



## **A COMPARATIVE EVALUATION OF *FICUS RELIGIOSA* WITH *FICUS SPECIES* FOR ITS ANTI-INFLAMMATORY ACTIVITY: A REVIEW**

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### **ABSTRACT**

Herbal medicine is one of the oldest forms in medical treatment. Through various studies it was known that medicinal herbs are used for treating inflammatory disorders in traditional medicine. Inflammation is the body's process of opposing against the foreign particles that harm it, such as infections, injuries etc. The work aims to compare the anti-inflammatory action of extracts of various *Ficus species* using Carrageenan induced hind paw oedema method and cotton pellet granuloma method. Literature surveys have been done to check the extent of anti-inflammatory activity on extracts of various plant parts like roots, leaves, barks, fruits etc. of *Ficus species* with oral administration of different doses. As a result, the leaf extract of plant *Ficus religiosa* have found to be greater effect compared to other *Ficus species*. Thus, the review may conclude that the anti-inflammatory effect of *Ficus religiosa* extract is more potent than other *Ficus species*

### **INTRODUCTION**

Inflammation plays an active role in the body's immune system to injury and infection by healing and repairing damaged tissue and also provide protective response against foreign bodies [1]. The main symptoms of inflammation include redness, swelling, pain and loss of function due to infection, irritation and injury [2].

Inflammation can be of two types- acute and chronic. Acute inflammation usually occurs in a short period of time and often relieves within hours. But chronic, is a prolonged inflammation

that leads to long term medication [3]. In maintaining and improving the health of people, medicinal herbs play an essential task. In the present age herbal medicines are accepted world widely due to its fewer side effects [4]. Rheumatoid arthritis, one of the chronic inflammatory disorders are still a major health issue faced in the world population. Since continuous treatment with NSAIDs cause several adverse reactions, it is necessary to develop new anti-inflammatory agents with less side effects [5]. Therefore, traditional treatment involving plant parts can be used in the inflammatory disorders [6].

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*Ficus* L. (fig), one of the important species in the Moraceae family plays a vital role in the ecosystem as they are considered as a key element in tropical rainforest. About 800 *Ficus species* are primarily distributed in subtropical and tropical regions in the world, which is one of the largest genera of angiosperm [7]. In that about 500 species are found in Asian-Australian regions that make about 66% of the total world species and these are very common in different geographic areas that reach up to 2000m altitude in lowland. It is known as the most diversified genera based on the presence of deciduous and evergreen trees, shrubs, herbs, climbers and creepers [8].

#### **Taxonomy**

Domain	: Eukaryota
Kingdom	: Plantae
Sub kingdom	: Tracheobionta
Phylum	: Tracheophyta
Subphylum	: Euphyllophytes
Super division	: Spermatophyta
Division	: Magnoliophyta
Class	: Magnoliopsida
Subclass	: Hamamelididae
Superorder	: Urticales
Order	: Urticales
Family	: Moraceae
Genus	: <i>Ficus</i> L.

*F. racemosa*, *F. religiosa*, *F. benghalensis*, *F. carica* etc. are some of the well-recognized species in the Moraceae family. The studies recommended the use of *Ficus species* in the treatment of diseases like diabetes, inflammation, cancer, cardiovascular disorder etc. [9]. Among these species, *Ficus religiosa* commonly known as bodhi tree or sacred fig has shown the effective response in traditional ailments since most of the parts of this plant are used for different diseases in the traditional system of medicine [10]. From various reports it was studied that different parts like leaf, bark, root fruit and latex possess significant activity against inflammation [11].

#### **Phytochemical constituents**

Various phytochemicals including phenolics, polyphenols, flavonoids, tannins, anthocyanins, volatile components, glycosides, saponins, alkaloids, triterpenoids and vitamins are present in *Ficus species*, in that phenolics and flavonoids are found to be the major components in different parts of plant. It

was reported that fruits and leaves of *Ficus species* exhibit relatively higher concentration of phenolic compounds. Hence, these have comparatively greater effect as the presence of polyphenols and flavonoids form the cornerstone for supporting the anti-inflammatory activity [12].

Through literature survey the presence of coumarins, flavonoids, sterols, triterpenoids etc. are found as major constituents in *Ficus carica* [13] and ketones, flavonoids, sterols, triterpenes, terpenoids etc. in *Ficus bengalensis* [14]. Likewise, *Ficus religiosa* shows greater therapeutic potential since the majority of their activity is due to the presence of tannin, saponins, triterpenoids, polyphenols etc. [15]. The abundance of phenolics in *Ficus pandurata* and phytosterol in the leaf extract of *Ficus hispida* are clearly shown in studies. Likewise, *Ficus religiosa* extract also exhibits the presence of tannins and phenols in greater amounts [16].

#### **Anti-inflammatory activity of *Ficus species***

In this review article, we are trying to compare the anti-inflammatory activity of different extracts of *Ficus species*, with the help of recently published research works. Evaluation of different extracts of stem bark, root, fruits and leaves by oral administration at different doses showed significant effect in inflammation when compared to standard drugs. The acute anti-inflammatory activity of extracts of *Ficus species* such as *F. religiosa*, *F. benghalensis*, *F. carica*, *F. racemosa*, *F. hispida* etc. were screened by carrageenan induced paw oedema in Wistar albino rats by administering doses at 20-600 mg/kg of the body weight to healthy animals. Literatures found that leaf extract of *F. carica* (300 mg/kg) and *F. benghalensis* (600mg/kg) when given orally by suspension exhibit a reduced paw volume by 38.7% and 28.93% respectively and administration of bark extract showed 31.6% and 22.4% respectively. In the same way, bark and leaf extracts of *F. religiosa* at a dose 40 mg/kg showed reduction in inflammation by 43.13% and 48.21% respectively, compared to standard drugs indomethacin (75.69%) at 10 mg/kg and diclofenac (94.73%) at 100 mg/kg [17][18][19][20].

The chronic inflammatory activity was evaluated by cotton pellet granuloma model by administration of extracts at doses 20-600 mg/kg of the body weight to healthy animals intraperitoneally showed anti-inflammatory activity with dose-response effect. Administration of leaf extract of *F. carica* (300

mg/kg) and *F. benghalensis* (600mg/kg) orally showed reduction in the cotton pellet weight by 43.90% and 65.54% respectively and stem and bark extract was found to be 35.5% and 55.03% respectively. But in case of *F. religiosa* when the bark and leaf extracts were administered at 40 mg/kg found a drastic reduction in granuloma weight by 52.31% and 66.46% respectively, compared to standard drugs indomethacin (75.64%) at 10 mg/kg and diclofenac (95.16%) at 100 mg/kg.. Therefore, *F. religiosa* extracts showed better anti-inflammatory effect when clearly monitored and indicates the efficacy of *F. religiosa* extract as therapeutic agents in acute as well as chronic inflammatory conditions [21][22][23][24].

Flavonoids, tannins and polyphenols, saponins, terpenoids, carbohydrates and steroids are the various components found in *F. species* in preliminary phytochemical investigation. Abundance of phenolics and phytosterol in *Ficus pandurata* and *Ficus hispida* leaf extract and tannins in *Ficus religiosa* were demonstrated in previous reports. Studies revealed that tannic acid was the potent inhibitor of NO synthetase activity. Therefore, the anti-inflammatory activity of *Ficus religiosa* may be related to the high tannin content [25][26][27][28].

However, no comparison had been held among *Ficus religiosa* and other *Ficus species* for their anti-inflammatory activity. This review aimed to provide a pharmacological basis for its use in inflammation and to compare its anti-inflammatory activity with other *Ficus species* such as *F. racemose*, *F. carica*, *F. bengalensis* etc. which are already found to have anti-inflammatory activity. Based on this, an attempt has been made to compare the inflammatory potency of *F. religiosa* among other *Ficus species*.

### CONCLUSION

As the herbal medicines are most illuminated due to their wider acceptability and lesser side effects comparable to synthetic drugs. From various reports it was found that if the dosage is increased the anti-inflammatory activity of the plant extract may increase as well. Hence, it can be concluded that while *Ficus religiosa* extracts are given at low dosage, it shows greater response as compared to other *Ficus species*. Along with that it was reported that the anti-inflammatory activity of the plant may be due to abundance of tannins present in it and in *Ficus religiosa* it was observed that tannins are the dominating constituent present in the leaf extract. Therefore, the review

confirmed that *Ficus religiosa* extract has greater activity than other *Ficus species* extracts.

### FINANCIAL ASSISTANCE

Nil

### CONFLICT OF INTEREST

The authors declare no conflict of interest

### REFERENCES

- [1] Linlin C, Huidan D, Zhao L. Inflammatory response and inflammation-associated in diseases in organs. *Journal Pharmaceutical Science and Research*, **9(6)**, 7204 -7218, (2018).
- [2] Brenner PS, Krakaueret T. Regulation of Inflammation: A review of recent advances in Anti Inflammatory strategies. *Current Medicinal Chemistry*, **2(3)**, 274-283, (2003).
- [3] Ahmmed A. An overview of inflammation: mechanism and consequences. *Front Biol.*, **6(4)**, 274-281, (2011).
- [4] Modi RK, Kawadkar M, Sheikh S, Kastwar R, Tiwari G. A review on: Comparative studies on ethanolic extract of root and stem bark of *Ficus carica* for analgesic and anti-inflammatory activities. *International Journal of Pharmacy and Life Science*, **3(8)**, 1930-1934, (2012).
- [5] Sreelakshmi R, Latha PG, Arafat MM, Shyamal S, Shine VJ, Anuja GI, Suja SR, Rajasekharan S. Anti-inflammatory, Analgesic and Anti-lipid peroxidation Studies on stem bark of *Ficus religiosa* Linn. *Natural Product Radiance*, **6(5)**, 377-381, (2007).
- [6] Choudhury PK, Dinda S, Dash S. Anti-inflammatory activity of methanolic extract of bark of *Ficus racemosa* L and root of *C. Parreira* VAR. *hirsute* Forman. *International Journal of Research in Pharmacy and Chemistry*, **2(4)**, 1128-1133, (2012).
- [7] Hamed MA. Beneficial effect of *Ficus religiosa* on high fat-induced hypercholesterolemia in rats. *Food Chem*, **129**, 162-170, (2011).
- [8] Verkerke W. Structure and function of fig. *Experientia*, **45**, 612-622, (1989).
- [9] Gordon MC, David JN. Natural product drug discovered in the next millennium. *Pharmaceutical biology*, **39**, 8-17, (2001).
- [10] Babu K, Shankar SG, Rai S. Comparative pharmacognostic studies on the barks of four *Ficus* species. *Turk. J. Bot.*, **34**, 215-224, (2010).

- [11] Swami KD, Bisht NP. Constituents of *Ficus religiosa* and *Ficus infectoria* and their biological activity. *J Indian Chem Soc.*, **73**, 631, (1996).
- [12] Somashekhar M, Naira N, Mahesh AR. Botanical studies of four *Ficus* species of family Moraceae. *International Journal of Universal Pharmacy and Bio Sciences*, **2(6)**, 558-570, (2013).
- [13] Morton F, Morton J. Fruits of warm climates. *Fig. Miami, FL.*, 47-50, (1987).
- [14] Subramanian PM, Misra GS. Chemical constituents of *Ficus bengalensis*. *Indian Journal of Chemistry*, **15**, 762, (1997).
- [15] Makhija IK, Sharma IP, Khamar D. Phytochemistry and Pharmacological properties of *Ficus religiosa*: an overview. *Ann Bio Res.*, **1(4)**, 171-180, (2010).
- [16] Sandeep, Kumar A, Dimple, Tomer V, Gat Y, Kumar V. *Ficus religiosa*: A wholesome medicinal tree. *Journal of Pharmacognosy and Phytochemistry*, **7(4)**, 32-37, (2018).
- [17] Patil Vikas, Patil Vijay. A comparative evaluation of Anti-inflammatory activity of the bark of *Ficus bengalensis* in plants of different ages. *Journal of basic and clinical Pharmacy*, **20(4)**, 261-268, (2010).
- [18] Dharmadeva S, Galgamuwa LS, Kumarasinghe N. In vitro anti-inflammatory activity of *Ficus racemosa* Linn. Bark using albumin denaturation method. *AYU*; **39(4)**, 239-242, (2018).
- [19] Gulecha V, Sivakumar T, Mahajan M, Upaganlawar AB, Upasani CD. Screening of *Ficus religiosa* leaves fractions for analgesic and anti-inflammatory activities. *Indian Journal of Pharmacology*, **43(6)**, 662-666, (2011).
- [20] Patil VV, Pimprikar RB and Patil VR. Pharmacognostical studies and evaluation of Anti-inflammatory activity of *Ficus bengalensis* Linn. *Journal of Young Pharmacist*, **1(1)**, 49-53, (2009).
- [21] Harer S, Harer P. Evaluation of Analgesic and Anti-inflammatory activity of *Ficus racemosa* Linn. Stem bark extraction in Rats and Mice. *PHCOJ*, **2(6)**, 65-70, (2010).
- [22] Mahajan M, Gulecha VS, Khandare RA, Upaganlawar AB, Gangurde HH, Upasani CD. Anti-edematogenic and analgesic activities of *Ficus benghalensis*. *International Journal of Nutrition, Pharmacology and Neurological diseases*, **2(2)**, 100-104, (2012).
- [23] Murugesan P, Rajaram K, Victor AS, Pandian MR, Manoharan S., Evaluation of Anti-inflammatory effects of *Ficus religiosa* Linn. in Carrageenan induced acute inflammation. *Elixir Food Science*, **51A**, 11124-11128, (2012).
- [24] Anasane P, Chaturvedi A. Evaluation of Anti-inflammatory effects of *Ficus hispida* L. leaves extract against Carrageenan induced Paw Oedema in Rats. *Journal of Pharmaceutical Science and Research*, **9(4)**, 364-367, (2017).
- [25] Hafeez A, Jain U, Sajwan P, Srivastava S, Thakir A. Evaluation of carrageenan induced antiinflammatory activity of ethanolic extract of bark of *Ficus virens*. *The Journal of Phytopharmacology*, **2(3)**, 39-43, (2013).
- [26] Manocha N, Chandra SK, Sharma V. Anti-Rheumatic and Antioxidant activity of extract of stem bark of *Ficus bengalensis*. *Research Journal of Chemical Sciences*, **1**, 2-8, (2011).
- [27] Norfarah IR, Adlina M, Nadia ME. A systematic review on the anti-oxidative and Anti-inflammatory properties of *Ficus carica*. *ASM Sci J.*, **11(2)**, 124-127, (2018).
- [28] Srivastava RC, Hussain MM, Hassan SK, Athar M. Green tea polyphenols and tannic acid act as potent inhibitors of phorbol esters-induced nitric oxide generation in rat hepatocyte independent of their antioxidant property. *Cancer Lett*, **153**, 1-5, (2000).