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Research Article

Important Medicinal Plants of Western Rajasthan: Ethnomedicinal Significance and Therapeutic Potential: A Review

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Abstract

Traditional herbal medicine plays an important role in primary health care, particularly in arid and rural regions where plant-based remedies continue to be widely practiced. Ethnomedicinal knowledge preserved by local and tribal communities provides valuable insights into the therapeutic applications of native plant species, many of which serve as rich sources of biologically active compounds.

The present review compiles and analyzes available literature on the ethnomedicinal uses and phytochemical profiles of selected medicinal plants from Western Rajasthan, including *Commiphora wightii*, *Glossonema*, *Haloxylon salicornicum*, *Capparis decidua*, *Tecomella undulata*, *Withania coagulans*, *Prosopis cineraria*, *Ziziphus nummularia*, *Aloe vera*, *Lawsonia inermis and Leptadenia pyrotechnica*. These plants are widely employed in traditional systems of medicine such as Ayurveda, Unani, and regional folk practices, with various plant parts used to manage diverse health conditions. Reported phytochemical constituents, including flavonoids, alkaloids, terpenoids, phenolic compounds, tannins, and sterols, support their traditional applications. This review highlights the significance of these medicinal plants as valuable resources for future research and sustainable utilization.

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INTRODUCTION

Medicinal plants have long formed the foundation of traditional health care systems and continue to play a vital role in primary health care across many regions of the world. Herbal remedies remain widely practiced due to their cultural relevance, ease of availability and deep integration with indigenous healing traditions. Established systems such as Ayurveda, Unani, and diverse folk practices depend extensively on plant-based resources for health maintenance and the treatment of common ailments, particularly among rural and tribal populations.

India is recognized for its exceptional medicinal plant diversity, supported by a wide range of climatic zones and ecological habitats. Western Rajasthan, encompassing much of the Thar Desert, represents a distinctive arid ecosystem marked by low precipitation, extreme temperatures, and sparse vegetation. Despite these challenging environmental conditions, the region supports numerous hardy plant species that possess significant ethnomedicinal importance. Over generations, local communities have developed detailed knowledge regarding the identification, harvesting, and therapeutic use of these plants, primarily transmitted through oral traditions.

Ethnomedicinal practices in Western Rajasthan reflect a close interaction between indigenous communities and their surrounding environment. A variety of plant species are traditionally prepared as decoctions, powders, pastes, and infusions, using different plant parts such as roots, bark, leaves, flowers, fruits, seeds, and resins to address a wide spectrum of health conditions. These practices form an essential component of indigenous health care systems and contribute substantially to the cultural heritage of the region.

In recent decades, socio-economic transformation, urbanization, and degradation of natural habitats have contributed to the gradual erosion of traditional knowledge systems. Consequently, systematic documentation and critical review of ethnomedicinal information are crucial for preserving this valuable heritage and enhancing awareness of traditional health care practices.

The present review focuses on selected medicinal plants of Western Rajasthan, namely *Commiphora wightii*, *Glossonema*, *Haloxylon salicornicum*, *Capparis decidua*, *Tecomella undulata*, *Withania coagulans*, *Prosopis cineraia*, *Ziziphus nummularia*, *Aloe vera*, *Lawsonia inermis* and *Leptadenia pyrotechnica*. The objective of this review is to compile and evaluate existing literature on their ethnomedicinal uses and traditional significance within the indigenous health care systems of the region.

1. Glossonema spp.

Glossonema is a genus of flowering plants belonging to the Apocynaceae family (previously classified under Asclepiadaceae) and is typically found in arid and semi-arid regions, including the Thar Desert of Western Rajasthan. These plants are well-adapted to dry sandy soils (Meena, 2025) [12], exhibiting a spreading or climbing growth habit and producing small flowers with characteristic milky latex.

The species has long-standing ethnomedicinal significance among rural and tribal populations. Various parts of the plant, including roots, leaves, and latex, are traditionally used to manage skin conditions, wounds, inflammatory disorders, digestive issues, and respiratory problems (Bishnoi et al., 2023) [2]. Preparations from the plant may be applied externally or ingested orally depending on the ailment, highlighting its central role in local health care practices.

Phytochemical analyses have revealed that *Glossonema* contains alkaloids, flavonoids, glycosides, phenolic compounds, tannins, saponins, and terpenoids, which are responsible for its therapeutic effects. Scientific studies indicate antimicrobial, anti-inflammatory, antioxidant, and wound-healing activities (Asati et al., 2022) [1], validating its traditional applications. Its combination of ecological adaptability, ethnomedicinal importance, and bioactive compounds makes *Glossonema* a key medicinal plant in desert regions.

2. Haloxylon salicornicum

Haloxylon salicornicum, belongs to the family Amaranthaceae (previously Chenopodiaceae) and is native to arid regions such as the Thar Desert. These plants are adapted to sandy and saline soils and can withstand extreme conditions like drought, high temperatures, and soil salinity. Ecologically, they are important for stabilizing sand dunes and preventing soil erosion.

In traditional medicine, *Haloxylon salicornicum* is used by local communities to treat a range of health issues, with stems, leaves, and bark utilized in various remedies. The plant is commonly employed for gastrointestinal complaints, fever, inflammation, skin infections, joint pain (Bishnoi et al., 2023) [2], and other minor ailments, reflecting its integration into indigenous health practices.

Phytochemical studies have identified alkaloids, flavonoids, phenolic compounds, tannins, saponins, sterols, and terpenoids in *Haloxylon salicornicum*, which contribute to its antioxidant, antimicrobial, anti-inflammatory, and analgesic activities(Asati et al., 2022) [1]. These findings support the plant's traditional medicinal uses. The combination of ecological resilience, ethnomedicinal relevance, and bioactive constituents highlight its significance in the desert medicinal flora of Western Rajasthan.

3. Prosopis cineraria

Prosopis cineraria is a genus of drought-resistant trees and shrubs in the Fabaceae family, commonly found in arid and semi-arid regions, including the Thar Desert of Western Rajasthan (Chavan et al., 2025) [3]. These plants are adapted to sandy and saline soils and play a key role in desert ecosystems by providing shade, fuel, fodder, and stabilizing the soil.

Traditionally, *Prosopis cineraria* are valued in local ethnomedicine. Various plant parts, such as leaves, pods, bark, and seeds, are used for managing gastrointestinal disorders, respiratory ailments, wounds, fever, and inflammation (Saini, Shruti et al., 2024; Bishnoi et al., 2023) [2]. Preparations include

decoctions, pastes, and powders, reflecting their widespread use in folk and indigenous health practices.

Phytochemical studies have revealed the presence of alkaloids, flavonoids, tannins, phenolic compounds, saponins, and terpenoids (Asati et al., 2022; Sharma & Tomar, 2022) [1], which are believed to contribute to the medicinal properties of the plant. These bioactive compounds support its traditional applications, demonstrating its importance as a multipurpose medicinal and ecological plant in desert regions.

4. Tecomella undulata

Tecomella undulate also called as Rohida or Desi Teak, belonging to the Bignoniaceae family, is a medium-sized deciduous tree native to arid regions of Rajasthan, particularly the Thar Desert. It is well adapted to dry, sandy soils and is considered an important tree species for afforestation and desert ecosystem restoration due to its drought tolerance (Dhir & Shekhawat, 2012) [4].

The species holds notable ethnomedicinal significance. Traditionally, its bark, leaves, and flowers are used for treating skin disorders, fever, jaundice, liver-related ailments, and wounds (Tewari et al., 2025). Folk remedies often involve decoctions, pastes, or direct application, reflecting its integration into local health care systems and traditional healing practices.

Phytochemical investigations indicate that *Tecomella undulata* contains alkaloids, flavonoids, phenolic compounds, tannins, saponins, and glycosides (NCBI, n.d.), which are believed to underlie its therapeutic effects. The combination of its ecological role, medicinal importance, and bioactive compounds highlights the relevance of *Tecomella undulata* in indigenous health care and desert biodiversity.

5. Withania coagulans

Withania coagulans, commonly known as Indian rennet, Paneer Bandh or Panir ke phool, is a perennial shrub in the Solanaceae family. The plant is also known for its use in coagulating milk. It is widely distributed in arid and semi-arid regions of India, including Western Rajasthan, where it grows naturally in sandy soils and dry habitats. The plant is highly valued for both its medicinal properties and traditional use in local communities.

Ethnomedicinally, it is used in the treatment of diabetes, digestive disorders, liver ailments, inflammation, cosmetic applications, as antimicrobial agents and general weakness (Meena, 2025) [12]. Different parts of the plant, particularly the roots, leaves, and fruits, are used in decoctions, powders, and pastes, demonstrating its integration into traditional health care systems of rural and tribal populations.

Phytochemical studies reveal that *Withania coagulans* contains alkaloids, flavonoids, tannins, saponins, steroids, and phenolic compounds NCBI, n.d.) which are responsible for its therapeutic properties. These compounds validate its long-standing use in traditional medicine and underline the plant's significance as a valuable medicinal resource in the deserts of Western Rajasthan.

6. Commiphora wightii

Commiphora wightii also known as Guggul, plant which is highly valued for its medicinal properties (Patel et al., 2016). They are hardy shrubs and small trees in the Burseraceae family, widely distributed in arid and semi-arid regions including the Thar Desert. *Commiphora wightii* thrives in sandy soils and can withstand the harsh conditions of the desert, often exhibiting thorny stems and resinous bark.

Ethnomedicinally, *Commiphora wightii* is used to manage wounds, skin infections, fever, digestive issues (Raina et al., 2018), anti-inflammatory (Saeed et al., 2018) and respiratory ailments (Bishnoi et al., 2023) [2]. The resin, leaves, and bark are processed into pastes, decoctions, and oils in traditional medicine, reflecting the plant's importance in rural health practices.

Phytochemical studies indicate the presence of guggulsterones (Singh et al., 2018) [22], alkaloids, flavonoids, phenolics, terpenoids (Kumar et al., 2020) [9, 11], tannins, and saponins, which contribute to its therapeutic activities. These compounds support the ethnomedicinal relevance of *Commiphora wightii* in desert communities. It is considered an endangered species due to over-harvesting and habitat loss (IUCN, 2020) [8]. Conservation efforts are necessary to protect this valuable plant species.

7. Capparis decidua

Capparis decidua also known as Ker or Caper are shrubs and small trees in the Capparaceae family, growing widely in arid and semi-arid areas of Western Rajasthan. The species are adapted to sandy and rocky soils and are commonly found in desert landscapes.

Traditionally, different parts of *Capparis decidua*, including leaves, bark, roots, and fruits, are used to treat fever, jaundice, digestive disorders, skin ailments, and respiratory problems (Gupta & Singh, 2018)) [5]. Decoctions, powders, and pastes prepared from these plant parts are integral to folk medicine.

Phytochemical investigations reveal alkaloids, flavonoids, phenolics, terpenoids, tannins, and saponins with potential antioxidant, anti-inflammatory, and antimicrobial activities which contribute to the medicinal properties of the plant. These bioactive compounds substantiate its use in traditional remedies and highlight its ethnomedicinal importance.

8. Ziziphus nummularia

Ziziphus nummularia also called as wild Jujube or Jhar Ber belonging to the Rhamnaceae family, includes shrubs and small trees widely distributed in arid regions, including the Thar Desert. The species are highly tolerant to sandy soils, low rainfall, and high temperatures, making them important in desert ecosystems.

Ethnomedicinally, leaves, bark, and fruits are used to manage diabetes, gastrointestinal problems, skin infections, respiratory issues, and inflammation (Meena et al. 2020) [13]. Traditional preparations such as decoctions, pastes, and powders are commonly employed by local communities

Phytochemical studies show the presence of alkaloids, flavonoids, tannins, steroids, saponins, and phenolic compounds, which are linked to the therapeutic effects of the plant. These constituents support its traditional medicinal use and emphasize its relevance in indigenous health care. *Ziziphus nummularia* could be used for desert landscaping and restoration due to its ability to tolerate harsh conditions. The plant's phytochemicals could be used to develop medicinal products for various health conditions and its edible fruits could contribute to food security in arid regions.

9. Aloe vera

Aloe vera also known as Ghritkumari, a succulent in the Asphodelaceae family, is widely cultivated and naturally grows in arid areas of Western Rajasthan. It thrives in dry, sandy soils and is well-known for its medicinal and cosmetic value (Singh et al., 2019) [20].

The leaf gel is traditionally used to treat burns, wounds, inflammation, digestive disorders, and skin problems (Kumar et al., 2020) [9, 11]. It is applied externally or consumed orally in folk remedies and remains an important component of local herbal medicine.

Phytochemical analyses indicate the presence of anthraquinones, flavonoids, saponins, phenolic compounds, glycosides, and sterols, which contribute to its therapeutic properties (Gupta et al., 2017) [6]. These compounds validate its long-standing use in traditional medicine. *Aloe* also has potential applications in cosmetic products and digestive health (Singh et al., 2019) [20].

10. Lawsonia inermis

Lawsonia inermis, commonly called henna, is a small shrub of the Lythraceae family, widely distributed in arid and semi-arid regions of Western Rajasthan. The plant grows well in sandy, well-drained soils and holds both medicinal and cultural significance (Kumar et al., 2018) [10].

Ethnomedicinally, leaves, bark, and seeds are used to manage skin disorders, wounds, fever, jaundice, headaches, and inflammation (Singh & Pandey, 2011) [23, 24]. Pastes, powders, and decoctions are commonly prepared and applied externally or orally in traditional remedies.

Phytochemical studies reveal alkaloids, flavonoids, tannins, saponins, glycosides, and phenolic compound, which are responsible for its therapeutic effects (Sharma et al., 2020) [19]. These bioactive compounds support its traditional applications and emphasize its importance in desert health care practices.

11. Leptadenia pyrotechnica (Khimp or Safedbansi)

It is an important medicinal shrub of the arid and semi-arid regions of Western Rajasthan, particularly the Thar Desert. It belongs to the family *Apocynaceae* and is well adapted to extreme desert conditions such as high temperatures, low rainfall, and nutrient-poor sandy soils. Traditionally, different parts of the plant, including roots, stems, and leaves, are widely used by local and tribal communities for the treatment of wounds, ulcers, digestive disorders, jaundice, diabetes, inflammation, and respiratory ailments (Bishnoi et al., 2023) [2]. Decoctions and pastes prepared from the plant are commonly applied in folk medicine for their healing properties.

Phytochemical investigations of *L. pyrotechnica* have revealed the presence of bioactive constituents such as alkaloids, flavonoids, saponins, tannins, phenolic compounds, glycosides, and terpenoids. These compounds support the ethnomedicinal relevance of the plant and highlight its potential therapeutic value. In addition to its medicinal importance, *L. pyrotechnica* plays a significant ecological role in sand dune stabilization (Meena, 2025) [12] and desert ecosystem sustainability. The plant's deep root system helps to prevent soil erosion and stabilize sand dunes, which can help to reduce the risk of desertification and promote biodiversity in arid regions.

CONCLUSION

Medicinal plants of Western Rajasthan, including *Glossonema, Haloxylon salicornicum, Prosopis, Tecomella undulata, Withania coagulans, Commiphora weightii, Capparis decidua, Ziziphus nummularia, Aloe vera, Lawsonia inermis* and *Leptadenia pyrotechnica*, form an integral part of the region's ethnomedicinal heritage. Adapted to the harsh conditions of the Thar Desert, these species are traditionally used by rural and tribal communities to manage a wide range of ailments, utilizing roots, leaves, bark, fruits, seeds, and latex in preparations such as decoctions, powders, and pastes. Phytochemical studies have revealed bioactive compounds including flavonoids, alkaloids, phenolics, tannins, saponins, and terpenoids, which provide scientific support for their therapeutic potential.

The continued documentation and study of these plants are essential to preserve indigenous knowledge, support sustainable use, and conserve desert biodiversity. Future research could focus on comprehensive phytochemical analyses, pharmacological evaluation, and validation of traditional preparation methods. Integrating these species into modern health care, herbal formulations, and nutraceuticals could open new avenues for medicinal, ecological, and economic applications. Overall, the combination of traditional wisdom and scientific investigation can enhance the sustainable utilization of Western Rajasthan's valuable medicinal plant resources.

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