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A review of the pharmacological potential and phytochemical profile of Weeping Fig-*Ficus benjamina* L.

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Abstract

The genus Ficus is an individual from the Moraceae family, growing in tropical and subtropical districts and incorporates greater than 800 plant species. *Ficus benjamina* L., a medium size tree with a few spreading branches from the base usually called sobbing fig, is found in the neighborhood of South Africa, Australia, tropical focal Africa and West Africa. Known for its restorative ability, indigenous people make use of this plant to manage and/or treat skin ailments, infections, intestinal illnesses, and retching. In addition, they are commonly used as antimicrobial, antipyretic and antinociceptive. The leaves, barks and natural merchandise contain bioactive compounds such as cinnamic acids, lactose, naringenin, quercetin, caffeic acid and stigma sterol with documented pharmacological properties.

Key words: Africa, Nociceptive, Moraceae, Cinnamic acids, Quercetin, Infection

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1. Introduction

Weeping fig (*Ficus benjamina* L.) is an annual tree belonging to the family mulberry (Moraceae). It has been used for thousands of the year as an ornamental plant and hedge plant [1]. *Ficus* is a large genus of about 40 genera and 1000 species of trees, shrubs, lianas, or rarely herbs and many varieties are native to Asia, Malaysia, Australia, and parts of the Pacific region. The uncertainty in the exact number of spices within the genus is largely attributed to the great variability among the constituent. Weeping fig cross-pollinates very easily, the resulting diversity and variation has found. For pollination, wasps play an important role for reproduction of this species. Members of this genus are hard to differentiate by their flowers, but can be distinguished by their pattern, whether they are weeping fig or not, by leaf shape, and by their fruits [2]. *Ficus benjamina* is known by different names depending on the geographical distribution. The common English names are famously as Benjamin tree, or oval leaf fig, Benjamina fig and weeping fig tree. Common vernacular names are 'balete' or 'salisi'. In India specifically, it is best known as 'pukar'. In Chinese it is called 'Chui ye rong' or 'Cong Mao Chui ye rong'. In different regions of Brazil is known by different names beringan and *Figueira benjamina*. In Germany it is known as 'Benjamin Feige'. In Indonesia it is famous by the name of 'beringin', 'wariengin'. In Israel it is called 'ficus ha'shderot'. In Myanmar it is called 'nyaung thabye'. In Netherlands it is known as 'Baniaanboom'. In Thailand it is called 'sai yoi bai laem' [1].

Ficus benjamina is the most diverse species within the range. Large numbers of cultivars are available but the exact numbers are unknown while they also vary in flavors and uses. *Ficus benjamina* is a tree reaching 30 meters under natural conditions. Some famous species that represent the sort of the genus include the common place fig, a small temperate deciduous tree whose recognized fig leaf is known in artwork and iconography, the weeping fig (*F. benjamina*), a hemi-epiphyte with thin hard leaves on pendulous stalks adapted to its rain wooded area habitat; the difficult-leaved sandpaper figs from Australia; and the creeping fig (*F. pumila*), a few species are more not unusual but some aren't a vine whose small, tough leaves form a compact carpet of foliage over rocks or garden walls. But 'Variegate' is most common in spices than that of several spices in Europe. Variegate are leaves with white and gray-inexperienced along edges, new leaves regularly begin white and age with extra green. Often greater common cultivars are Amstel King-upright with long leathery banana-fashioned leaves [3]. Leaves are ovate-elliptic, slender-pointed, thin leathery, dark green and shiny, glossy and 2-5 cm long. Flower are insignificant and minute time unknown and sometime it borne in a hollowed out stem in axils but

these flowers are not showy [1]. Wide range of the species is due to the glossy oval foliage. The plant is available as a natural-looking bush and grow as an ornamental plant in different places such as park and around the roads [4].

Different factors like plant part, maturity of the plant part and agro climatic conditions affects the percentage yield of the extracts. *Ficus benjamin* of fruits, leaves and bark contains various bioactive components like stigma sterol, quercetin, cinnamic acid, and lactose naringenin [5].

2. History/Origin

Ficus benjamina found nearby to Asia, Malaysia, Australia, and fundamentals of the Pacific district. It has been provided some other place as an ornamental, and is found in Americas and on numerous Pacific islands. The species is reportedly unusual at the Marshall Islands, with just one tree found developing close to a village. This plant has been growing on Earth for an exceptionally prolonged time and fossil remains have been located going again 30 million years. The species call of *F. benjamina*, on occasion spelled benzamine, possibly alludes to the anticipate connection of this plant to the supply of resin or benzoin secured from the Orient in instances long past, or the specific designation from banyan, the Sanskrit 'banij'. Its common English name 'weeping fig' alludes to its drooping branches just as its aerial roots which slide from the branchelts to the floor. It was cultivated in England by Philip Miller in 1757 and then brings to United State from different countries. In the wild, the plant can acquire a height of 30 m. The largest plant is in India, with a crown width of 131 m and in excess of 1775 aerial roots. It does not do so scale as a houseplant, however it could surely be a serious individual in your own home [6].

3. Demography/Location

Ficus benjamina can grow in moderate amount of water during the warm season and only enough to shield it from drying out during the rest of the year. On the off chances that you can feel dampness one inch underneath the dirty surface, that is sufficient for the existence of weeping fig. *Ficus benjamina* is an enormous, spreading, strangulation tree of Asian source, which is known to be naturalized in past and its local range in spots including the Galapagos Islands, Australia, and the USA, Bangkok and Thailand. At world circulation it is found in various nations, for example, in Asia: Bhutan, Cambodia, China, India, Laos, Malaysia, Myanmar, Nepal, Papua New Guinea, Philippines, Thailand, Vietnam; Oceanic Islands: Solomon Islands; Australasia. Furthermore, at nearby distribution it is found in Andaman and Nicobar Islands, Andhra Pradesh, Assam, Bihar, Delhi, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Tamil Nadu, Tripura. Total figure for weeping fig generation are hard to get. However, the world creation of crude fig in 2013 was 1.1 million tones, driven by Turkey with 0.3 million tones, two-fold the volume of the following biggest maker, Egypt 0.15 million ton, Algeria produce 0.12 million and Morocco and Iran 0.08 a great many ton respectively. Dried fig creation in 2013 was 133,447 tons all inclusive, additionally driven by Turkey with 36% of the aggregate, trailed by Morocco and Iran [7].

4. Botany/Morphology/Ecology

Ficus benjamina is one of the most popular houseplants. Shiny oval leaves can be categorized into following classes depending on the species; plain green, creamy yellow, marked with burgundy, green, yellow or pink, silver-white patterns. The *F. benjamina* plant is available as natural looking bush however; it is also grown on trunks that can be twisted, straight or interwoven. Generally, branches droop slightly by providing it a graceful green appearance. Leaves are oblongovate, leathery, 6-9 cm long, having noticeable and somewhat slender point, rounded base. Petioles are 5-10 mm long while fruit is solitary, axillary, dark-purple, stalkless and fleshy when mature, rather spherical and 1 cm in diameter [8].

5. Chemistry

Banyan is additionally known for flavonoids and cell reinforcements. Banyan tree have diverse compounds. For example, methanol separate, *n*-hexane, chloroform, ethyl acetic acid derivation, *n*-butanol of stem, root and leaves was observed to be in the scope of 9.7-18 g/100 g, 8–20 g/100 g and 8.3-23.34 g/100 g individually. The most extreme yield was displayed by methanol concentrate of leaves 23.34 g/100 g. The methanol is available in root 20 g/100 g and stem 18 g/100 g likewise indicated distinctive degree. It is accepted that rate yield of concentrates relies upon different components, similar to plant part, season and development of plant part, and agro climatic conditions from where that part is gathered [9].

5.1. Chemical Composition

Weeping fig contains some measure of oil fat substance and brings less caloric worth. *Ficus benjamina* demonstrated the presence of phenolic mixes, carbohydrates, saponins, flavonoids, alkaloids, proteins and tannins. Mineral synthesis (Ca, Fe, K, Cu, Si and Zn), all out phenols, flavonoids, tartaric esters and anthocyanin's were measured. Photosynthetic colors (chlorophyll a and b and carotenoids), superoxide dismutase (SOD) and catalase (CAT) were investigated. Bark contains 4.2% tannin. It additionally contains latex which is 30% caoutchouc, alongside 59% gum. Furthermore, wax contains cerotic corrosive. Extraction from leaves, bark, and organic products is yielded six mixes, for example, cinnamic corrosive, lactose, naringenin, coumaric quercetin, caffeic corrosive and stigma sterol. Fundamental oil yielded four mixes in stem and eight mixes in root. Phenolic mixes, for example, chlorogenic p-, ferulic and syringic acids are available in root, three mixes, for example, chlorogenic, p-coumaric, and ferulic acids are available in stems, and in

leaves just one compound is available, for example, caffeic acid. 2, 2-diphenyl-1-picrylhydrazyl (DPPH) and Quercetin is additionally present in this plant [10].

5.2. Phytochemistry

Ficus benjamina has explicit aromatic odor because of the existence of essential or volatile oil, which is largely confined in green leaves. These oils are generally characterized by GC-MS analysis [11-16]. This scented volatile oil from leaves is chiefly comprised of alkaloids, saponins, flavonoids and tannins [17-19]. While oil also extracted from seed are mainly composed of naringenin, quercetin and cinnamic acid lactose. Its organic product contains caffeic corrosive; its bark contains stigma sterol while its root bark contains Benjamin amide. The investigation of gum of sobbing fig shows real constituents of sucrose and d-glucose, establishing 60.92% of substance constituents, while carboxylic acids albietic corrosive 1.00%, oleic corrosive 0.01% hexadecanoic corrosive 4.41%, 9-octadecanoic corrosive 1.00%, stearic corrosive 3.01%, octadecanoic corrosive 9.12%, and 6,13-pentacenequinone 20.43% represented the rest of the components. The leaf oil of *Ficus Benjamina* collected during the day, contained high contents of alpha-Pinene, abietadiene, cis-alpha-bisabolene, gas, reticuline, calycanthidine, anabasine, tomatidine, acridine derivative, sophocarpine, neblinine, harmine, obscurinervinediol, ergoline, ellipticine, indicine, matridine, scoulerine, hydroxyl morphine, aspidospermidin, nicodicodine, adenocarpine, lycocernuine, isoclaurine, dasycarpidan, retronecine, and clemastine [20].

6. Post-Harvest Technology

Conventionally, the best harvesting time of *Ficus benjamina* is early in the morning, just after the evaporation of dew before the day temperature start increasing. It has been observed that the essential oil activity is strong in the morning. Main method of this plant storage is air-layering method. Exportation of air-layered plants by means of airship cargo and ocean cargo takes 2-3 days or 2 weeks. In the wake of reaping they are kept at room temperature until they are sent out under various conditions. On the off chance that chilly stockpiling conditions are connected following harvest, until they are sent out then timeframe of realistic usability could be fundamentally improved. This will bring about less post-gather loss of plants. Weeping fig is stored for a week or less. And then plant is further use in future. [21]. Weeping fig should be dried under shade instead of sun drying otherwise it will lose aroma due to essential oil volatility [22]. Dried fig can be stored for a year if kept in closed jar away from heat and light. If it is stored at room temperature than it store at temperatures 65°F/16°C to 75°F/24°C. This is ideal temperature. Try not to allow temperatures to decrease lower than 50°F/10°C. Although they can handle a bit lower, without any problems. Cutting time of fig will be late June and early September. And it packs into imperforated polyethylene bags. And put these bags in carton boxes. Other pot plants are pack in imperforated polyethylene bags with a sachet of potassium permanganate at 1 ppm/sachet and put in carton boxes. All pot plants are stored in complete dark chamber at different temperatures (22±2ºC or 5ºC) and 55-65% RH for 15 days. Then for to sub-optimal transport conditions [23].

7. Processing

Ficus benjamina, like other natural plant, is consumed in a variety of methods and for numerous purposes. In addition to its fresh leaves, other common processed kinds of weeping fig encompass entire dry leaves, powdered leaves, and extracted essential oils. Fresh and mature leaves of *F. benjamina* are assembled and washed very well with water and positioned into color for drying (room temperature). Leaves ought to be dried straight away after harvest because they darken if uncovered to open air for prolonged period of time. Dried leaves are powdered homogeneously using an automated grinder. The powder is extracted in methanol the use of Soxhlet apparatus. The extract became concentrated with a rotary evaporator and dried using lyophilizer. Dried extract became amassed in an air tight receptacle and stored at 4°C for similarly use. Dried form of weeping fig can be stored for 12 months when saved blanketed from warmth, mild and moisture [24].

8. Value Addition

Weeping fig parts are utilized as a medicinal plant as is a component of various drugs. A plant has capacity to produce an extensive assortment of synthetic aggravates that are utilized in various noteworthy organic exercises. In addition, it gives a shield against assault from predators, for example, creepy crawlies, herbivorous mammals and parasites. Most of these phytochemicals are showed significant effects on long term health when disbursed by humans and could be used for effective treatment of various human disorders.

9. Uses

Ficus benjamina and other spices contribute significantly for the ornamental purpose that is why it is found in various countries outside its natural range. Sometimes, it is also used for the landscaping in housing estates and urban areas. It is also planted beside roadsides. Furthermore, latex of this plant possesses toxic property. Twigs can be used to control insects in field. Leaf juice can be used as bug and flea repellant. Latex can be applied on the boils as this plant has number of antioxidants. Free radicals are responsible for the several clinical disorders like cancer, diabetes mellitus, degenerative disease, renal failures because they disturbed the natural defense mechanisms. However, natural antioxidant present in the body provides defense against these diseases. It was found that plant extracts strengthen the antioxidant defense system of human and are antioxidant of choice as they lower the side effect 7 as well as toxicity over the synthetic ones. *Ficus benjamina*

has a number of medicinal importance as it is used in medicine for malaria, influenza, dysentery, airways inflammation (bronchitis), acute enteritis, whooping cough (pertussis) and hot seizures in children [25].

9.1. General Therapeutic Uses

Ficus benjamina has various uses ranging from culinary to religious; its uses are often high in ritual. There are a number of curious beliefs associated with the historical uses of weeping fig. Presence of various types of alkaloids in *Ficus* species is responsible for the potent biological activities like, antioxidant, anticancer, antimicrobial and anti-muscarinic activity [26].

*9.2. Pharmacological Use*s

F. benjamina has showed potent anti-oxidant activities. Methanolic extracts of *F. benjamina* was observed for the anti-oxidant pastime via 2, 2-diphenyl-1-picrylhydrazyl (DPPH) and discovered that extract exhibit precise antioxidant assets. In addition to antioxidant activity, extract is al so evaluated for cytotoxic activity brine shrimp lethality assay. Estimation of general phenolic content became accomplished by means of Folin-Ciocalteu reagent technique and estimation of total flavonoid content material was completed by way of aluminum chloride technique. During initial phytochemical evaluation, *F. benjamina* confirmed the presence of carbohydrates, phenolic compounds, oil and fat, saponins, flavonoids, alkaloids, proteins and tannins as principal phytochemical compounds. Phytochemical screening of methanolic extract of *F. benjamina* confirmed the presence of excessive levels of phenolic constituents (4.006 mg gallic acid equivalence/gm) and flavonoids constituents (16.005 mg quercetin acid equivalence/gm) compounds which will be responsible for its antioxidant capability. The obtained results emphasize the antioxidant activity of *F. benjamina* and furnished the medical basis for the traditional use in prevention and therapies of diseases. Study on Ficus spp. by various researchers shows the presence of numerous compounds including alkaloids, triterpenes, ascorbic acid, and flavonoids [27].

9.2.1. Antibacterial Activity

Essentials oils obtained from various plants generally showed good antimicrobial activity [28-29]. Antibacterial effect of plant extract was observed on various bacterial species *Escherichia coli*, *Staphylococcus aureus*, *Klebesiella pneumonia*, *Pseudomonas aeruginosa* and *Salmonella typhi.* From the results it was concluded that plant extract exhibit good antibacterial activity [30]. The concentrates and divisions of stem, root and leaves displayed vast antimicrobial action against four bacterial and two parasitic lines. The scope of antimicrobial actions communicated as measurements of restraint region for stem become 105 mm (*n*-hexane) and it is 22.83 mm (*n*-butanol). All the butanol elements displayed stable movement. Methanol concentrate showed movement against 22.63 mm against *P. aeruginosa* and *n*-butanolic part show motion in opposition to 22.83 in opposition to *B. subtilis* of stem indicated generous motion. The *n*-hexane, chloroform and ethyl acetic acid derivation grew mild estimation of DIZ, with most intense well worth revealed by way of ethyl acetic acid derivation (16.88 mm). The stem concentrate and elements exposed the accompanying request of antimicrobial potential against *B. cereus*, methanolic > *n*-butanolic > ethyl acetate > chloroform > *n*-hexane.

9.2.2. Antioxidant Activity

Antioxidant effect of different alcohol extracts of *F. bienjamina* were observed by various researchers. It was found that the methanol extract and *n*-butanol fraction showed greater percentage inhibition of linoleic acid system as compare to other fractions. The percentage inhibition in linoleic acid method for stem was inside the range of 16.94 - 78.16%, in root 20.57-85.87% and in leaves 26.82-69, 81%. The maximum percentage inhibition was observed 85.87 by methanolic extract and 81.48 by butanol fraction of root. The outcomes of those experiments discovered that antioxidant capability of plant elevated linearly with the increase in awareness. The methanol extract in addition to fractions of root exhibited a linear upward rise in absorbance value for various concentrations 0.56 nm: 2.5 (mg/ml), 0.87 nm: 5 (mg/ml), 1.03 nm: 7.5 (mg/ml) and 1.49 nm: 10 (mg/ml). The presence of phenolic compounds might be the reason for decreasing electricity. Literature review showed that that the reducing strength of bioactive compounds is associated with antioxidant activity. The effects of this assay indicated that the plant is a good source of antioxidants with high reducing power [31]**.**

9.2.3. Hemolytic Activity

Ficus bienjamina demonstrates the hemolytic action. The greatest hemolytic movement is appeared by chloroform parts of stem which is 3.36% and leaves indicate 3.29%. The mechanical dependability of the erythrocytic layer is a decent pointer of cytotoxity. The rate lysis of human erythrocytes was underneath 5.0% for all examples, so it very well may be normal that the concentrate and parts have a no cytotoxity .Nine compound constituents have been distinguished from basic oil of stem and foundation of *F. benjamina* gotten by hydrodistilation. Stem basic oil contained four mixes, for example, 2-pentanone, hexadecanoic corrosive, Palmitic corrosive, octadecadienoic corrosive and these compound show homolytic movement. Roots contained eight mixes, for example, methanamine, cyclopentanone, methyl-2 phenylindole, cyclopropaneoctanal, arsenous corrosive, hexadecanoic corrosive, Palmitic corrosive and octadecadienoic corrosive. Interestingly, these compounds showed homolytic movement [32].

9.2.4. Antifungal Activity

Aspergillus niger (ATCC 10595) and *Candida albicans (*ATCC 32612*) Pseudomonas aeruginosa*,

Escherichia coli (ATCC 25922), *Bacillus subtilis* (JS 2004) and *Bacillus cerus* isolated locally and were used to test the antifungal as well as antibacterial activity of the respective plant [33].

9.2.5. Insect Repellent Activity

Twigs are used as insect repellant by keeping them under the beds. Its leaves have some active compounds that repel the insect. It is also used to repel the insect from kitchen and other places.

9.2.6. Pollution Removal Activity

Ficus benjamina tree leaves are used as a captor of substantial metal particles from environmental cleans in urban regions. Leaf tests are taken to evacuate the contamination. Attractive vulnerability is led to decide the attractive improvement utilizing tests from green, moderately unpolluted zone, as a source of perspective. The samples collected from the areas which have heavy traffic were observed to yield values nearly ten times higher than that of the values obtained from the unpolluted reference. Heavy metals are removed by using *F. benjamina* from the environment.

9.2.7. Anthelmintic Activity

It showed anthelmintic association against grown-up Indian night crawler *Pheretima posthumous*. Its results showed the dose dependent reduction in both paralysis as well as in death time. The methanolic extract of this plant was found to be most effective at 100 mg/kg. The methanol concentrate is best at 100 mg/kg. Furthermore, it is equivalent to standard Piperazine citrate [33].

10. Summary

The genus Ficus is an individual from the Moraceae family growing in tropical and subtropical districts and incorporates of greater than 800 species *F. benjamina* L., a medium size tree with a few spreading branches from the base usually called sobbing fig, neighborhood of tropics South Africa, Australia, tropical focal Africa and West Africa. Well known for its restorative ability, indigenous networks make use of this plant to deal with skin ailments, infection, intestinal illness, retching and likely to be applied as antimicrobial, antipyretic and ant nociceptive. The leaves, barks and natural merchandise contain one-of-a-kind bioactive ingredients like cinnamic acids, lactose, naringenin, quercetin, caffeic acid and stigma sterol.

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