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REVIEW

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Phytochemical Diversity and Medicinal Properties of *Ficus* Species: A Review

Dhruv Barot [1] & Chintankumar Barot [2]*

[1] *Research scholar, Sheth M N Science college, Patan. PATAN-384265 (NORTH GUJARAT INDIA)*

[2] *Assistant professor, Sheth M N Science college, Patan. PATAN-384265 (NORTH GUJARAT INDIA)*

*E-Mail: *barotdhruv32@gmail.com*

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Genus *Ficus*, which is a member of the Moraceae family, includes more than a thousand species of vines, shrubs, and woody trees. *Ficus* species, generally known as fig trees or figs, are endemic to the tropics and a few species expand into the semi-warm temperate zones. *Ficus* species have traditional applications such as expectorants, mild laxatives, anthelmintic, hypoglycemic, and antihypertensive agents, as well as therapy for rheumatic illness, constipation, dysentery, and dyspepsia. *Ficus* species have several biological actions, including anti-hypertensive, hypoglycemic, neuroprotective, antioxidant, analgesic, antibacterial, and anti-inflammatory and some species show antidibetic properties.Several species, including *F.religiosa, F. bengalensis, F.hispida, F. racemosa, F. curtipes, F. rumphi, and F. elastica*, have strong economic potential and having potential medicinal uses. This present review aims to offer a comprehensive overview of the plant's phytochemical components and various medicinal properties.

Key words: Compound, Ficus, Medicinal, Moraceae, Phytochemical

Medicinal plants have been employed for medicinal purposes in many civilizations throughout history. Natural products with therapeutic qualities have been linked to the widespread use of herbal remedies and healthcare preparations, such as those found in old books like the Bible and the Vedas and made from commonly used traditional herbs and medicinal plants (Hoareau & DaSilva, 1999). It has also been generally noted that the majority of developing nations utilise traditional medicine and medicinal plants as a normative foundation for maintaining good health (UNESCO, 1996).

Based on all the information that is currently accessible, about 115 taxa (89 species and 26 infraspecific taxa) of *Ficus* have been recorded in india (Chaudhary *et al.,* 2012) and Gujarat state 14 *Ficus* special recorded (Shah, 1978).

Ficus trees have high therapeutic value. For Hindus and Buddhists, it is a sacred tree. The "Nalpamaram" group includes four trees: *F. racemosa, F. microcarpa, F. benghalensis, and F. religiosa* (Athi, Ithi, Peral, and Arayal). *Ficus* show several medicinal properties.

Ficus is a tropical, deciduous, evergreen tree genus with over 800 species. This plant's bark, roots, leaves, fruit, and latex are used to cure a variety of ailments. Ficus bears a distinctive fruit that resembles an inverted flower. Ficus species include polyphenolic chemicals and flavonoids, which have high antioxidant capabilities and aid in the prevention and treatment of oxidative stress-related disorders, including neurological and hepatic diseases (Sirisha *et al.,* 2010).

The interest in natural remedies and traditional medicine has led to research on plants traditionally used to treat diabetes (Perez *et al.,* 2003). Traditional medicine, derived from plants, accounts for around 25% of current medications (Serraclara *et al.,* 1998). Almost 800 plants may have the ability to prevent diabetes, according to surveys on world ethnobotanical information (Alarcon-Aguilara *et al.,* 1998). Ficus plants (*Moraceae* family) have been traditionally employed in several ethnomedical cures (Ahmed and Urooj, 2009). The current review focuses on experimental research that uses various Ficus species parts, including bark, aerial roots, leaves, fruits, and roots, together with their bioactive components.

Phytochemical diversity of Ficus species

In the pharmacological and medical fields, phytochemicals—the bioactive components of plants—have a significant impact. Genus *Ficus* having very diverse phytochemicals like Phenolics, polyphenols, flavonoids, tannins, anthocyanins, coumarins, volatile components, glycosides, saponins, carotenoids, alkaloids, triterpenoids, and vitamins are among the phytochemicals found in the genus *Ficus*.

Biological activities of ficus species

Ficus species have been reported to exhibit a variety of biological activities based on their antioxidant profile and phytochemical content. The investigated Ficus plant species were found to exhibit anti-inflammatory, antibacterial, anti-ulcerogenic, mucoprotective, gastroprotective, antifungal, antiviral, antimalarial, and anti-parasitic properties as well as anticancer, hepatoprotective, hypo-glycemic, antitumor, antioxidant, anthelmintic, analgesic, and antimicrobial activity (Abdel-Hameed *et al.,* 2014; Konyalıoğlu *et al*., 2005). Ficus species have varying levels of antibacterial activity.

Medicinal Uses

Traditional medical practices have employed *Ficus* species as astringents, carminatives, stomachics, vermicides, hypotensives, anthelmintics, and anti-dysentery medications (Trivedi *et al.,* 1996). Several *Ficus* species, including *Ficus racemosa*, *Ficus glomerata*, *Ficus glumosa*, *Ficus carica*, *Ficus religiosa*, and *Ficus benghalensis*, have long been used as herbal remedies for diabetic disorders. These species are known to regulate enzymatic activities, the rate at which carbohydrates are absorbed, insulin sensitivity, insulin secretion, hepatic glycogen synthesis, peripheral glucose uptake, and the body's antioxidant status (Deepa *et al.,* 2018). By enhancing weight gain in male diabetic rats, these species' extracts also lessen oxidative stress (You *et al.,* 2006). It has been discovered that *F. benghalensis* aqueous bark extract is

effective in reducing the cholesterol levels of hypercholesterolemic rats (Aswar *et al.,* 2008; Shukla *et al.,* 2004). Because the roots of *F. hispida* have a higher quantity of flavonoids, methanolic extracts of the roots show anti ulcerogenic action. Because it contains antioxidants, the methanolic leaf extract of *F. arnottiana* has both mucoprotective and gastric antisecretory properties (Ao *et al.,* 2008; Gregory *et al.,* 2009). Traditionally, respiratory and skin ailments have been treated using almost all of the Ficus species that are part of the *Moraceae* family as folk medicine. *Ficus* species roots are useful in the treatment of gum disease and gout due to their anthelmintic properties. It has been discovered that the fruit of several *Ficus* species, including *F. carica*, *F. hispida*, *F. microcarpa*, and *F. sycomorus*, can help with vomiting relief or improved digestion. Bark powder that has been dried out is useful for treating asthma and burns (Joseph & Raj, 2010). *F. benjamina* can treat bacterial or neoplastic conditions, but it cannot treat fungal infections (Mousa *et al.,* 1992; Aswar *et al.,* 2008). The bark of *F. religiosa* exhibits hypoglycemic activity and is used as an antiseptic, astringent, antidote, and treatment for gonorrhea, hemorrhage, paralysis, diarrhea, and bone fractures (Mazumder *et al.,* 2009; Singh & Goel, 2009). Through various processes, it has also been used to treat inflammatory diseases, hemorrhoids, urinary tract infections, and liver abnormalities (Ahmed & Urooj, 2010)

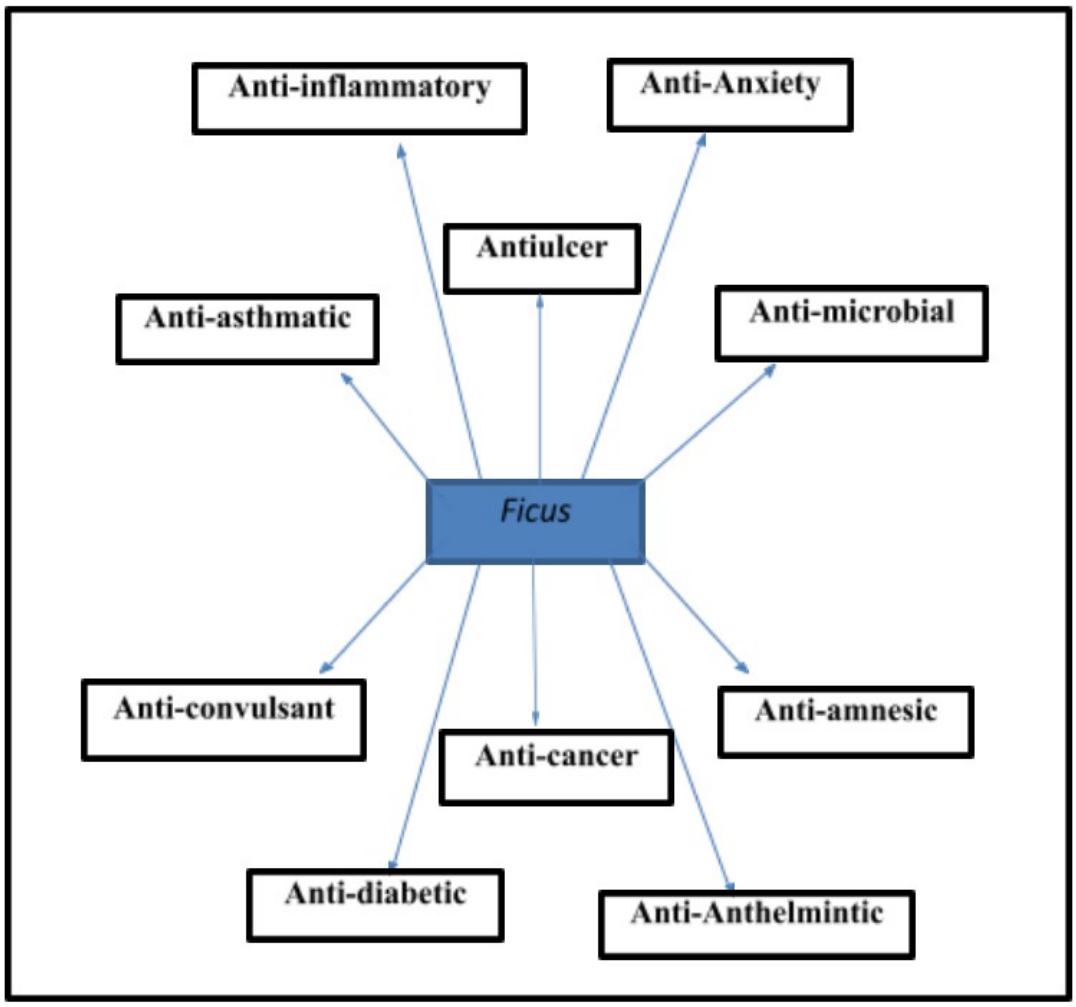

Figure 1. Various medicinal properties of Ficus species

Table 1. Phytochemical diversity of Ficus genus

Ficus Species	**Part**	**Class**	**Phytochemical compound**	**Reference**
Ficus religiosa	Bark	Phytosterols	Bergapten, bergaptol, lanosterol, β-sitosterol-d-glucoside, β-sitosterol, stigmasterol,	Al-Snafi, 2017; Rajiv & Sivaraj, 2012
		Flavonoids	Leucocyanidin-3-O-β-glucopyranosid, leucopelargonidin-3-O-β-d-glucopyranoside, leucopelargonidin-3-O-α-l-rhamnopyranoside, lupeol, cetyl behenate, acetate and α-amyrin acetate	
		Polyphenols	Tannin, wax, saponin, leucoanthocyanidin, leucoanthocyanin	
	Fruit	Flavonoids	Kaempferol, quercetin, and myricetin	Grison-Pige *et al.,*2002; Makhija *et al.,*2010
		Mixed compounds	Undecane, tridecane, tetradecane, (e)-β-ocimene β-bourbonene, β-caryophyllene, germacrene, bicycle-germacrene, γ-cadinene and δ-cadinene, α-trans bergamotene,α-humulene, alloaromadendrene	
	Leaves	Polyphenols	Eugenol, 2-phenylethyl alcohol, and benzyl alcohol, hexenol, n-hexanol, phytol, benzyl alcohol	Poudel *et al.,* 2015; Baliyan *et al.,* 2022
		Mixed compounds	Phenol, salicylaldehyde, phenylacetaldehyde, allyl caproate, linalool, n-nonanal, adipoin, methylcyclopentane, 2-dione, itaconic anhydride, catechol, coumaran, cinnamyl alcohol,α-eudesmol, α-cadinol, pentadecanal, palmitic acid and itaconic anhydride,	
Ficus benghalensis	Arial root	Polyphenols	Saponins, tannins, glucoside and flavonoids	Aswar *et al.,* 2008; Ahmed. *et al.,*2017
		Sterol	β-Sitosterol-α-d-glucose and meso-inositol	
Ficus racemosa	Leaves		triterpenoids,tannins, kaempferol, rutin, arabinose, bergapten, pso-ralenes, flavonoids, ficusin, coumarin, phenolic gly-cosidesand, saponins	Mandal *et al.,* 1999; Baruah & Gohain, 1992; Deraniyagala *et al.,*1998; Din *et al.,* 2002
	Fruit		β-sitosterol, gluanol acetate, hentriacontane, tiglic acid of taraxasterol, lupeol acetate,and α-amyrin acetate,gallic acid, ellagic acid	Nguyen *et al.,* 2001; Chandra *et al.,* 1979; Merchant *et al.,* 1979; Rao *et al.,*2008; Narender *et al.,* 2008
	Bark		gluanol acetate, leucocyanidin-3-O-β-D-glucopyrancoside, leucopelargonidin-3-O-β-D-glucopyranoside, leucopelargonidin-3-O-α-L-rhamnopyranosideceryl behenate, lupeol acetate, α-amyrin acetate.	Devmurari, 2010
Ficus microcarpa	Arial root	Terpenoids	Friedelin, lupeol, oleanolic acid, ursolic acids	Chiang & Kuo, 2002; Kalaskar & Surana, 2012
	Leaves	Flavonoids	Catechin, epicatechin and isovitexin	

Table-2. Medicinal properties of Ficus genus

Ficus species	part	Activity	Reference
Ficus religiosa	Whole	Antioxidant, antidiabetic activity and Antimicrobial activity	Kirana *et al.,* 2009 ; Joseph & Raj, 2010
	Whole	Anthelmintic activity	Iqbal *et al.,* 2001
	Fruit	Antitumor activity	Mousa *et al.,* 1992
	Bark	Anti-parasitic activity	Iqbal *et al.,* 2001
Ficus benghalensis	Bark	Antioxidant and hypolipidemic activity	Geetha *et al.,* 1994
	Fruit	Anticancer and antibacterial activity	Sharma *et al.,* 2007
	Arial Roots	Anti-inflammatory and analgesic activity	Patil *et al.,* 2009
	Whole	Anti-inflammatory and analgesic activity	Patil *et al.,* 2009
Ficus racemosa	Whole	Anticancer properties	Khan & Sultana, 2005 ; Joseph, B. *et al.,*2010
	Bark	Hepatoprotective activity	Joseph & Raj, 2010

CONCLUSION

Ficus species to manage many diseases. Additional research is required to determine the drug's precise mechanism, toxicological consequences and pharmacological activity. Since they are a great substitute for pharmaceuticals, particularly in developing nations. In this sense, species belonging to the genus *Ficus* (*Moraceae*) have the potential to treat diabetes, cancer and skin disease naturally and can be employed as an additive source in the biopharmaceutical and nutraceutical industries.

CONFLICTS OF INTEREST

The authors declare that they have no potential conflicts of interest.

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