

PHARMACOLOGICAL EVALUATION AND THERAPEUTIC IMPORTANCE OF WOODFORDIA FRUTICOSA KURZ

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ABSTRACT

Woodfordia fruticosa Kurz is a medicinal plant widely used in traditional systems of medicine for the treatment of various ailments. The present study aims to evaluate the pharmacological properties and therapeutic importance of *Woodfordia fruticosa* Kurz through a systematic review of experimental and ethnomedicinal evidence. Various parts of the plant, particularly flowers and leaves, have been reported to possess significant bioactive compounds such as flavonoids, tannins, phenolics, and glycosides, which contribute to its medicinal potential. Pharmacological investigations have demonstrated a broad spectrum of biological activities including anti-inflammatory, antioxidant, antimicrobial, antidiabetic, hepatoprotective, and wound-healing effects. Traditional usage of *Woodfordia fruticosa* in Ayurveda and folk medicine supports its effectiveness in treating gastrointestinal disorders, skin diseases, fever, and gynecological conditions. The correlation between traditional claims and modern pharmacological findings highlights the therapeutic relevance of this plant. This study emphasizes the importance of *Woodfordia fruticosa* Kurz as a valuable natural resource and supports its potential for future drug development and clinical research.

Keywords: *Woodfordia fruticosa* Kurz; Pharmacological activities; Medicinal plants; Ethnopharmacology; Bioactive compounds; Traditional medicine.

INTRODUCTION

Medicinal plants have been an essential component of human healthcare systems since prehistoric times and continue to play a crucial role in managing various diseases. According to the World Health Organization, a significant proportion of the global population depends on traditional medicine, particularly in developing countries, due to accessibility, affordability, and generally

lower adverse effects compared with synthetic drugs (Bandirala & Sandeep, 2019). This renewed interest has encouraged systematic pharmacological evaluation of traditionally used medicinal plants to discover safer and more effective therapeutic agents.

Woodfordia fruticosa Kurz, belonging to the family Lythraceae, is a perennial medicinal shrub commonly known as Dhawai or

Dhataki in India. It is widely distributed throughout tropical and subtropical regions of South Asia and is prominently mentioned in Ayurvedic, Unani, and folk medicine texts (Thakur, Kaurav, & Chaudhary, 2021). The flowers, leaves, and bark of *W. fruticosa* have been traditionally used to manage conditions such as diarrhea, dysentery, fever, wounds, skin diseases, and gynecological ailments. The flowers are also key components in classical herbal formulations (*Asava* and *Arishta*) due to their fermentative and therapeutic properties (Thakur et al., 2021).

Phytochemical investigations have demonstrated that *W. fruticosa* contains diverse bioactive compounds including flavonoids, tannins, phenolics, glycosides, and terpenoids, which are associated with multiple biological activities (Bandirala & Sandeep, 2019). The presence of such constituents suggests potential pharmacological relevance, as phenolic compounds and flavonoids are well known for their antioxidant and anti-inflammatory properties. Contemporary research shows that extracts of *W. fruticosa* exhibit strong antioxidant activity and promising therapeutic effects in various experimental models (Asian Journal of Biological and Life Sciences, 2023). For instance, in vitro neuroprotective and antioxidant studies have confirmed free-radical scavenging activity, indicating potential utility in oxidative stress-related conditions (Asian Journal of Biological and Life Sciences, 2023).

Recent pharmacological experiments with methanolic extracts of leaves and bark have reported significant anti-inflammatory, analgesic, thrombolytic, antimicrobial, and antidiarrheal properties in both in vitro and in vivo models (PubMed, 2023). These studies also suggest the extracts are relatively safe at high doses, with LD₅₀ values exceeding 5000 mg/kg body weight in acute toxicity screening (PubMed, 2023). In

addition, novel research has documented anticonvulsant effects of *W. fruticosa* flower extracts in animal models, highlighting broader neurological relevance and therapeutic potential (Parameshwari et al., 2024).

Moreover, contemporary studies have begun exploring anticancer potential, where methanolic leaf extracts showed dose-dependent cytotoxicity against human breast and pancreatic cancer cell lines, suggesting the presence of bioactive anticancer phytochemicals that warrant further isolation and characterization (KC Ninada et al., 2023). Other work has focused on the quantitative analysis of gallic acid — a major phenolic compound — in hydroalcoholic flower extracts, which may contribute to diverse pharmacological effects including antioxidant, anti-inflammatory, and antimicrobial activities (Dey et al., 2025).

Despite this growing evidence, systematic experimental evaluation correlating phytochemical profiles with therapeutic outcomes remains limited, especially with standardized extraction procedures and comparative dose-response data. In the current era of evidence-based medicine, rigorous experimental validation of traditional claims is necessary to establish the safety and efficacy of *Woodfordia fruticosa* and to facilitate its integration into modern therapeutics. Therefore, the present study aims to investigate the pharmacological activities and therapeutic importance of *Woodfordia fruticosa* Kurz through controlled experimental methods, with the objective of bridging traditional knowledge and contemporary scientific evidence.

1. WOODFORDIA FRUTICOSA KURZ

Woodfordia fruticosa Kurz is a well-documented medicinal plant belonging to the family Lythraceae and holds a prominent position in traditional systems of medicine such as Ayurveda, Unani, and folk medicinal

practices. The plant is commonly known as Dhataki or Dhawai and is widely distributed across tropical and subtropical regions of India, Sri Lanka, Nepal, and other parts of South-East Asia. Its extensive geographical distribution and long-standing ethnomedicinal usage highlight its adaptability and therapeutic relevance (Thakur et al., 2021).

In traditional Indian medicine, *W. fruticosa* is primarily valued for its flowers, which are considered the most pharmacologically active part of the plant. The dried flowers are extensively used as natural fermenting agents in classical Ayurvedic formulations known as *Asava* and *Arishta*. These formulations are liquid herbal preparations prepared through fermentation, where *W. fruticosa* flowers facilitate microbial activity and enhance bioavailability of active constituents. This unique fermentative property distinguishes *W. fruticosa* from many other medicinal plants and underlines its pharmaceutical importance (Thakur et al., 2021).

Apart from its role in herbal formulations, various parts of *W. fruticosa*, including leaves, bark, and roots, have been traditionally employed for the treatment of a wide range of ailments. Ethnomedicinal records describe its use in managing gastrointestinal disorders such as diarrhea, dysentery, and ulcers, as well as skin diseases, wounds, fever, inflammation, and gynecological conditions. Decoctions and pastes prepared from the plant are commonly used by indigenous communities for their astringent, antimicrobial, and wound-healing properties, indicating its broad therapeutic spectrum (Bandirala & Sandeep, 2019).

From a phytochemical perspective, *W. fruticosa* has attracted considerable scientific attention due to the presence of diverse bioactive constituents. Studies have reported that the plant is rich in flavonoids, tannins, phenolic compounds, glycosides, saponins, and organic acids, particularly gallic acid.

These compounds are well known for their antioxidant, anti-inflammatory, antimicrobial, and cytoprotective properties. The high tannin and phenolic content of the flowers is believed to contribute significantly to their astringent and wound-healing effects, which corroborates traditional medicinal claims (Bandirala & Sandeep, 2019).

Recent reviews and experimental investigations have emphasized the multipurpose medicinal nature of *W. fruticosa*. Modern pharmacological studies have demonstrated that extracts obtained from different parts of the plant exhibit a wide range of biological activities, including antioxidant, anti-inflammatory, antimicrobial, antidiabetic, hepatoprotective, anticonvulsant, and wound-healing effects. These findings support the traditional use of the plant and provide a scientific basis for its therapeutic applications (Parameshwari et al., 2024).

Despite extensive traditional usage and growing experimental evidence, *W. fruticosa* remains underutilized in modern pharmaceutical applications. Variations in extraction methods, lack of standardization, and limited clinical studies pose challenges to its wider acceptance. Nevertheless, recent literature strongly supports the need for systematic experimental evaluation and standardization of *W. fruticosa* to harness its full therapeutic potential. The growing body of scientific evidence positions *Woodfordia fruticosa* Kurz as a promising medicinal plant with significant relevance for future drug development and evidence-based herbal medicine (Thakur et al., 2021; Bandirala & Sandeep, 2019).

2. PHARMACOLOGICAL ACTIVITIES

Experimental investigations conducted over the last decade have clearly demonstrated that *Woodfordia fruticosa* Kurz possesses a wide spectrum of pharmacological activities, validating its extensive traditional use. Various solvent extracts, particularly

methanolic and hydroalcoholic extracts, have been subjected to systematic evaluation using standard in vitro and in vivo experimental models. These studies have consistently reported significant antioxidant activity, which is largely attributed to the high phenolic and flavonoid content of the plant. Free radical scavenging assays such as DPPH, ABTS, and reducing power assays have shown dose-dependent antioxidant effects, indicating the plant's potential role in combating oxidative stress-related disorders (Parameshwari et al., 2024).

Anti-inflammatory activity of *W. fruticosa* extracts has been demonstrated in experimental animal models, including carrageenan-induced paw edema and other acute inflammation models. The observed reduction in inflammatory markers supports the traditional use of the plant in treating inflammatory conditions, wounds, and skin disorders. Additionally, antimicrobial studies have revealed inhibitory effects of the extracts against a range of Gram-positive and Gram-negative bacterial strains, as well as certain fungal species, suggesting its potential application in the management of infectious diseases (PubMed, 2023).

Antidiabetic activity is another important pharmacological property reported for *W. fruticosa*. Experimental studies using chemically induced diabetic animal models have shown significant reductions in blood glucose levels following administration of plant extracts. These effects are believed to be mediated through improved insulin sensitivity and modulation of carbohydrate metabolism, thereby supporting its traditional use in metabolic disorders. Hepatoprotective activity has also been observed, where extracts demonstrated protective effects against chemically induced liver damage by normalizing liver enzyme levels and improving histopathological features (PubMed, 2023).

Furthermore, wound-healing studies have indicated accelerated wound contraction and enhanced epithelialization in extract-treated groups, reinforcing its ethnomedicinal application in wound management. Recent experimental evidence has also highlighted anticonvulsant activity of flower extracts in animal models, suggesting a possible influence on the central nervous system and opening new avenues for neurological research (Parameshwari et al., 2024).

Overall, these pharmacological effects are predominantly dose-dependent and statistically significant, providing strong scientific support for the therapeutic claims associated with *Woodfordia fruticosa*. The consistency between traditional knowledge and modern experimental findings underscores the medicinal importance of this plant and highlights its potential for further pharmacological exploration and drug development.

3. MEDICINAL PLANTS

Medicinal plants continue to be a major source of bioactive compounds used in drug discovery. According to the World Health Organization, nearly 80% of the global population relies on traditional plant-based medicines for primary healthcare. Studies emphasize the importance of validating medicinal plants like *W. fruticosa* through experimental research to ensure efficacy, safety, and standardization (Bandirala & Sandeep, 2019). The increasing resistance to synthetic drugs has further accelerated interest in herbal therapeutics.

4. ETHNOPHARMACOLOGY

Ethnopharmacology plays a vital role in connecting indigenous traditional knowledge with modern scientific research by documenting the medicinal use of plants and guiding experimental validation. Traditional healing practices, developed through centuries of empirical observation, provide valuable insights into the therapeutic

potential of medicinal plants. Scientific investigation of ethnomedicinal claims not only helps in validating traditional therapies but also contributes to the discovery of novel bioactive compounds for modern drug development.

Woodfordia fruticosa Kurz holds a significant place in ethnopharmacological traditions across India and other parts of South-East Asia. Indigenous communities have long utilized various parts of the plant for the treatment of a wide range of ailments. Traditional healers commonly use flower decoctions and leaf extracts to manage gastrointestinal disorders such as diarrhea, dysentery, and stomach ulcers. The astringent nature of the plant, attributed to its high tannin content, is believed to be responsible for its effectiveness in treating intestinal infections and inflammatory conditions (Thakur et al., 2021).

In addition to gastrointestinal applications, *W. fruticosa* has been extensively used in ethnomedicine for skin diseases, wounds, and inflammatory conditions. Paste preparations of flowers or leaves are traditionally applied topically to promote wound healing, reduce inflammation, and prevent microbial infections. The plant is also used as an antipyretic in fever management and as a remedy for gynecological disorders, including menstrual irregularities and leucorrhea, particularly in rural and tribal communities (Thakur et al., 2021). These widespread traditional uses suggest the presence of multiple pharmacologically active constituents acting through diverse mechanisms.

Ethnomedicinal documentation of *W. fruticosa* has served as a foundation for modern pharmacological investigations. Several experimental studies have been initiated based on traditional claims, leading to the identification of antioxidant, anti-inflammatory, antimicrobial, antidiabetic, hepatoprotective, and wound-healing

activities. The consistency between traditional therapeutic uses and experimentally observed pharmacological effects highlights the reliability of ethnopharmacological knowledge and its importance in guiding scientific research (Bandirala & Sandeep, 2019).

Furthermore, ethnopharmacological studies emphasize the holistic use of *W. fruticosa*, where multiple plant parts are employed in different formulations depending on the ailment. This traditional approach aligns with the concept of multi-target therapy, which is increasingly recognized in modern pharmacology for the management of complex diseases. Despite its extensive ethnomedicinal use, systematic clinical validation and standardization remain limited. Therefore, integrating ethnopharmacological knowledge with controlled experimental studies is essential to fully explore the therapeutic potential of *Woodfordia fruticosa* and to support its rational use in evidence-based medicine (Bandirala & Sandeep, 2019; Thakur et al., 2021).

5. BIOACTIVE COMPOUNDS

Medicinal plants have played a vital role in the prevention and treatment of diseases since ancient times and continue to serve as an important source of therapeutic agents in modern drug discovery. A significant proportion of the global population still relies on traditional systems of medicine, particularly in developing countries, due to their accessibility, affordability, and perceived safety. The growing interest in plant-based medicines has encouraged scientific validation of traditionally used medicinal plants to establish their pharmacological efficacy and safety.

Woodfordia fruticosa Kurz, commonly known as Dhawai or Fire Flame Bush, is a flowering plant belonging to the family Lythraceae. It is widely distributed in India and other parts of South-East Asia and has

been extensively used in Ayurveda, Unani, and folk medicine. Traditionally, different parts of the plant, especially flowers and leaves, have been utilized for the management of gastrointestinal disorders, skin infections, fever, wounds, and gynecological ailments. The flowers of *W. fruticosa* are also an important ingredient in several Ayurvedic formulations, where they are used as natural fermenting agents.

Phytochemical investigations of *Woodfordia fruticosa* have revealed the presence of diverse bioactive constituents such as flavonoids, tannins, phenolic compounds, glycosides, and saponins. These secondary metabolites are known to exhibit various pharmacological activities and are considered responsible for the therapeutic effects of the plant. Previous experimental studies have reported that extracts of *W. fruticosa* possess antioxidant, anti-inflammatory, antimicrobial, antidiabetic, hepatoprotective, and wound-healing properties, supporting its traditional medicinal claims.

Despite its long history of traditional use, systematic experimental evaluation of the pharmacological potential of *Woodfordia fruticosa* is essential to substantiate its therapeutic relevance and explore its application in modern medicine. Scientific validation through in vitro and in vivo studies provides a rational basis for understanding the mechanism of action of plant-derived compounds and their possible role in drug development. Therefore, the present study aims to investigate the pharmacological activities and therapeutic importance of *Woodfordia fruticosa* Kurz using experimental approaches, with the objective of correlating traditional knowledge with modern scientific evidence.

6. TRADITIONAL MEDICINE

In traditional systems of medicine, *Woodfordia fruticosa* Kurz has been highly valued for its therapeutic versatility and has

been extensively used for centuries in Ayurveda, Unani, and various folk healing practices. The plant is traditionally regarded as an astringent, anti-infective, and wound-healing agent, properties that are primarily attributed to its high tannin and phenolic content. Classical Ayurvedic texts describe *W. fruticosa* as an important medicinal plant used to restore digestive balance, reduce inflammation, and promote tissue healing (Thakur et al., 2021).

In Ayurvedic medicine, the flowers of *W. fruticosa* occupy a unique position due to their role in the preparation of fermented herbal formulations known as *Asava* and *Arishta*. These preparations are widely prescribed for digestive disorders, anemia, gynecological problems, and general debility. The fermentative property of the flowers enhances the extraction and bioavailability of active constituents, thereby increasing the therapeutic efficacy of the formulations. This traditional pharmaceutical application highlights the advanced understanding of herbal processing techniques in ancient medical systems (Thakur et al., 2021).

Traditional healers have also employed *W. fruticosa* in the treatment of infectious and inflammatory conditions. Decoctions and infusions of flowers and leaves are commonly used to manage diarrhea, dysentery, fever, and skin infections. Topical application of flower or leaf paste is a well-documented practice for wound healing, where it is believed to accelerate tissue repair, prevent microbial growth, and reduce inflammation. These uses align with the plant's astringent and antimicrobial properties, which have been recognized in ethnomedicinal practices across different regions (Thakur et al., 2021).

In the context of reproductive health, *W. fruticosa* has been traditionally used for managing gynecological disorders such as leucorrhea, menstrual irregularities, and

post-partum conditions. Such applications suggest hormonal modulation and antimicrobial actions, although these mechanisms were not scientifically understood in traditional medicine. Recent experimental studies have begun to validate these traditional claims by demonstrating anti-inflammatory, antimicrobial, wound-healing, and anticonvulsant activities in controlled laboratory settings (Parameshwari et al., 2024).

The convergence of traditional medicinal knowledge and modern pharmacological evidence underscores the importance of *W. fruticosa* as a valuable medicinal plant. Validation of traditional applications through experimental research not only strengthens the scientific credibility of traditional medicine but also facilitates the identification of new therapeutic agents for modern drug development. Thus, *Woodfordia fruticosa* serves as an excellent example of how traditional knowledge can guide contemporary pharmaceutical research and evidence-based medicine (Thakur et al., 2021; Parameshwari et al., 2024).

CONCLUSION

The present study underscores the pharmacological significance and therapeutic potential of *Woodfordia fruticosa* Kurz, a medicinal plant with a strong foundation in traditional systems of medicine. Ethnopharmacological evidence, supported by phytochemical and experimental investigations, reveals a close correlation between traditional uses and scientifically validated pharmacological activities. The plant exhibits a broad spectrum of biological effects, including antioxidant, anti-inflammatory, antimicrobial, antidiabetic, hepatoprotective, wound-healing, and anticonvulsant activities, highlighting its multipurpose medicinal value.

Phytochemical analyses indicate that the therapeutic efficacy of *W. fruticosa* is largely attributed to the presence of bioactive

compounds such as flavonoids, tannins, phenolic acids, glycosides, and saponins. High phenolic and flavonoid content, particularly in flower extracts, plays a crucial role in mediating antioxidant and anti-inflammatory effects, thereby supporting its traditional applications in gastrointestinal, inflammatory, and wound-related disorders. The validation of ethnomedicinal claims through experimental models reinforces the relevance of traditional knowledge in modern drug discovery.

Although substantial experimental evidence supports the medicinal potential of *Woodfordia fruticosa*, further research is required to standardize extraction methods, elucidate mechanisms of action, and establish safety and efficacy through clinical studies. Overall, *Woodfordia fruticosa* Kurz represents a valuable natural resource with promising therapeutic prospects and holds significant potential for the development of evidence-based herbal formulations and novel plant-derived pharmacological agents.

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