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Review Article

Therapeutic significance of anti-inflammatory phytochemicals in plant species of the family Fabaceae

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Abstract: Fabaceae, one of the largest families of flowering plants, is widely recognized for its nutritional, agricultural and medicinal importance. Besides serving as a major source of protein-rich food crops, members of this family possess diverse phytoconstituents with significant pharmacological properties. Present study highlights the anti-inflammatory potential of selected plant species of the family and summarizes the reported bioactive compounds responsible for these activities. Various classes of phytochemicals including flavonoids, alkaloids, terpenoids, polyphenols, tannins and saponins have been identified from different species such as *Abrus precatorius*, *Butea monosperma*, *Glycyrrhiza glabra*, *Pongamia pinnata* and *Tamarindus indica*. These compounds exhibit anti-inflammatory activity through inhibition of inflammatory mediators and cytokines such as TNF-α, IL-1β, IL-6, COX-2 and iNOS, along with modulation of oxidative stress and immune responses. The reviewed studies indicate towards the considerable therapeutic potential of Fabaceae against inflammation-associated disorder by representing this family as an important reservoir of bioactive compounds with promising applications in drug discovery and biomedical research.

Keywords: Anti-inflammatory action, bioactive compounds, Fabaceae, legumes

Introduction

Fabaceae, commonly referred to as the legume family ranks as the third largest family of angiosperms with nearly 20,000 species distributed across 805 accepted genera (POWO, 2026).

Members of this family are well known for their nitrogen-fixing ability, where root nodules formed in association with nitrogen-fixing bacteria help enrich soil fertility, making them agriculturally significant (Meena et al., 2025). The family includes several economically important food crops such as beans, lentils, peas and soybeans, which serve as rich sources of dietary protein and have become an integral part of human nutrition worldwide. Apart from their nutritional value, many Fabaceae members are economically used as fodder, timber, dye-yielding plants, resins, medicinal plants and ornamentals (Saensouk et al., 2025). In India, nearly 1297 species under 179 genera have been reported, among which around 23% are endemic and of ecological importance (Meena et al., 2025). Beyond their agricultural and economic relevance, species belonging to Fabaceae are also recognized as rich sources of diverse bioactive phytoconstituents. Various classes of compounds such as flavonoids, terpenoids, polyphenols, alkaloids and steroids have been reported from this family, possessing integrative pharmacological properties (Prajapati et al., 2025). Although legumes are known for supporting muscle growth due to their high protein content, their phytochemicals also play a crucial role in regulating several metabolic and molecular pathways in the human body. Among these, their anti-inflammatory potential is one cornerstone. Inflammation is a natural defense response of the body that may arise due to microbial invasion, physical injury, unhealthy dietary practices, smoking, excessive alcohol consumption, environmental pollutants, chronic stress, sleep disorders and auto-immune conditions such as rheumatoid arthritis (Chen et al., 2017). While acute inflammation is usually short-term and resolves naturally, chronic inflammation can persist for prolonged periods and may eventually lead to severe disorders including cardiovascular and neurodegenerative diseases (Chavda et al., 2024). In this regard, bioactive compounds of Fabaceae species have potential in modulating inflammatory pathways and reducing inflammation-associated damage (Jadhavar and Deshpande, 2022). Therefore, the Fabaceae family serves as an important reservoir of anti-inflammatory phytoconstituents with significant applications in human health and biomedical research.

Methodology

The present study is based on an extensive survey of published literature related to the family Fabaceae. Authors consulted scientific databases, including Google Scholar, Scopus, PubMed and Web of Science, to retrieve peer-reviewed research articles, review papers, ethnobotanical surveys and pharmacological studies. A variety of keywords such as “Fabaceae”, “anti-inflammatory properties”, “bioactives”, “inflammation”, “legumes”, “inflammation inhibitors” and “ethnopharmacology” were used to identify relevant publications. Additionally, the regional floral books and reports that document traditional knowledge and distribution patterns were examined. Only studies containing verifiable scientific or ethnomedicinal data were included in the analysis. The information gathered was critically analyzed and systematically organized into thematic sections to ensure clarity and coherence (Kumar, 2025; Sahu et al., 2026).

Anti-inflammatory bioactivity

The selected Fabaceae species are presented in Table 1. They demonstrate significant anti-inflamma

-tory potential due to the presence of diverse bioactive phytoconstituents such as flavonoids, alkaloids, terpenoids, saponins, tannins and polyphenols (Sharma et al., 2023). Most of the reported studies revealed their ability to suppress major inflammatory mediators and cytokines, including TNF-α, IL-1β, IL-6, COX-2 and iNOS, along with reduction of oxidative stress and edema in experimental models (Hafez et al., 2024). Species such as *Glycyrrhiza glabra*, *Pongamia pinnata*, *Butea monosperma* and *Vachellia nilotica* particularly have strong anti-inflammatory responses through modulation of key molecular pathways.

Plate 1: Some common plant species of the family Fabaceae; (a) *Pongamia pinnata*, (b) *Mimosa himalayana*, (c) *Butea monosperma*, (d) *Crotalaria pallida*, (e) *Cleome viscosa* and (f) *Saraca asoca*

Table 1: Anti-inflammatory activity of selected plant species of the family Fabaceae

Species	Common name	Reported Anti-Inflammatory Bioactives	Anti-inflammatory activity	Source(s)
Abrus precatorius L.	Rosary pea	Cirsimaritin & Abrectorin (flavonoids), Abrine (alkaloid), Abrusosides (A-D) (Triterpene glycosides), Stigmasterol, Delphinidin, etc.	Inhibition of inflammatory mediators like COX-2, TNF-α and iNOS; modulation of immune response, reduction of oxidative stress.	Kaur et al., (2022); Vijayan and Margesan, (2025)
Albizia lebbeck (L.) Benth.	Indian siris	Albiziahexoside (saponins), tannins, flavonoids (e.g., D-catechin) and terpenoids likebetulinic acid and echinocystic acid glycoside	Reduction of eosinophils, neutrophils and pro-inflammatory cytokines like TNF-α, IL-6 and L-4; elevation of anti-inflammatory markers like IFN-*γ*.	Chaudhary et al., (2018); Balkrishna et al., (2022)
Butea monosperma (Lam.) Kuntze (Plate 1c)	Flame of the forest	Butein, butrin, isobutrin,chalcones, triterpenes, tannins and flavonoids	Inhibition of inflammatory mediators (IL-8, IL-1β and IL-6); methanolic extract showed activity against carragenin (paw edema & cotton pellet granuloma in albino rats).	Hiremath et al., (2024)
Caesalpinia pulcherrima (L.) Sw.	Pride of Barbados	Flavonoids (isobonducellin, bonducellin, 5,7-dimethoxyflavanone) and cassane-type diterpenoids	Methanolic pod extracts are viable against carrageenan-induced paw edema reduction.	Kumbhare and Sivakumar, (2011)

Cajanus cajan (L.) Huth	Pigeon pea	Flavonoids and stilbenes (apigenin, isorhamnetin, biochanin A, luteolin, quercetin cajaninstilbene acid, genistein, pinostrobin), Pinostrobin chalcone (Terepene), etc.	Cytokine suppression, like TNF-α and IL-1β; Stilbenes containing extract-fraction reduced the atherogenic properties of dietary cholesterol in mice.	Orni et al., (2018); Gajurel et al., (2025)
Cleome viscosa L. (Plate 1e)	Wild mustard	Quercetin, kaempferol and flavonoid glycosides	Effective against carrageenan-induced edema and traditionally used for rheumatism treatment.	Senthamilselvi et al., (2012)
Crotalaria pallida Aiton (Plate 1d)	Smooth rattlebox	Pterocarpanoids (crotafurans), luteolin, vitexin and chrysoeriol-7-rutinoside, alkaloids, novel homo-isoflavonoids	Ethanol extracts of leaves showed pain reduction in acetic acid-induced and formalin-induced paw-licking tests.	Hu et al., (2017)
Delonix regia (Bojer ex Hook.) Raf.	Flame tree	Flavonoids (quercetin, rutin), triterpenoids (lupeol), sterols (β-sitosterol) and phenolic acids	Modulation of cytokine expression, inhibition of paw edema and reduction of oxidative stress.	Lima et al., (2022)
Glycyrrhiza glabra L.	Liquorice	Glycyrrhizin (triterpene saponin) and various flavonoids like liquiritin and isoliquiritigenin	Inhibition of inflammatory markers, suppression of COX activity and reduction of prostaglandins.	Leite et al., (2022)
Mimosa	Himalayan	Alkaloids,	Anti-inflammatory	Hossain et al.,

himalayana Gamble (Plate 1b)	mimosa	glycosides, saponins and gums	activity at 40, 80 and 160 µg/mL in the Swiss mice.	(2017)
Pleurolobus gangeticus (L.) J.St.-Hil. ex H.Ohashi&K.Ohashi	Sal-leaved Desmodium	Pterocarpans (Gangetin, gangetinin anddesmodin); Flavonoids (Kaempferol and Quercetin); Alkaloids (N, N-dimethyltryptamine)	n-hexane root extracts showed potent activity in exudative and proliferative phases of inflammation in rat models.	Bhattacharjee et al., (2013); Sahu et al., (2025)
Pongamia pinnata (L.) Pierre (Plate 1a)	Indian beech tree	Flavonoids, karanjin (furano flavonoids), terpenoids and sterols	Modulation of key inflammatory pathways such as NF- κB, COX-2, iNOS; expression of pro inflammatory cytokines.	Dudhatra et al., (2026)
Saraca asoca (Roxb.) W.J.de Wilde (Plate 1f)	Ashoka tree	Flavonoids, tannins, glycosides and β-sitosterol	Ethanolic extract showed activity against carrageenan-induced hind-paw edema in rats.	Salvi et al., (2022)
Tamarindus indica L.	Tamarind tree	Polyphenols, flavonoids, tannins, saponins, steroids	Inhibition of biological pathways like cyclooxygenase-2 (COX-2) expression, inducible nitric oxide synthase (iNOS) and 5-lipoxygenase biosynthesis.	Komakech et al., (2019)
Vachellia nilotica (L.) P.J.H.Hurter&Mabb.	Indian gum arabic tree	Catechin, epicatechin, quercetin, gallic acid and leucocynidin	Inhibition of TNFα-stimulated 3T3-L1 adipocytes; Reduction in	Khanet al., (2015); Hafez et al., (2024)

		gallate	carrageenan-induced paw edema in rats, 20% vs. 47% aspirin.	

Research gaps

Despite the traditional use and reported anti-inflammatory potential of many Fabaceae species, research remains limited. Most studies are confined to preliminary *in vitro* and *in vivo* investigations, with insufficient information on molecular mechanisms, toxicity, pharmacokinetics and clinical efficacy. In several cases, the active bioactive compounds have not been fully identified or characterized. Additionally, standardization of extracts and dosage optimization are still lacking, while many lesser-known and endemic species remain unexplored.

Conclusion

Fabaceae species possess remarkable anti-inflammatory potential owing to the presence of diverse secondary metabolites such as flavonoids, alkaloids, terpenoids, tannins and polyphenols. The reviewed species demonstrated significant ability to regulate inflammatory mediators, cytokines and oxidative stress pathways associated with acute and chronic inflammation. In addition to their nutritional and agricultural importance, these plants serve as valuable natural reservoirs of therapeutic compounds with promising pharmaceutical applications. However, further studies focusing on isolation of active compounds, molecular mechanisms, toxicity assessment and clinical validation are essential for the development of effective plant-based anti-inflammatory drugs. Considering all the criteria, the Fabaceae family offers immense scope for future research in the field of inflammation biology and natural product-based drug discovery.

References

Balkrishna A, Sakshi, Chauhan M, Dabas A and Arya V. (2022). A Comprehensive insight into the phytochemical, pharmacological potential and traditional medicinal uses of *Albizia lebbeck* (L.) Benth. Evidence-Based Complementary and Alternative Medicine. 2022(1): 5359669. doi: 10.1155/2022/5359669

Bhattacharjee A, Shashidhara SC and Saha S. (2013). Phytochemical and ethno-pharmacological profile of *Desmodium gangeticum* (L.) DC.: a review. International Journal of Biomedical Research. 4(10): 507-515.

Chaudhary S, Gulati K, Rai N and Ray A. (2018). Anti-inflammatory and immunomodulatory effects of *Albizia lebbeck* in experimental model of bronchial asthma. Indian Journal of Chest Diseases & Allied Sciences. 60(3): 147-152.

Chavda VP, Feehan J and Apostolopoulos V. (2024). Inflammation: the cause of all diseases. Cells. 13(22): 1906. doi: 10.3390/cells13221906

Chen L, Deng H, Cui H, Fang J, Zuo Z, Deng J, Li Y, Wang X and Zhao L. (2017). Inflammatory responses and inflammation-associated diseases in organs. Oncotarget. 9(6): 7204-7218.

Dudhatra B, Thummar K, Vadalia J and Bhatt V. (2026). Anti-inflammatory potential of *Pongamia pinnata*: a comprehensive review on molecular mechanisms and therapeutic implications. Anti-inflammatory and Anti-allergy Agents in Medicinal Chemistry. doi: 10.2174/0118715230426226260126161153

Gajurel G, Sharma AR, Abdel-Karim S, Balmaceda C, Zulfiqar F, Pandey P, Ali Z, Shields RC, Alam MA and Medina-Bolivar F. (2025). Enhanced production of anti-inflammatory and antibacterial prenylated isoflavonoids in pigeon pea (*Cajanus cajan*) hairy root cultures. Journal of Agricultural and Food Chemistry. 73(10): 5996-6009.

Hafez LO, Brito-Casillas Y, Abdelmageed N, Alemán-Cabrera IM, Morad SAF, Abdel-Raheem MH and Wägner AM. (2024). The *Acacia* (*Vachellia nilotica* (L.) PJH Hurter & Mabb.): traditional uses and recent advances on its pharmacological attributes and potential activities. Nutrients. 16(24): 4278. doi: 10.3390/nu16244278

Hiremath KY, Veeranagoudar DK and Bojja KS. (2024).*Butea monosperma* as a collective phytomedicine and environmentally sustainable, conservative and beneficial plant. Archives of Razi Institute. 79(3):465-474.

Hossain MI, Bashar MK, Ibrahim M and Islam MT. (2017). Antipyretic, analgesic and anti-inflammatory activity of the methanol *Mimosa himalayana* extract. International Journal of Medicine. 5(1): 87-89.

Hu XR, Chou GX and Zhang CG. (2017). Flavonoids, alkaloids from the seeds of *Crotalaria pallida* and their cytotoxicity and anti-inflammatory activities. Phytochemistry. 143: 64-71.

Jadhavar P and Deshpande S. (2022). Recent updates on medicinal potentiality of Fabaceae family: critical review. International Journal of Pharma and Bio Sciences. 13(3): b32-b42.

Kaur A, Sharma Y, Kumar A, Ghosh MP and Bala K. (2022). *In-vitro* antiproliferative efficacy of *Abrus precatorius* seed extracts on cervical carcinoma. Scientific Reports. 12(1): 10226. doi: 10.1038/s41598-022-13976-7

Khan TA, Anjaria JK, Dedhia V and Gohel AK. (2015). Bioactivity guided fractionation and anti-inflammatory activity of *Acacia nilotica* pods. International Journal of Pharmacy and Pharmaceutical Sciences. 7(7): 380-383.

Komakech R, Kim YG, Matsabisa GM and Kang Y. (2019). Anti-inflammatory and analgesic potential of *Tamarindus indica* Linn. (Fabaceae): a narrative review. Integrative Medicine Research. 8(3): 181-186.

Kumar S. (2025). Data collection from literature for biological sciences, medicinal plants research, ethnobotany and pharmacology: a methodological overview. Journal of Biodiversity and Conservation. 9(2): 167-169.

Kumbhare M and Sivakumar T. (2011). Anti-inflammatory and antinociceptive activity of pods of *Caesalpinia pulcherrima*. Journal of Applied Pharmaceutical Science. 1(7): 180-184.

Leite CDS, Bonafé GA, Santos JC, Martinez CAR, Ortega MM and Ribeiro ML. (2022). The anti-inflammatory properties of licorice (*Glycyrrhiza glabra*)-derived compounds in intestinal disorders. International Journal of Molecular Sciences. 23(8): 4121. doi: 10.3390/ijms23084121

Lima IC, Castro RR, Adjafre BL, Sousa SHAF, de Paula DS, Alves APNN, Silva PGB, Assreuy AMS and Mota MRL. (2022). Galactomannan of *Delonix regia* seeds modulates cytokine expression and oxidative stress eliciting anti-inflammatory and healing effects in mice cutaneous wound. International Journal of Biological Macromolecules. 203: 342-349.

Meena KC, Singh N, Bhandoria MS, Bansal P and Yadav SS. (2025). Floristic diversity of the family Fabaceae (Leguminosae) in community forests of South Haryana, India. Legume Research: An International Journal. 48(10): 1712-1720. doi: 10.18805/LR-5515

Orni PR, Ahmed SZ, Monefa M, Khan T and Dash PR. (2018). Pharmacological and phytochemical properties of *Cajanus cajan* (L.) Huth. (Fabaceae): a review. International Journal of Pharmaceutical Science and Research. 3(2): 27-37.

POWO. (2026). Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew, London, United Kingdom. Published on the Internet; https://powo.science.kew.org/ Retrieved 29 April 2026.

Prajapati J, Maitreya A, Pandya H and Solanki H. (2025). A review on bioactive compounds of Fabaceae family. International Journal of Scientific Research and Technology. 2(8): 266-272.

Saensouk P, Saensouk S, Mattapha S, Chanthavongsa K and Jitpromma T. (2025). Diversity and traditional uses of Fabaceae species in Maha Sarakham province, Thailand. Diversity. 17(12): 838. doi: 10.3390/d17120838

Sahu JK, Sureshrao A, Majhi S, Dimri R, Sharma BP, Tailor V, Kumar S and Patra A. (2026). Methodology for writing review articles in biological sciences: a systematic and scholarly guide. Archives of Current Research International. 26(2): 170-182.

Sahu SS, Mishra R and Joshi RK. (2025). Phytochemical, pharmacological and biotechnological dimensions of the medicinal under-shrub, *Pleurolobus gangeticus* (L.) - current updates and future prospects. Discover Plants. 2(1): 80. doi: 10.1007/s44372-024-00068-1

Salvi S, Varghese R, Digholkar G, Deshpande A, Malvankar C, Pawar A and Kumar D. (2022). *Saraca asoca*: a scoping review on the phytoconstituents, bioactives and their therapeutic effects. German Journal of Pharmaceuticals and Biomaterials. 1(3): 03-13.

Senthamilselvi MM, Kesavan D and Sulochana N. (2012). An anti-inflammatory and anti-microbial flavone glycoside from flowers of *Cleome viscosa*. Organic and Medicinal Chemistry Letters. 2(1): 19. doi: 10.1186/2191-2858-2-19

Sharma BP, Behera B, Mishra S and Kumar S. (2023). Medicinal Fabaceae of India, Volume 1. Ambika Prasad Research Foundation, Odisha, India.

Vijayan S and Margesan T. (2025). The potential of *Abrus precatorius* leaves in arthritis alleviation computational approaches through lC-MS analysis. Future Science OA. 11(1): 2483131. doi: 10.1080/20565623.2025.2483131