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A REVIEW ON ASTONISH PLANT *FICUS VIRENS*

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ABSTRACT: Plants serve humans as primary sources for food and medicines, so their use in treating diseases is very important for leading a healthy life. Our ancestors employed numerous plants for medicinal purposes, urging the imperative for scientific validation of these traditional practices. *Ficus virens (F. virens)* is commonly known as white fig, pilkhanand plaksa, one such plant that belongs to the family Moraceae and normally found in India, Southeast Asia, Malaysia, and northern Australia, this plant contains chemical constituents like phenols, flavonoids, tannins, saponins, vitamins, anthocyanins, glycosides, alkaloids, and amino acids. Not much scientific support was given to the folklore claims of the plant, and some of its traditional uses have been investigated, including anti-diabetic, anti-inflammatory, hepatoprotective effect, wound healing properties, anti-hyperlipidemic, anti-viral, antioxidant, anti-bacterial, anti-implantation, anti-ovulatory, anti-estrogenic, and anti-cancer activity. As per the literature review, the detailed pharmacological information of *F. virens* is not yet reported. In this review article taxonomy, synonyms, vernacular names, distribution, food value, ethnomedical uses, phytochemicals, and pharmacological activities of *F. virens* have been discussed.

INTRODUCTION: Medicinal plants have been an integral part of human life to fight against several diseases since ancient times. More than 80,000 medicinal plants are used around the world, and among them, the maximum number of plants are traditionally used from generation to generation. It means medicinal plants are the backbone of folk or traditional medicines [1]. Medicinal plants play an important role in the prevention and cure of diseases in comparison to conventional treatments that are injurious to health.

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Traditional plant medicines still enjoy a significant position in the modern-day drug industry due to the minor side effects as well as the synergistic action of the combination of compounds [2]. Plants are an enriched source of secondary metabolites with biological and pharmacological activities [3].

The genus Ficus, belonging to the family Moraceae, constitutes an important group of trees with immense medicinal value, plays an important role in the ecosystem, and has been providing food and medicines for humans for a long time [4]. Ficus, often known as figs, is one of the largest plant genera, with over 800 species of trees, shrubs, and vines found in tropical and subtropical climates across the world [5]. Ficusis a medicinal plant that is commonly used in India, Malaysia, China, Thailand, South Africa, and other countries due to

its pharmacological properties. Based on some ethnological reports, this genus is used to treat fever, skin diseases, hypertension, diabetes, cardiovascular diseases, and diarrhea. Traditional decoctions of whole plants have been used as herbal drinks for women to recover after childbirth, and they also treat disorders related to the menstrual cycle, improve blood circulation, and regain body strength [6].

F. virens, commonly known as white fig, locally in Hindi, known as pilkhan, belongs to the genus ficus and family Moraceae [7]. It is a medium-sized tree that grows to a height of 24-27 meters. *F. virens* is found in coastal, monsoon, or savannah forests, on cliffs, and in secondary rainforests. It is normally found in India, Southeast Asia, Malaysia, and northern Australia. Southeast Asia, Malaysia, and Northern Australia [8]. Very limited research has been done on the pharmacological activities of *F. virens.* Some *i*nvestigation of *F. virens* leaf revealed that phenolic compounds form the major photochemical components. Its leaf shows antioxidant, anti-inflammatory, anti-diabetic, and hepatoprotective properties. The stem bark of the tree is employed in the indigenous systems of medicine for a variety of purposes, like as an astringent medicine, for cooling in action, as hemostatic, as a laxative, to improve complexion, to clean the vagina, and as an antiseptic [9].

It is also used for inflammatory swellings, boils, and wound healing. The bark extract showed antifungal, antibacterial, anti-inflammatory, and anticancer properties. Phytochemicals found in *F. virens* include phenolics, flavonoids, tannins, terpenoids, alkaloids, glycosides, sitosterol, lupeol, stigmasterol, gallic acid, epicatechin, kaempferol, ellagic acid, rutin, catechin, quercetin, betulinic acid, myricetin, and luteolin [4].

FIG. 1: ***FICUS VIRENS***

Plant Biography:

Taxonomical Classification [5]:

Kingdom	Plantae
Phylum	Tracheophyta
Class	Magnoliopsida
Order	Rosales
Family	Moraceae
Genus	Ficus
Species	Virens

Synonyms [10]:

Ficus ampla Kunth & Bouche

Ficus apiculata (Miq.) Miq.

Ficus carolinensis Warb.

Ficus infectoria Roxb

Ficus caulobotrya var. Fraseri (Miq.) Miq.

Ficus cunninghamii (Miq.) Miq.

Ficus glabella Bl.

Ficus glabella var. Nesophila (Miq.) K. Schum.

Vernacular Names [5]:

Language	Vernacular Name
Gujarati	Pipli or Pipri
Sanskrit	Phagu, Phalgu, or Plaksa
Hindi	Kahimal, Kahimmal, Kaim, Keol, Pakur, Pilkahan, Pilkhan, and Ramanjir
Kannada	Basari, Basarigoli, Juvvimara, Karibasari, Karibasuri, or Mataiichchi
Kannada & Marathi	Pakur, Bassari, Pakari
Telugu	Badijuvvi, Bandajuvvi, Jati, or Jatijuvi
Malayalam	Bakri, Chakkila, Chela, Cherala, Cherla, Chuvannal, Itti, or Jati.
Tamil	Cuvalaipipal, Itti, Jovi, Kallal, Kurugatti, Kurugu, Mataiichchi, or Suvi
Urdu	Pakodo

Distribution: *F. virens* is one of the most widely distributed taxa in the genus Ficus [11]. It is a versatile species that can be found in various habitats, including coastal, monsoon, Savannah, and secondary rainforests, as well as in lowland and hill forests. It is a global natural resource, from Sri Lanka to southern China, across Southeast Asia to northern Australia. In India, it is distributed in the plains or lower hills of India in Sikkim, Bengal, Assam, and the West Peninsula. It is found in the Sub-Himalayan belt in the monsoon, occasionally in deciduous to moist deciduous forests of the Western Ghats and the Decan plateau; it is not common in Decan but frequently planted near villages and along the roads [5, 12].

Phytochemical Constituents [5, 8]:

Stem bark	Tyrosinase Alkaloids Phenolics Flavonoids Glycosides N-octadecanyl-O- α-D-glucopylranosyl N-octadecanyl-O- α-D-glucopylranoside Methyl ricinolate Caffeic acid Cergenin B-sitosterol Lanosterol Carbohydrate Tannins Steroids/terpenoids Proantrocyanidins Amino acids Phytosterols
Fruit	Tyrosinase Proantrocyanidins Lutein Luteolin

Leaves	Myricetin Catechin Epicatechin Phenolics Flavonoids Tyrosinase Lipid Carotenoids Quercetin Quercetin-3-O-α-D-arabinopyranoside Quercetin-3-O-β-D-galactopyranoside Kaempferol Kaempferol-3-O-α-D-arabinopyranoside Kaempferol-3-O-β-D-galactopyranoside Vogeline J Glycosides Tannins

Food Value: Plants serve as an excellent source of food and nutrition; they play a vital role in sustaining human health and improving the quality of life. Plants contain a number of phytochemicals and various health benefits; hence, they are often proven to be an advantage for the food and pharmaceutical industries [13].

The new foliage leaves of the *F. virens* are collected by the tribal communities during the mansoon and winter seasons since the consumption of mature leaves is not appropriate for human life. The foliage leaves are prepared as side dishes like curry or chutney and eaten with rice. In Thai culture, it is consumed as Phak Lueat and also eaten by boiling as a vegetable. The fruits of *F. virens* are edible; they can be consumed in dried or ripened form. The ripened fruits are also used for the preparation of jam [4].

Ethnomedical uses: Since, ancient times, all the parts of the *F. virens* plant have been traditionally used to cure diseases. Different parts are used, as given below:

Fruit: *F. virens* fruits are commonly known as white figs, and they are edible. The ripened fruit is helpful for indigestion, and it can be eaten in the form of jam mixed with jaggery or sugar to cure heart-related diseases. The dried or ripened fig can be roasted over the fire and taken with salt to treat fever. *F. virens,* gives relief to urinary disease and reduces excess sweating. It is also used for estrogenic, hepatoprotective, intrinsic, anti-haemorrhage, anti-erysipelas, and wound healing properties [4].

Leaves: The foliage leaves of *F. virens* are suitable for human consumption, and the mature leaves are not appropriate for human life. Traditionally, leaf dedication is made against diabetes and a herbal drink for women to recover after childbirth. It also treats disorders related to the menstrual cycle, improves blood circulation, and regains body strength [4, 6].

Bark: The bark has astringent properties, and compared to other parts of *F. virens*, plant bark has more medicinal uses. In spongy gum conditions, the infusion of bark is used as a mouth wash and a paste of bark is used for a burning sensation, rheumatism, and bone fracture. Traditionally, decoctions of bark are used for washing ulcers, treating diarrhoea, menorrhoea, nervous disorders, vaginal diseases, hyperlipidemia, hallucinations, dysentery, vertigo, blood diseases, menstrual disorders, leucorrhea, and diabetes [5, 14].

Latex: The white latex of the *F. virens* tree is applied to sore sites to reduce inflammation [4].

Pharmacological Activity: There are very few research reports on the pharmacological properties of *F. virens*.

Anti-diabetic Activity: The anti-diabetic activity of *Ficus infectoria* methonolic leaf extract was evaluated by streptozotocin-induced rats. Diabetes was induced in rats by a tail vein injection of streptozotocin (50 mg/kg, i.v.). Forty-eight hours after streptozotocin administration, blood samples were drawn by retro-orbital puncture, and glucose levels were determined to confirm diabetes.

The diabetic rats exhibiting blood glucose levels in the range of 250 and 280 mg/100 ml were selected for the studies. . The methanolic extract of *Ficus infectoria* was taken at various dose levels (200, 400, 800, 1000, and 2000 mg/kg b.wt.) and glibenclamide (600 µg/kg). The methanolic extract of *Ficus infectoria* showed a significant effect compared with the respective diabetic control group, decreasing the blood glucose level at doses of 100 mg/kg, 200 mg/kg, and 400 mg/kg. The standard drug glibenclamide also showed a significant decrease in the blood glucose level after 21 days. Finally, this study shows 400 mg/kg, and the standard drug showed a significant decrease in the blood glucose level after 21 days of treatment [15]. No clinical signs of toxicity or mortality were observed in Wistar albino rats during both acute and repeated-dose 28-day oral toxicity studies at the given dose and duration. The LD_{50} value is likely to exceed 2000 mg/kg [16].

Anti-inflammatory Activity: The anti-inflammatory activity of an ethanolic extract of *F. virens* bark using carrageenan induced inflammation in the mice. Swiss albino mice were treated orally with normal saline (as the control group) and plant extract (200 and 400 mg/kg) for 60 min before a 0.1 mL 1% carrageenan injection. Paw volume was assessed both before and at 1, 2, and 3 h after post-carrageenan injection. The subplantar injection of carrageenan induced a time-dependent paw oedema in the mice. Oral administration of plantextract (200 and 400 mg/kg) inhibited paw swelling dose-dependently at 1, 2, and 3 h after carrageenan injection. The results of this study indicate that the extract from *F. virens* demonstrates a notable anti-inflammatory effect in mice. It was observed that the ethanolic extract of *F. virens* (400 mg/kg, p.o.) exhibits maximum anti-inflammatory activity against carrageenan-induced hind paw edema [17].

A methanolic extract of *F. virens* bark and fruit was screened for in vitro anti-inflammatory effects. The study explored a noteworthy stabilisation effect on the RBC membrane using the heat-induced hemolysis method and investigated in vitro anti-inflammatory action and egg albumin protein inhibition. The observed anti-inflammatory effect of the methanolic extract may be attributed to the presence of phytochemicals such as alkaloids, phenolics, flavonoids, and tannins. The inhibition of hypotonicity-induced HRBC membrane lysis, i.e., stabilisation of the HRBC membrane, was taken as a measure of the anti-inflammatory activity. The percentage of membrane stabilisation for methanolic extracts and aspirin was done at 100, 200, and 500 µg/ml. Methanolic extracts of *F. virens* are effective in inhibiting the heat-induced hemolysis of HRBC at different concentrations. It showed a maximum inhibition of 64% at 200 µg/mL.

The inhibitory effect of different concentrations of FVBME on protein denaturation. Methanolic bark extract at different concentrations showed significant inhibition of the denaturation of egg albumin in a dose-dependent manner. When compared with a standard drug at a concentration of 200 µg/mL. The erythrocyte membrane resembles the lysosomal membrane, and as seen, the erythrocyte could be extrapolated to the stabilisation of the lysosomal membrane. Hence, the methanolic extract of *F. virens* possesses membrane stabilisation properties, limiting the protein denaturation process, and white blood cell anti-migration properties. Therefore, the extract leads to effective RBC membrane stabilisation and protein inhibition denaturation, both of which contribute to in vitro anti-inflammatory activity [18, 19].

Hepatotoxicity: The hepatoprotective effect of a methanolic leaf extract of the *F. virens* plant in rats of both genders. Group i (negative control), group ii (ccl4 control), group iii (standard control) treated with vit-c (ascorbic acid) at 200 mg/kg b.wt., and group iv, v, and vi (test groups) treated with methanolic leaf extract at 50, 100, and 150 mg/kg b.wt., respectively, for 7 days. After 6 h of the last treatment, acute hepatotoxicity has been induced by p.o. administration of ccl_4 (1 ml/kg b.wt.) to all animals in groups ii–vi. On day 8, animals were sacrificed, blood samples were collected for biochemical parameters, and liver tissue was processed for liver function enzymes and antioxidant enzyme profiles. The study revealed that there are gender differences in ccl_4-induced oxidative stress, with males being more prone to ccl_4-induced oxidative stress than females. *F. virens*, a traditional medicinal plant, showed marked hepatoprotection at a given dose of 150

mg/kg as compared to other test groups and a positive CCL4 control [20].

Wound Healing: The wound healing activity of *F. virens* methanolic bark extract, with the fresh homogenized crude extract of *F. virens* bark prepare a ointment of10% and Povidone iodine 5% was used as standard drug applied on Wistar albino rats of either sex. Group I - consider as Control, Group II - *Ficus virens* 10% methanolic extract, Group III - consider as Standard and treated with 5% w/w Povidone iodine ointment. Anesthesia was induced in three groups of animals, each comprising six rats using the open mask method with anesthetic ether. The rats were depilated on the back and a predetermined area of 500 mm2 full thickness skins was excised in the dorsal interscapular region. The Rats were exposed to the ambient environment without any covering. The extract and standard drug were applied daily until the complete healing s the topical application of *F. virens* methanolic extract (10%) was used as a test drug, which indicates the significance of the wound healing process. An increase in tensile strength may be due to an increase in collagen concentration and the stabilisation of fibers. The results suggest that treatment with a homogenised extract of *F. virens* bark may have a beneficial influence on the various spaces of wound healing, including fibroplasia, collagen synthesis, and wound contraction, resulting in faster healing [21].

Anti-Cancer: The anti-breast cancer and anti-mucositis activities of proanthocyanidins from *F. virens* were demonstrated in the study. The results revealed that the cytotoxic effects against MDA-MB-231 and MCF-7 breast cancer cells followed the order of proanthocyanidins (spas) > leaves proanthocyanidins > fruits proanthocyanidins from stem barks. Furthermore, spas treatment induced apoptosis in both cell lines, accompanied by an increase in mitochondrial membrane potential loss, reactive oxygen species production, an alteration in the Bax to Bcl-2 protein expression ratio, and activated caspase. Additionally, intraperitoneal injection of 5-FU (150 mg/kg body weight) led to both body weight loss and jejunal injury in the rats, but the administration of spas (100 mg/kg body weight) counteracted these changes. Collectively, this study demonstrated that spas induced apoptosis cell death in breast cancer cells while ameliorating the symptoms of intestinal mucositis in rats. Hence,spas deserves additional investigation as a promising therapeutic agent for both breast cancer and chemotherapy-induced mucositis. Proanthocyanidins have demonstrated promising anti-carcinogenic effects in several breast cancer models [22].

Anti-implantation: Anti-implantation activity of *Ficus infectoria* aqueous extract Adult female Wistar albino rats in the proestrous phase were kept with adult male rats. The following morning, the females were examined for evidence of copulation, and those showing thick clumps of spermatozoa in their vaginal smears were separated for the experiment. The detection of spermatozoa was considered the beginning of pregnancy, designated as day 1. 12 albino rats were divided into 2 groups of 6 animals. Group 1 served as the control and was administered distilled water. Group 2 received an aqueous extract of *Ficus infectoria* at a dose of 100 mg/kg body weight orally on days 1–7 post-coital with the help of a catheter. On the 10^{th} day of pregnancy, a laparotomy was performed under general anesthesia. Count the number of implants from the uterus and the corpora lutea from the ovary. Calculate the pre-implantation loss and post-implantation loss using the equation. Therefore, extracts possess greater post-implantation loss than pre-implantation loss [23].

Anti-ovulatory: Anti-ovulatory activity of *Ficus infectoria* in albino female rats by examining whether it inhibited cupric acetate-induced ovulation. Animals were kept in isolation for at least 21 days to ensure that they were not pregnant and to prevent the induction of ovulation by mating. After isolation, these animals were divided into two groups of six animals each. *Ficus infectoria* was administered from day 1^{st} to 3^{rd} by oral route at a dose level of 100 mg/kg body weight in Group 2 animals. Group 1 served as control group and received distilled water only by oral route. Thirty minutes after the administration of the last dose, a freshly prepared 0.4% solution of cupric acetate was administered intravenously to each animal at a dose of 4 mg/kg body weight to induce ovulation. To observe ovulation, all rats were sacrificed, and the ovaries were examined after 18–24 hours of the administration of cupric

acetate. Compare histopathology with that of the normal group. Group 2 histopath shows numerous follicles in the earlier stages of maturation; the number of corpora luteaseen in this group was noticeably less than that seen in the control group [23].

Anti-estrogenic: Anti-oestrogenic activity is usually determined by the ability of a compound to inhibit the increases in uterine weight induced by oestrogen. The anti-oestrogen activity was executed on immature female Swiss albino mice, about 3 weeks old and weighing approximately 8–10 rams. Animals were divided into 4 groups of 5 animals: Group 1: 2 ml of distilled water (control); Group 2: 0.5 µg/ml of estradiol benzoate in olive oil (standard group); and Group 3: 100 mg/kg of body weight aqueous extract of *Ficus infectoria* (oral). Group 4: 100 mg/kg body weight aqueous extract of *Ficus infectoria* (oral) followed by 0.5 µg/ml of beta-estradiol in olive oil (subcutaneously). The treatment was continued for 4 days. 24 hours after the last dose, the animals were sacrificed, and their uteri were dissected, pressed, and weighed. The weight of the uterus was recorded. The mean value of each group was calculated and expressed as a percent reduction in uterine weight compared to controls treated with estradiol alone. *Ficus infectoria* induced the uterotropic effect on the uterus, which was possessed by beta-estradiol that exhibited an anti estrogenic activity [23].

Anti-oxidant: The *F. virens* leaves and stem bark are rich with phenolic components. An aqueous methanolic extract of leaves of *F. virens*, the various different fractions, etoac and *n*-buoh, obtained through successive fractionation of the meoh extract exhibit significant antioxidant activity against ti-DPPH radicals. In this present study, phytochemical analysis was conducted on the etoac fraction derived from an aqueous meoh extract of leaves of F. virens, which led to the purification of six known flavonoids (quercetin, quercetin-3-*O*-α-D-arabinopyranoside, quercetin-3-*O*-β-galactopyranoside, kaempferol-3-*O*-α-D-arabinopyranoside, kaempferol-3-*O*-β-D-galactopyranoside, and vogelin J). The antioxidant effect of vogelin J (6) was not reported previously, while the antiradical activities of a few or more of the other molecules 1–5 were studied extensively by various methods. Since the antioxidant capacity depends on the concentration ratio between antioxidants and target, the reaction conditions, and other factors, the anti-DPPH radical activities of the different isolated compounds, as well as an authentic sample of the flavonoid kaempferol, were evaluated under the same experimental conditions. The concentration of antioxidant needed to decrease the initial DPPH concentration by 50% (IC50) was determined. The lower value of IC_{50}corresponds to higher antioxidant power. On the basis of the obtained results, the antioxidant activity of the compounds that follow the trend 1 > 2 ≈ 3 > kaempferol > 4 ≈5 > 6. Results indicate that the antioxidant activity of flavonoids increases with the number of aromatic OH groups and also suggest two structural requirements for efficient antioxidant flavonoids [12, 24].

Production of free radicals is associated with cigarette smoke (CS), which in turn generates oxidative stress and could be responsible for alterations in the activities of enzymatic and non-enzymatic antioxidants that link with atherosclerosis. FVBM extract, its bioactive fraction (F18), and at or vast at in suspension were administered to male Sprague-Dawley (SD) rats who were subjected to gastric intubation with two divided doses (morning and evening) of 0.5 ml per rat per day,and exposure to cigarette smoke in the morning.

This was achieved by placing two rats in a bottomless metallic container (10 x 11 x 16 inches) with two holes of 3 and 1.5 cm diameter, positioned on the hing side. The burning cigarette was introduced through one hole (3 cm), and the other hole (1.5 cm) was used for ventilation. The animals underwent daily 30-minute exposures to CS over a 4-week period, with a 10-minute interval between each 10-minute exposure. This involved the use of 3 cigarettes per day by 2 rats assigned to each group. CS induces paramount oxidative stress and is consistent with our results, which demonstrate a significant decrease in the liver and lung enzymatic activity of SOD, CAT, Gred, and GST, including the GSH level, while Gpx activity was significantly increased in CS-exposed rats. Histopathological observations strongly support the results, suggesting that the extract from F18/FVBM serves as a highly promising natural antioxidant.

It indicates its potential utility not only as an antioxidant but also as an antiatherogenic agent [25].

Anti-bacterial: Silver nanoparticles (Agnps) were 197cholera197a197d using distinct leaf extracts (aqueous, ethanol, and methanol) of *F. virens* and evaluated for their antibacterial activity by the agar-well diffusion method against different pathogenic bacterial microorganisms (*Bacillus subtilis, Staphylococcus epidermidis, Klebsiella* 197 *holera* 197a, *Vibrio* 197 *holera*, *Enterococcus faecalis*, and *Vibrio vulnificus*). Sterile cotton swabs were used to uniformly swab each bacterial strain onto individual plates. Wells with a diameter of 8 mm were created on nutrient agar plates using the gel puncture method. The concentration of samples (streptomycin, agno3, agnps, and streptomycin + agnps) used in wells was kept at 1 mg/ml; 60 µl of streptomycin (the positive control), silver nitrate, and agnps (pre-paired with different extracts) were inoculated in different wells in the agar plate. To assess the antibacterial activity of streptomycin, a combined formulation of streptomycin (30 µl) and AgNPs (30 µl) was introduced into the wells. The plates were allowed to remain undisturbed for 1 hour for the diffusion of samples into agar. Incubation of the plates occurred at 37 °C for a duration of 18–24 hrs. The zone of inhibition surrounding the wels was measured using an antibiotic measurement scale and expressed in millimeters. The measurement of negative growth zones was conducted solely after a 24-hour period. The present investigation clearly reveals that AGNPs show a broad spectrum of antibacterial activity against human pathogens and further synergistically enhance the antibacterial activity of streptomycin [26].

Antiviral: A wide variety of active phytochemicals have been found to have therapeutic effects against different genetically and functionally diverse viruses. Some plant-derived extracts rich in flavonoids, such as quercetin glycosides, showed high activity against viral infection in *in-vivo* and in vitrostudies. Quercetin and quercetin-3-*O*-glycosides showed anti-Mayaro virus activity. The flavonoid dihydroquercetin (taxifolin) exhibits strong *in-vitro* and *in-vivo* antiviral activities against CVB4 and HAV. Some flavonoids have also shown antiviral activities against influenza virus, HSV-1 and HSV-2, enterovirus 71, and dengue virus. In our efforts to explore the potential of natural products as sources of low toxicity and high antiviral selectivity, we examined the in vitroantiviral activity of six pure flavonoids (quercetin, quercetin-3-*O*-α-D-arabinopyranoside, quercetin-3-*O*-β-D-galactopyranoside, kaempferol-3-*O*-α-D-arabinopyranoside, kaempferol-3-*O*-β-D-galactopyranoside, and vogelin J) from *F. virens*. Results of the virus inhibitory effects of the flavonoids demonstrated that quercetin, quercetin-3-*O*-α-D-arabinopyranoside, and vogelin J exert mild inhibitory activity on CVB4 at their MNTCs of 15.6, 15.6, and 62.5 µg/ml, respectively. On the other hand, only the quercetin glycosides 2 and 3 exhibited mild inhibitory effects (8.0 and 12.3% at their MNTC (62.5 and 15.6) on HAV, respectively. Kaempferol-3-*O*-glycosides didn't produce antiviral activity at the experimental conditions. Although the low antiviral activity of quercetin and its 3-*O*-glycosides under our experimental conditions, this is the first report on the anti-CVB4 and HAV properties of these flavonoids. These results are an addition to the known antiviral properties of flavonoids shown in recent reviews. Our results demonstrate that the leaves of *F. virens are* a cheap source of flavonoids with mild antiviral activity against the CVB4 and HAV viruses [8].

Hypolipidemic/Anti-hyperlipidemic: The *in-vitro, in-silico* rationale, and *in-vivo* studies were designed to evaluate the hypolipidemic properties of stem, bark, and leaf extracts of *F. virens*. Among all extracts, methanolic bark extract showed the most potent anti-oxidant, genoprotective, and HMG-coa reductase inhibitory activity. To isolate and identify the bioactive compounds from the methanolic extract of *F. virens* bark, it was subjected to a column Chromatography was used in order to identify and isolate the bioactive compounds as well as to examine their antioxidant and HMG-coa reductase inhibitor properties. The antioxidant activity of the newly isolated compound was measured using a 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay and FRAP value.

In-vivo hypolipidemic properties of FVBM extract and a newly isolated compound were also analysed in triton-WR 1339-induced rats after administration of FVBM extract (at a higher dose of 100 mg/rat) and the inhibitor (1 mg/rat) to Triton-WR 1339-

induced hyperlipidemic rats. Following the experiment, blood was collected from animals and plasma was separated from it. The result shows a significant increase in plasma TG, TC, VLDL-C, and LDL-C levels, with a decrease in HDL-C value with the increase in hepatic HMG-coA reductase activity. The increase in plasma TG and TC by triton was due to an increase in HMG-coA reductase activity and the inhibition of lipoprotein lipase, which is responsible for the hydrolysis of plasma lipids [27].

CONCLUSION: Plants are the natural sources of bioactive compounds used to treat various life-treatening diseases. *F. virens* showed various phytochemical constituents which means that it can be used for treating various types of diseases. This review shows the activity of various parts of the plant and its pharmacological action. Extract and phytoconstituents isolated from this plant have been shows to produce different pharmacological response, which include anti-diabetic, anti-inflammatory, hepatoprotective effect, wound healing properties, anti-hyperlipidemic, anti-viral, anti-oxidant, anti-bacterial, anti-implantation, anti-ovulatory, anti-estrogenic, and anti-cancer activity. Considering all the above impacted medicinal importance of *F. virens* this review will helps to the researchers for further research study about the plant.

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