estimated. The body weight of the animals was measured by digital balance to access the course of the disease at the initial day before induction and the end of 28$^{th}$ day.

The results indicate that at the dose of 300 mg/kg b.w, both the extracts protect the rats against primary and secondary arthritic lesions, body weight changes and haematological perturbations induced by FCA. Daily treatment with crude extracts and standard drug effectively inhibits paw edema in rats. Both the extracts significantly ($p<0.01$) altered the parameters which were estimated, when compared to control group rats. The observations showed that ethanol extract show highly inhibition of paw edema in rats. The ethanol extract inhibits rat paw edema by 63.64% than the aqueous extract 31.82% when compared to standard drug 62.34% on 28$^{th}$ day. At the end of study the ethanol extract show more pronounce effect then aqueous extract when compared to standard drug. Our findings showed a significant anti-arthritic activity of *F. benghalensis* root extracts against FCA induced arthritis in rats [78].

**Antifungal Activity:** Antifungal activity of aqueous extracts of the stem bark, leaf and root was evaluated by agar diffusion technique at dose level of 30 mg/ml using nystatin (30 µg/ml) as reference standard. Among the three extracts, stem bark extract showed antifungal activity against *Trichophyton rubrum* and *Candida albicans* comparable to that of nystatin. *T. rubrum* was resistant to the leaf extract and K. pneumonia was resistant to both leaf and root extracts [79]. In another study, water and ethanolic extracts of the stem bark increased breaking strength and decreased period of epithelialization and percentage wound contraction in incision and excision model respectively [80].

**Larvicidal Activity:** Larvicidal activity of methanolic extract of the leaf was studied against early 2$^{nd}$, 3$^{rd}$ and 4$^{th}$ instar larvae incorporated in different concentrations in glass beakers. Results revealed $LC_{50}$ values against early 2$^{nd}$, 3$^{rd}$ and 4$^{th}$ instar larvae of *Culex quinquefasciatus*, *Anopheles stephensi* and *Aedes aegypti* as 41.43, 58.21 and 74.32 ppm, 60.44, 76.41 and 89.55 ppm and 56.54, 70.29 and 80.85 ppm respectively. $LC_{50}$ values against early 3$^{rd}$ instar larvae of *Culex tritaeniorhynchus* and *Anopheles subpictus* were 100.88 and 159.76 ppm respectively [81, 82].

**Wound Healing Activity:** Since ancient times various herbs and medicinal plants have been of medicinal importance for treatment of different ailments. One of these is wound healing activity. Wound healing process holds various steps which involve coagulation, inflammation, formation of granulation tissue, matrix formation, remodeling of connective tissue, collagenization and aquisation of wound strength [83]. Research on wound healing drugs is developing area in modern biomedical sciences. Scientists who are trying to develop newer drugs from natural resources are looking toward the Ayurveda, the Indian traditional system of medicine. Several drugs of plant, mineral and animal origin are described in the Ayurveda for their wound healing properties under the term Vranaropaka.

Most of these drugs are derived from plant origin. Some of these plants have been screened scientifically for the evaluation of their wound healing activity in different pharmacological models and patients, but the potential of most remains unexplored. In a few cases, active chemical constituents were identified. Some Ayurvedic medicinal plants, namely, FB, *Cynodon dactylon*, *Symplocos racemosa*, *Rubia cordifolia*, *Pterocarpus santalinus*, *Ficus racemosa*, *Glycyrrhiza glabra*, *Berberis aristata*, *Curcuma longa*, *Centella asiatica*, *Euphorbia nerifolia* and *A. vera*, were found tobe effective in experimental models [84]. For wound healing activity, leaf powder of *F. bengalensis* is mixed with coconut oil and applied topically on the affected places to treat the wounds. Dosage is once a day for 3 days [85].

Wound healing capacity of aqueous and ethanolic extract of the root was studied by incision model, excision model and dead space wound model in rats. Increased breaking strength, decreased period of epithelialization and percentage wound contraction and increased hydroxyproline content were observed in incision, excision and dead space model respectively. Results were comparable to that of standard drug povidone iodine [86]. In another study, using excision and incision wound models, wound healing ability of aqueous and ethanolic extracts of the stem bark was evaluated in excision

and incision wound models. Significant wound healing activity was shown by increase in the skin breaking strength and the rate of wound contraction and a decrease in the period of epithelialization, compared with placebo [80].

**Growth Promoting Activity:** The growth promoting potential of alcohol and aqueous extracts of young prop roots of *F. bengalensis*, a medicinal plant widely used among the tribes of the Western zone of Maharashtra state, India to increase height was studied. Its growth promoting effect was evaluated in one-month-old immature female rats. Extracts were administered to young rats for 30 days. Significant ($p<0.05$) increase in body weight was observed in alcohol and aqueous extract treated immature female rats.

Animals treated with alcohol extract showed statistically significant difference ($p<0.05$) in parameters such as mean food consumption, total body length and increase in alkaline phosphatise levels, a biochemical marker for bone formation. Significant results were not observed in other parameters such as feed efficiency, tail length, relative organ weight, bone density, tibial epiphyseal cartilage width and bonehydroxy proline levels. The results obtained establish the efficacy of the plant material as well as importance of chronic studies to justify the use of this plant in growth promotion [87].

**CONCLUSION:** Plants have been serving the humanity for centuries by providing a good source of medicines. Active constituents are isolated from plants and being used for diagnosis, treatment and prevention of various human diseases, but many crude drugs are also in use. This review article comprised of plant study, pharmacological activity and toxicological study of *F. bengalensis* Linn. (Moraceae), a medicinal plant found throughout India and also in other countries. The various extracts of *Ficus bengalensis* showed various pharmacological activities as similar to standard drugs. It has pharmacological activities such as antidiabetic, hypolipidemic, antiatherogenic, antibacterial, immunomodulatory, analgesic and antipyretic, antioxidant, antiinflamatory, anti-diarhoeal, wound healing and growth promoting. Thus, the plant can be considered as a great herbal remedy for human beings.

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