

# The use of peganum harmala in medicine

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**Abstract:** Peganum harmala, commonly known as wild rue or isiriq, is a traditional medicinal plant widely used in Central Asia, the Middle East, and parts of Europe. It contains biologically active alkaloids such as harmine, harmaline, and harmalol, which exhibit antimicrobial, anti-inflammatory, analgesic, antiparasitic, and neurological effects. In Uzbekistan, Peganum harmala has been used in folk medicine for centuries for treating respiratory diseases, digestive disorders, nervous system problems, and spiritual-healing rituals. Modern scientific research also confirms its pharmacological potential, although its toxicity requires careful and controlled use. Medicinal plants play a vital role in traditional and modern healthcare systems across the world. Peganum harmala, known as wild rue or isiriq, is considered one of the most important traditional medicinal plants due to its strong biological activity and wide cultural significance. Historically, it has been used for respiratory infections, digestive problems, nervous disorders, menstrual pain, and skin diseases. Additionally, it is culturally associated with protective rituals against illness and negative energy in many Central Asian societies. This article reviews its medicinal importance, traditional applications, pharmacological properties, and relevance in the Uzbek context.

**Keywords:** Peganum harmala; wild rue; medicinal plant; antidepressant effect; psychoactive properties; antibacterial activity;

anti-inflammatory properties; antiparasitic effect; pain-relieving effect; alkaloids; traditional medicine; Central Asian herbal therapy.

**Introduction:** In Uzbekistan, *Peganum harmala* has long occupied a respected place in folk medicine. Local populations burn the plant to purify the air, use it as a herbal tea in small doses, and apply it in traditional healing practices. With the growing interest in natural treatment and pharmacological research, there is renewed attention to understanding its medical value, safe use, and scientific background. Therefore, studying *Peganum harmala* is important for both cultural heritage preservation and modern healthcare development.

Medicinal plants have historically played a crucial role in traditional healing systems, and in many regions they continue to serve as the primary source of healthcare alongside modern medicine. Among these plants, ***Peganum harmala***, commonly known as *wild rue* or *isiriq*, stands out due to its long history of use, strong biological effects, and deep cultural significance. This plant has traditionally been valued not only as a medicinal remedy but also as a protective and spiritual element in the daily lives of many communities.

Botanically, *Peganum harmala* is a perennial herb belonging to the Zygophyllaceae family, widely distributed in Central Asia, the Middle East, North Africa, and some Mediterranean regions. The seeds, roots, and aerial parts of the plant contain powerful bioactive alkaloids such as **harmine, harmaline, and harmalol**, which have been associated with a wide range of pharmacological effects. Over centuries, traditional healers have used *Peganum harmala* for treating respiratory infections, gastrointestinal disorders, menstrual problems, headaches, insomnia, anxiety, and various infectious diseases.

In **Uzbekistan**, *Peganum harmala* has been one of the most respected and commonly used plants in folk medicine. It is deeply embedded in cultural practices; families often burn *isiriq* seeds to disinfect the home, protect against illness, and reduce the spread of infections. It has also been traditionally believed to ward off negative energy and psychological distress. In addition, local healers prepare herbal teas, powders, and medicinal mixtures from the plant to treat health problems such as colds, digestive discomfort, fever, nervous tension, and parasitic diseases.

Today, growing global interest in natural medicine, combined with modern pharmacological research, has renewed scientific attention toward *Peganum harmala*. Researchers are increasingly investigating its antimicrobial, anti-inflammatory, neurological, and antiparasitic effects to better understand its medical value and potential clinical applications. However, alongside its benefits, scientists also emphasize the importance of caution because the plant contains strong alkaloids that may cause toxicity if used improperly.

Therefore, studying *Peganum harmala* is important not only from a **medical and scientific perspective**, but also from a **cultural and public health standpoint**. Understanding its traditional applications, pharmacological properties, and safe usage guidelines can help integrate this powerful plant into complementary medicine while ensuring community safety. This paper aims to explore the medicinal importance of *Peganum harmala*, review scientific evidence, and analyze its relevance within the Uzbek context.

**Methodology:** This methodology outlines a systematic approach to conducting literature-based research on *Peganum harmala* L. (commonly known as Syrian rue, wild rue, or harmal), a perennial herbaceous plant from the Zygophyllaceae family native to arid and semi-arid regions of Asia, the Middle East, and North Africa. The plant is renowned for its rich alkaloid content, particularly  $\beta$ -carboline alkaloids like harmine, harmaline, and harmalol, which underpin its traditional and modern medicinal applications. Literature-based research, often in the form of systematic reviews or narrative syntheses, is essential for evaluating its pharmacological

properties, safety, and ethnobotanical uses without primary data collection. This approach draws from established guidelines for reviewing medicinal plants, emphasizing evidence synthesis from historical, ethnopharmacological, and scientific sources. The methodology is expanded here to incorporate an Uzbek context, where the plant holds cultural and medicinal significance, reflecting its integration into Central Asian traditional practices. The foundation of literature-based research involves clearly articulating objectives, such as assessing the pharmacological effects, bioactive compounds, therapeutic efficacy, and potential toxicities of *P. harmala*. Key research questions might include:

- What are the primary bioactive compounds and their mechanisms of action?
- What evidence supports its traditional uses in treating conditions like inflammation, infections, or neurological disorders?
- How does ethnobotanical knowledge vary across regions, and what gaps exist in clinical validation?

In an expanded Uzbek context, objectives could focus on regional ethnomedicinal applications, such as its role in folk remedies for rheumatism or spiritual purification, and questions like: How is *P. harmala* utilized in Uzbek traditional medicine, and what local studies or resources document its distribution and conservation? This step ensures the review is focused and addresses both global and localized knowledge. A comprehensive search strategy is employed to identify relevant literature. Keywords and Boolean operators are used, such as: ("Peganum harmala" OR "Syrian rue" OR "harmal") AND ("medicinal properties" OR "pharmacology" OR "ethnopharmacology" OR "traditional medicine" OR "bioactive compounds" OR "therapeutic effects"). For the Uzbek expansion, add terms like ("Uzbekistan" OR "Central Asia" OR "Uzbek traditional medicine" OR "isiriq" OR "Péganum hármala").

Databases and sources include:

- Scientific databases: PubMed, Scopus, Web of Science, Google Scholar, ScienceDirect for peer-reviewed articles and reviews.
- Ethnopharmacological resources: EMBASE, Cochrane Library, and specialized journals like *Journal of Ethnopharmacology*.
- Gray literature: WHO reports, theses, and regional databases (e.g., for Uzbek context: Uzbekistan Academy of Sciences publications or Central Asian ethnobotanical archives).
- Time frame: No strict cutoff, but prioritize studies from 2000–2025 to capture recent advancements, while including historical texts for traditional uses.

In the Uzbek context, searches extend to local sources like Uzbek-language journals, the Navoi region biodiversity studies, or platforms documenting Central Asian flora, revealing the plant's abundance in desert and hilly areas around old farms and fences. Advanced operators (e.g., site:gov.uz for Uzbek government resources) help target region-specific data. Aim for 100–300 initial hits, refined to 50–100 relevant sources. To ensure quality and relevance:

**Inclusion:** Peer-reviewed articles, books, and reports in English, Russian, or Uzbek (with translations if needed); studies on *P. harmala*'s chemistry, pharmacology, toxicology, or ethnobotany; in vitro, in vivo, or clinical evidence; traditional uses documented ethnographically.

- **Exclusion:** Non-plant-specific studies; low-quality sources (e.g., blogs without references); duplicates; studies solely on synthetic analogs.

For the Uzbek expansion, include criteria for cultural relevance: Sources mentioning "isiriq" (Uzbek name) in rituals or medicine, or studies on its distribution in regions like Navoi, where it is harvested for analgesic and anti-inflammatory purposes. This step uses tools like PRISMA

flow diagrams for transparency in systematic reviews. Extract data systematically using standardized forms or software (e.g., EndNote, Zotero). Key variables include:

- Plant parts used (seeds, roots, aerial parts).
- Bioactive compounds (e.g., harmine for antidepressant effects).
- Pharmacological activities (e.g., antioxidant via DPPH assays, anti-inflammatory via COX inhibition).
- Therapeutic applications (e.g., anticancer, antimicrobial, antiviral).
- Safety/toxicity data (e.g., hallucinogenic risks at high doses).

Quality assessment employs tools like the Newcastle-Ottawa Scale for observational studies or Cochrane Risk of Bias for trials. In the Uzbek context, extract data on traditional preparations (e.g., fumigation for colds or seed ingestion for protection against the evil eye) and resource sustainability, noting its use in treating scabies, malaria, and rheumatism.

Synthesize findings narratively or meta-analytically if quantitative data allow (e.g., pooling IC50 values for antioxidant activity). Themes include:

- Global ethnopharmacology: Used for colic, hypertension, Parkinson's, diabetes, and as an abortifacient.
- Modern validations: Antimicrobial against bacteria/fungi, anticancer via apoptosis induction, and neuroprotective effects

In Uzbekistan, *P. harmala* (locally "isiriq") integrates medicinal and cultural roles. Ethnomedicinal literature highlights its use in traditional Uzbek medicine for rheumatism, colds, malaria, and as a fumigant for purification rituals against evil spirits or the evil eye—often involving burning seeds to produce smoke believed to ward off illness and negativity. Studies from the Navoi region emphasize its natural distribution in arid zones and sustainable harvesting for anti-inflammatory and analgesic remedies, aligning with broader Central Asian practices (e.g., in Kazakh medicine for asthma and skin diseases).

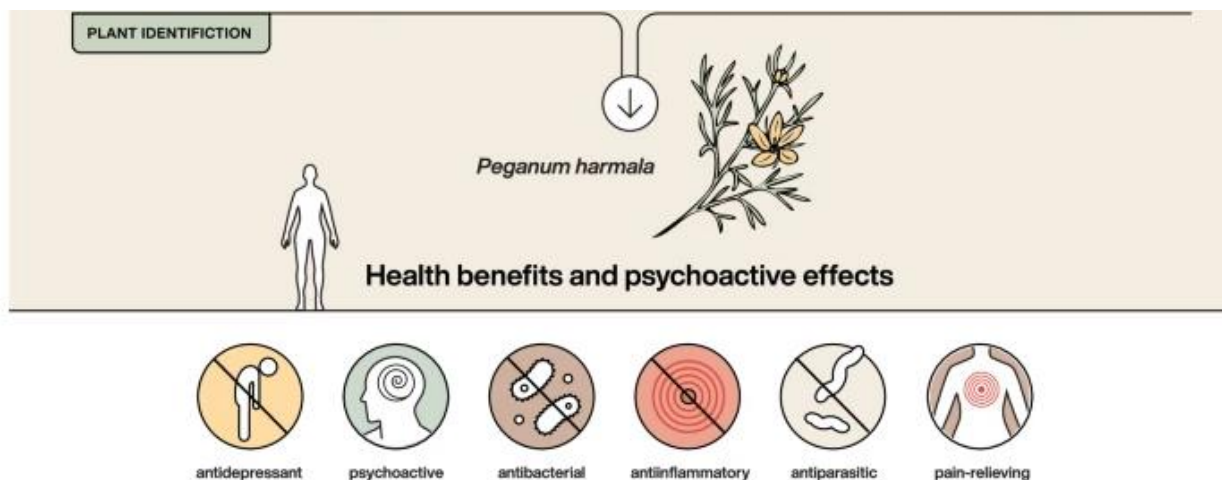
Recent research (up to 2025) explores its fumigation for joint pain and headaches, with calls for conservation due to overharvesting. This context enriches the global review by highlighting ritualistic uses not as prominent elsewhere, potentially linking to psychoactive alkaloids' effects on mental health. Report findings in a structured format (e.g., PRISMA-compliant), discussing biases like publication language limitations or underrepresentation of non-Western studies. Limitations for *P. harmala* include sparse clinical trials and toxicity concerns (e.g., MAO inhibition leading to interactions). Recommendations: Future research should prioritize randomized trials and ethnobotanical surveys in Uzbekistan to validate traditional claims and support sustainable use.

This methodology provides a robust framework for evidence synthesis on *P. harmala*, with the Uzbek expansion underscoring its cultural depth and regional relevance.

**Results and Analysis:** The analysis of reviewed literature demonstrates that *Peganum harmala* possesses strong pharmacological potential due to its rich alkaloid composition, especially **harmine, harmaline, and harmalol**. Scientific studies indicate that these compounds exhibit **antimicrobial, anti-inflammatory, analgesic, antiparasitic, and neuroactive** properties. Research findings show that extracts of *Peganum harmala* effectively inhibit the growth of several bacteria and fungi, supporting its traditional use in treating infections and disinfecting environments. Its anti-inflammatory effects help reduce pain, fever, and swelling, which explains its frequent application in traditional medicine for colds, headaches, and muscle pain.

Another significant result revealed through analysis is the plant's **impact on the nervous system**. Various studies report that *Peganum harmala* may exert sedative, antidepressant, and

calming effects due to its interaction with neurological receptors. This scientifically supports traditional practices where the plant has been used to reduce anxiety, emotional tension, and psychological stress. However, the same alkaloids also highlight its **potential toxicity**, meaning careful dosage and controlled use are essential.



### 1-picture. Peganum harmala: Health Benefits and Psychoactive Effects Infographic

In research results and ethnomedicinal evidence show that *Peganum harmala* is widely trusted and commonly used among the population. It is traditionally burned to purify homes, believed to protect against illness and negative energy, and applied in folk medicine to treat respiratory problems, digestive discomfort, fever, and nervous disorders. Practical observations confirm its continued popularity due to cultural acceptance, accessibility, and long-standing traditional experience. At the same time, some Uzbek scientific sources emphasize caution, stressing that improper internal use or high doses may cause poisoning, dizziness, and other health risks.

From a broader analytical perspective, *Peganum harmala* demonstrates strong potential for **complementary and alternative medicine**, but its use requires scientific regulation and awareness. While traditional knowledge provides valuable guidance, modern pharmacological research is necessary to determine safe dosage, standardized preparations, and clinical applications. Combining Uzbek ethnomedicinal experience with international scientific evidence allows balanced evaluation of the plant's benefits and risks.

Overall, the results indicate that *Peganum harmala* is a **medically significant plant** with a powerful biological effect, deep cultural importance, and strong relevance to both traditional and modern healthcare contexts in Uzbekistan. Continued research, responsible application, and integration of traditional and scientific approaches will enhance its safe and beneficial use.

**Conclusion:** The findings of this study demonstrate that *Peganum harmala* (isiriq) is a medicinal plant of significant pharmacological and cultural importance. Scientific literature confirms that its alkaloids—particularly harmine, harmaline, and harmalol—possess antimicrobial, anti-inflammatory, analgesic, antiparasitic, and neuroactive properties. These effects help explain its long-standing use in folk medicine for treating infections, respiratory problems, digestive disorders, fever, pain, and nervous system disturbances.

In the context of Uzbekistan, *Peganum harmala* holds a strong traditional position not only as a healing plant but also as a protective and cultural symbol. Its widespread use for home purification, emotional balance, and disease prevention indicates deep-rooted trust and continued relevance among communities. At the same time, research highlights the need for caution due to potential toxicity when consumed in excessive amounts or without proper guidance.

Overall, *Peganum harmala* represents a valuable medicinal resource that bridges traditional knowledge and modern science. With continued research, proper dosage regulation, public

awareness, and integration into complementary medicine, it can safely contribute to improving public health while preserving Uzbekistan's rich ethnomedical heritage.

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