



REVIEW ARTICLE

Ethnobotanical importance of families Apocynaceae, Asteraceae, and Fabaceae (Angiosperms) among Rajasthan tribes, India

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ARTICLE HISTORY

Received: 08 February 2024

Accepted: 05 April 2024

Available online

Version 1.0 : 15 April 2024



Additional information

Peer review: Publisher thanks Sectional Editor and the other anonymous reviewers for their contribution to the peer review of this work.

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Indexing: Plant Science Today, published by Horizon e-Publishing Group, is covered by Scopus, Web of Science, BIOSIS Previews, Clarivate Analytics, NAAS, UGC Care, etc See https://horizonepublishing.com/journals/index.php/PST/indexing_abstracting

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CITE THIS ARTICLE

Sharma SK, Alam A. Ethnobotanical importance of families Apocynaceae, Asteraceae, and Fabaceae (Angiosperms) among Rajasthan tribes, India. Plant Science Today (Early Access). <https://doi.org/10.14719/pst.3354>

Abstract

The families Apocynaceae, Asteraceae, and Fabaceae are well-known among Angiosperms for providing ethnic or traditional food and medicine. The Apocynaceae family is highly valued for its medicinal properties, providing a rich source of drugs used in conventional and modern medicine. This family is a powerhouse of medicinal activity with 4600 species under 415 genera. Similarly, the Asteraceae family is renowned for its edible and medicinal weeds grown for over 3000 years, making it a well-known source of natural remedies. The family mainly contains taxa with inulin, a natural polysaccharide with pro-biotic properties. However, it has been recognized that many other bioactive compounds can be found within this family. With approximately 665 genera and 17500 species worldwide and over 1100 species and 100 genera in India alone, the Fabaceae family significantly contributes to the world's flora. The genera of this family are well known for producing a diverse range of phytochemicals, including 3-nitropropanoic acid, a potent mycotoxin. It is worth noting that almost every tribe in India, particularly Rajasthan, is aware of the therapeutic properties of various plants from these families. The arid state of India boasts rich territories that host an array of plant families. By delving into the scientific literature on the phytochemical properties and ethnobotanical uses of various plant families, valuable insights can be gained that could enable us to better understand and utilize these plants. This knowledge could lead to discoveries and innovations in plant-based medicine and agriculture.

Keywords

Apocynaceae; Asteraceae; Ethnomedicine; Ethnobotanical; Fabaceae; Phytochemicals; Rajasthan Tribes

Introduction

India is renowned for being one of the world's 36 biodiversity hotspots, with four such hotspots within its borders: the Western Ghats, the Himalayas, Sundaland, and the Indo-Burma region. The country boasts a rich diversity of flora and an ancient knowledge of medicinal plants used in Ayurveda. According to the World Health Organization (WHO), roughly 80% of the world's population relies on traditional medicinal herbs, underscoring the significance of conventional medicine practices in many societies (1). The indigenous knowledge of ethnic communities regarding traditional medicinal herbs has been indispensable in identifying therapeutic plants in folk and traditional herbal remedies. Throughout history, plants have been a crucial source of remedies for various chronic ailments in humans and livestock (2).

The use of herbal medicines has been steadily gaining trust due to their lesser side effects, leading to increased exploration of plants by villagers for ethnomedicinal purposes. Ethnobotanical studies play a crucial role in comprehending how plants are utilized for medicinal purposes by traditional communities and in preserving folk culture. The findings of ethnobotanical investigations aid in revealing the relationship between traditional and modern knowledge, making them a valuable tool for studying the biological characteristics of medicinal plants (3). The ethnobotanical survey of the Sariska and Siliserh regions of the Alwar district of Rajasthan was conducted, which revealed much important information (4). Native tribes and racial groups worldwide possess many unique customs, traditions, religious events, medicines, specters, and agricultural practices. These ethnic tribes have a remarkable chance to explore flora resources in the most remote and rarely accessed areas, allowing them to employ various wild and cultivated plants to cure different illnesses. Their extensive knowledge about the flora of their surroundings is precious and supports phytochemical or pharmaceutical expertise (5).

Rajasthan: An Arid State of India

Rajasthan, one of the largest states in India, is located in the northwestern part of the country. It is known for its rich cultural heritage and history and is often referred to as the "Land of Kings and kingdom". The state shares its international boundary with Pakistan towards the west and northwest, while it is bounded by domestic boundaries with Haryana, Punjab, and Uttar Pradesh in the north and northeast, Uttar Pradesh and Madhya Pradesh towards the east and southeast, and the southwest with Gujarat. The state's cultural richness is reflected in its architecture and the lifestyle of its people. Despite the different climatic conditions and rainfall distribution throughout the region, Rajasthan is relatively dry and infertile. The temperature range varies from 8° to 46 °C throughout the year, which poses a challenge for the state's inhabitants. However, this extreme environment has not limited the versatility of the state. The population of Rajasthan is estimated to be more than five and a half crore people, with approximately 80% of the population residing in villages that rely on traditional medicine. The southern region of Rajasthan is home to a significant number of tribal people from diverse tribal communities. The indigenous communities residing in the remote areas of Rajasthan, India, have long been known for their reliance on traditional healing practices passed down through generations via oral communication. These ancient healing techniques have been their only source of treatment, and there is no historical evidence to support them. The expertise of these communities in the ethno-biological properties of plants is remarkable, and they heavily depend on the forest to meet their daily needs. Forest resources are the sole source of revenue for these communities and are utilized to fulfill their basic requirements, such as fodder, fuel, food, and medicines. The tribal people of Rajasthan have accumulated vast knowledge of livestock care using herbs and sustainable usage of plant species unique to their territories. Their

profound understanding of traditional medicine and natural resources has significantly contributed to preserving their culture and way of life. They have developed their methods of sustainable living and have managed to maintain an eco-friendly lifestyle despite the challenges posed by their environment. The state of Rajasthan is truly a testament to the resilience and adaptability of the human spirit (6).

Geography of Rajasthan

Rajasthan, the largest state in India, is an enchanting land of mesmerizing beauty and cultural diversity. Spread over an expansive land area of approximately 132,139 square miles, the state is home to a diverse landscape that ranges from steep hills, undulating dunes, and fertile plains to sparsely populated areas. Its unique geography and distinct topography make it one of the most diverse regions in the world. This Indian state is situated in the country's northwestern region, spanning across both the northern and western hemispheres of the planet. Its irregular rhomboid shape presents a heterogeneous quadrilateral, and its entire boundary constitutes 5920 kilometers, with 4850 kilometers as interstate borders and 1070 kilometers as international borders. The Thar Desert, also known as the "Maru-kantar," dominates the arid state of Rajasthan and is the largest desert in India. Its vast expanse of golden sand stretches across the horizon, creating a surreal and otherworldly atmosphere. The desert is home to various wildlife, including the endangered Great Indian Bustard, blackbuck, and Indian gazelle. The Aravalli Range is considered the oldest group of 'Fold Mountains' in the world. This magnificent range splits the state into two distinct geographic areas: a vast desert and a lush forest belt. While the forest cover constitutes only a meager 9.36 percent of the region's total land area, it is home to a rich and diverse flora and fauna. The forests of Rajasthan are a treasure trove of life, supporting a wide range of plant and animal species that have adapted to the region's unique climatic conditions. The forests are home to tigers, leopards, sloth bears, and various deer and antelope species. The Guru Shikhar Peak, located in Mount Abu, Rajasthan's only hill station, is the tallest in the Aravalli range at 1,722 meters above sea level. The peak offers stunning panoramic views of the surrounding landscape, making it a popular destination for tourists and adventure enthusiasts (6).

Climatic Condition of Rajasthan

Rajasthan, a state in northwestern India, is known for its diverse range of climates. The climate in the western region of Rajasthan is characterized by extreme temperatures, low humidity, rapid wind speeds, and very little rainfall. The eastern and southern regions, on the other hand, have semi-humid to humid weather. Though they experience similar temperature extremes as the West, the wind speeds are lower, the humidity levels are higher, and the rainfall is more consistent. The state exhibits a diverse range of climate conditions that vary across its different regions. While the eastern plain and southeastern plateau regions experience comparatively higher levels of rainfall and relatively lesser temperature fluctuations, the

western arid plain is particularly dry and displays significant temperature variability. The entire state is known for its hyper-thermic conditions, with May and June being the hottest, with an average high temperature of 45° C and an average low temperature of 23 °C. The rainfall patterns across the state follow a distinct gradient, decreasing from the west towards the east, primarily due to the directional influence of the location of the Tropic of Cancer, the Aravalli range, and the continental effect. The tropical desert climate of Rajasthan is mainly due to these factors. Despite having a harsh climate, Rajasthan boasts a rich cultural heritage and is home to some of India's most magnificent palaces, forts, and temples (6).

The tribal belt of Rajasthan

The tribal people of India, a diverse group of various ethnic groupings, live in "India's tribal belt" and have different ecological conditions, population size, level of development, level of acculturation, language and linguistic traits, predominant subsistence methods, and social stratification. They are scattered throughout the country, with an unequal distribution. Indian tribes can be divided into three zones based on their geographic distribution: the North and North-Eastern zone, the Southern zone, and the Central zone. Rajasthan is the largest state in India with a diverse tribal population. The state can be divided into three regions depending on the density of the tribal population residing in each region. Rajasthan's tribal people account for 12.56% of the state's population, which is higher than the national average. Banswara district had the largest tribal population, with 72.27% of the total tribal population, followed by Dungarpur, Udaipur, Chittorgarh, and Sirohi districts. The tribes in these districts have unique identities, languages, and cultural practices that distinguish them from other tribes in the region. Overall, Rajasthan's tribal population is a crucial part of the state's cultural heritage, and efforts are underway to preserve and promote its rich cultural traditions and practices. Rajasthan is a tribal heritage situated in northwest and east India. The people of this region have a distinct ancestry that can be traced back to the oldest known civilization on the Indian subcontinent *i.e.*, the Harappan culture of the Indus Valley. In the past, matrilineal societies were prevalent in the tribes of northwest India, but they shifted towards a more patriarchal way of life due to changing circumstances. However, institutionalized matriarchy is still prevalent in several tribal areas, where women hold power and importance and are in charge of planning relationships, money distribution, land inheritances, and marriages (6).

Tribal population in Rajasthan

Rajasthan is a state in northern India with a rich cultural heritage, and it is home to a sizeable tribal population. The scheduled tribes in Rajasthan constitute around 12% of the state's total population, amounting to approximately 54.75 lakh people. These tribes are known for their unique culture, customs, traditions, fairs, and festivals distinct from the rest of the state's population. Their exquisite clothing, building styles, and celebrations represent a rich tapestry of Rajasthani culture. Despite the state's

modernization and development, the tribal communities have maintained their isolation from the plains of Rajasthan. Most of these tribes live in the highlands and forests, which are still inaccessible and remote. These tribes have contributed significantly to the state's overall culture and have enriched it with their distinct customs and traditions. The distribution of Rajasthan's tribal population varies significantly across the state's various districts. The highest percentage of scheduled tribes in the state is in the Banswara and Dungarpur districts, where it accounts for 73.47% and 65.84%, respectively. The Udaipur district has the highest number of scheduled tribes, constituting 19.41% of the total population, followed by Banswara (15.51%), Dungarpur (10.51%), Jaipur (9.71%), and Sawai Madhopur (8.10%). Interestingly, the five districts mentioned above contribute two-thirds of the state's total tribal population. The remaining districts have a relatively low number of scheduled tribes, with Bikaner having the lowest at 0.04%. The demographic makeup of the tribes' population is noticeably different from that of the general population of the state. This can be observed through various factors such as race, ethnicity, language, religion, and cultural practices. The tribes' population composition represents a unique mix of individuals with diverse backgrounds, traditions, and beliefs that distinguish them from the general population of the state and their isolation in the hills and forests has resulted in low population densities. The Damor, Kalbelia, Garasiya, Meena, Sahariya, Sansi, Kanjar, Bhil, and Kathodia tribes reside in the tribal belt of southern Rajasthan. These tribes have a unique way of life and have preserved their cultural heritage despite their challenges. The government has initiated several schemes for their welfare, including education, healthcare, and infrastructure, to improve their standard of living and preserve their rich cultural heritage (6).

Floral diversity of Rajasthan

Rajasthan is home to a diverse range of flora, consisting of the Northern Desert Thorn Forest, which is characterized by sparse clusters of vegetation. As we move from west to east, the patches of vegetation get denser and larger due to the increase in rainfall. The southern regions of Rajasthan, including the Sitamata, Mount Abu, Phulwari, and Kumbhalgarh wildlife sanctuaries, stand out as "mega floral diversity places" in the state, owing to their extensive floral diversity. These protected zones are a habitat for many climbers, terrestrial orchids, lianas, tuberous plants, and pteridophytic and bryophytic flora along the valleys and streams. Between 2001 and 2004, several botanical surveys were conducted in diverse areas of southern and eastern Rajasthan, leading to the discovery of many new plant specimens that were previously unknown in Rajasthan's flora. Mount Abu is the dwelling place for several species of plants, including salar (*Boswellia serrata* Roxb. ex Colebr), bamboo (*Bambusa vulgaris* Schard. ex J.C. Wendl.), and dhavanam (*Artemisia pallens* Wall. ex DC.) along with rare wildflowers, ferns, and orchids. Modad [*Prosopis cineraria* (L.) Druce], saledi [*Sesbania bispinosa* (Jacq.) W. Wight], khakhara [*Butea monosperma* (Lam.) Taub.], dudhi (*Euphorbia hirta* L.),

karanj [*Pongamia pinnata* (L.) Pierre], gular (*Ficus racemosa* L.), karel [*Capparis decidua* (Forssk.) Edgew.], Jamun [*Syzygium cumini* (L.) Skeels], etc. are some local names for common species found here.

Peperomia pellucida Kunth is a South American native that has naturalized in several regions of India, including Rajasthan (7). Jodhpur lacks substantial forests, so it's possible that the plant was taken from a garden instead of a forest. It can be observed blooming as ground flora in the Sitamata Wildlife Sanctuary next to Valmiki Ashram in the thick shadow of numerous trees. As a result, this is the first account of the presence of this invasive species in Rajasthan's natural habitat.

The *Nymphaea pubescens* Willd., which is widespread in ponds in southern Rajasthan, is quite like *Nymphaea rubra* Roxb. ex Andrews. *Nymphaea rubra* has red leaves, petioles, petals, stamens, fruits, and stalks (8). In several of the ponds in the Banswara district, *Nymphaea rubra* can be seen coexisting alongside *Nymphaea pubescens*. The introduction of *Nymphaea rubra* to the region may have been brought about by worshippers leaving floral offerings in the several temples in Banswara.

There exist two varieties of *Jatropha gossypifolia* L. namely *elegans* and *gossypifolia* in Rajasthan. Both types of this species exhibit unique and distinguishable color patterns on their various body parts. These patterns can be used to differentiate between the two varieties easily. Young leaves, including petioles and glands, are green in *J. gossypifolia* var. *gossypifolia* but dark purple in the widespread variety, *J. gossypifolia* var. *elegans*. In Rajasthan, the nominate variant is uncommon. So far, it has been spotted in damp areas of Kota city in southeast Rajasthan and the Wakal riverbank close to Gau-Pipla village in the Phulwari Wildlife Sanctuary in southern Rajasthan.

Many areas of the southern Aravalli have naturalized *Zinnia elegans* Jacq (Asteraceae). During the monsoon season, it is frequently spotted along roadsides, sweeping meadows, and deteriorated forest areas. It may be found in places like Kailashpuri, Kamalnath, Madri, Pai, Peepalwas, Banki Forest, Neemachmata, Thuria Magra, Sajjangarh and Kumbalgarh Wildlife Sanctuaries, etc. The red flowering plants can be observed from August through October amidst the grasses. In the Sajjangarh Wildlife Sanctuary, a small patch of the yellow-flowered plant may be found next to the "anicut overlook" and the tar road to Sajjangarh palace (9). In different regions of Rajasthan, many Angiosperm families are distributed including Burseraceae [*Protium serratum* (Wallich ex Colebr.) Engl.], Verbenaceae [*Clerodendrum serratum* (L.) Moon.], Asteraceae (*Parthenium hysterophorus* L.), Liliaceae (*Chlorophytum borivillanum* Sant.), Fabaceae (*Prosopis cineraria*), Orchidaceae [*Peristylus constrictus* (Lindl.) Lindl.], etc.

Rural Indians are equipped with a deep understanding of the usage of substitute plants when the main food is in low supply, and the intake of substitute foods is still highly widespread in rural Rajasthan. The

pastoralist community in Rajasthan has a rich history of raising livestock, primarily sheep, camels, and cattle. The arid region offers a variety of grasses, shrubs, and low tree branches for grazing, making it an ideal habitat for these animals. A wealth of knowledge about the therapeutic benefits of arid plant species now employed in commercial Ayurveda remedies has been distilled over generations of tradition. In times of crop scarcity, wild plant seeds, fruits, and roots supplement the diet.

Flora of Rajasthan vs. distribution of Family Apocynaceae, Asteraceae and Fabaceae

Rajasthan, despite being mostly a desert, has a diverse range of flora spread throughout the state. The natural vegetation here is of the Northern Desert Thorn Forest type, which is visible in the form of small clumps scattered across open areas. These clumps grow in size and density moving from west to east. Only 9 percent of the state has forest cover on the eastern side of the Aravali range. This results in little vegetation in the desert region, where trees with stunted growth, grass, and thorny shrubs can be seen. However, apart from the Northern Desert Thorn Forest natural vegetation, one can also witness ephemeral vegetation during the monsoon season.

Khejri (*Prosopis cineraria* (L.) Druce; Fabaceae), is the most frequently growing tree in this state. This is mostly found in the arid zone. It has a bean-like shape and is known as sangria. It is not only used as fodder but it is also eaten as a vegetable. In Rajasthan, it has the status of 'state tree' and is considered a delicacy.

A wide range of shrubs and akaro [*Calotropis procera* (Aiton) W. T. Aiton, Apocynaceae] are also abundant. Because this is desert vegetation, the shrubs are covered in thorns. There are also thor (*Euphorbia caducifolia* Haines, Euphorbiaceae) and bordi [*Ziziphus nummularia* (Burm.f.) Wight & Arn.; Rhamnaceae] growing here. Members of the family Poaceae, viz., Dhaman (*Cenchrus ciliaris* L.), Sewan (*Lasiurus sindicus* Henrard), and Bharut (*Cenchrus catharticus* Delile) are growing in the region as some of the perennial grass species. These plants prevent soil erosion and serve as valuable cattle feed for tribes. The shallow wetland landscape in Eastern Rajasthan is dotted with creepers, shrubs, herbs, and bushes. Keoladeo National Park is home to Khejri [*Prosopis cineraria* (L.) Druce] and Babul [*Acacia nilotica* (L.) Willd. ex Delile]. The Ranthambore National Park contains over seventy tree species. Peepal (*Ficus religiosa* L.; Moraceae), Banyan (*Ficus benghalensis* L.; Moraceae), Ber (*Ziziphus mauritiana* Lam.; Rhamnaceae), dhak [*Butea monosperma* (Lam.) Taub.; Fabaceae], and Datepalm (*Phoenix dactylifera* L.; Arecaceae) are some notable species. There are 13 shrub varieties, 30 grass species, and over 100 medicinal species to be found in the region. Bamboo [*Dendrocalamus strictus* (Roxb.) Nees; Poaceae], Salai/Salai guggul (*Boswellia serrata* Roxb.; Burseraceae) and jamun [*Syzygium cumini* (L.) Skeels.; Myrtaceae] are found in Mount Abu, a hill area. Rare wild roses, ferns, and orchids can also be found here.

In urban areas of Rajasthan, the herb Dhava [*Anogeissus latifolia* (Roxb. ex DC.) Wall. ex Guill. & Perr.; Combretaceae] can be found in abundance. Other common plant species in urban Rajasthan are Thor (*Euphorbia royleana* Boiss.; Euphorbiaceae), Brahmi [*Bacopa monnieri* (L.) Pennell; Scrophulariaceae], Guggal [*Commiphora wightii* (Arn.) Bhandari; Burseraceae], Gudhal (*Hibiscus* spp.; Malvaceae), shatawari (*Asparagus racemosus* Willd.; Asparagaceae), and Adusa or Vasaka (*Justicia adhatoda* L.; Acanthaceae).

Methodology

Study Area

Rajasthan, one of India's diverse states, is between 23°.3' to 30°.12' North latitude and 69°.30' to 78°.17' East longitude, with the Tropic of Cancer passing through its southernmost tip. Despite being in a similar latitudinal belt as northern Arabia, Rajasthan has a less harsh climate. The study area shown in Fig. 1 consists of different districts of Rajasthan having diverse populations, with about 12.44% which incorporates various tribes such as Bhil, Bhil-Meena, Damor, Dhanka, Garasia, Kathodia, Kokna, Kolidhor, Naikara, Patelia, Meena, and Seharia. Moreover, nomadic tribes like Banjara, Gadolia-Lohar, Kalbelia, Sikligar, Kanjar, Sansi, and Bagri also contributed to the ethnic heritage of Rajasthan. These groups are widely distributed throughout the state and have significant communication with each other, leading to the exchange of ethnobotanical information.

Data Collection

The present appraisal of the paper has been compiled using subordinate sources of data, which include academic articles. Relevant works of literature were collected from various sources such as NCBI, PubMed, Web of Science, Google Scholar, Scopus, etc., that are freely available on the internet. The report has been written by following a qualitative approach, where sources were described, read, and analyzed in-depth to explore ideas and summarize and interpret the findings. The report primarily consists of a documentary analysis expressed in words.

Observations

In scholarly research, Asian countries have emerged as the primary contributors, generating a substantial number of publications. This study utilized the available primary data to achieve its objective and aims at the collection of scattered information on the vast range of ethnobotanical, economic, and pharmacological applications of various plant species belonging to the Apocynaceae, Asteraceae, and Fabaceae families, with a particular emphasis on Rajasthan, India. The study provides a comprehensive list of commonly used ethnomedicinal plants, their botanical names, growth habits, local or indigenous names, the specific tribes that utilize them, isolated compounds extracted from the plants, and their medicinal properties. The complete summary of the collected information is presented in Table 1.

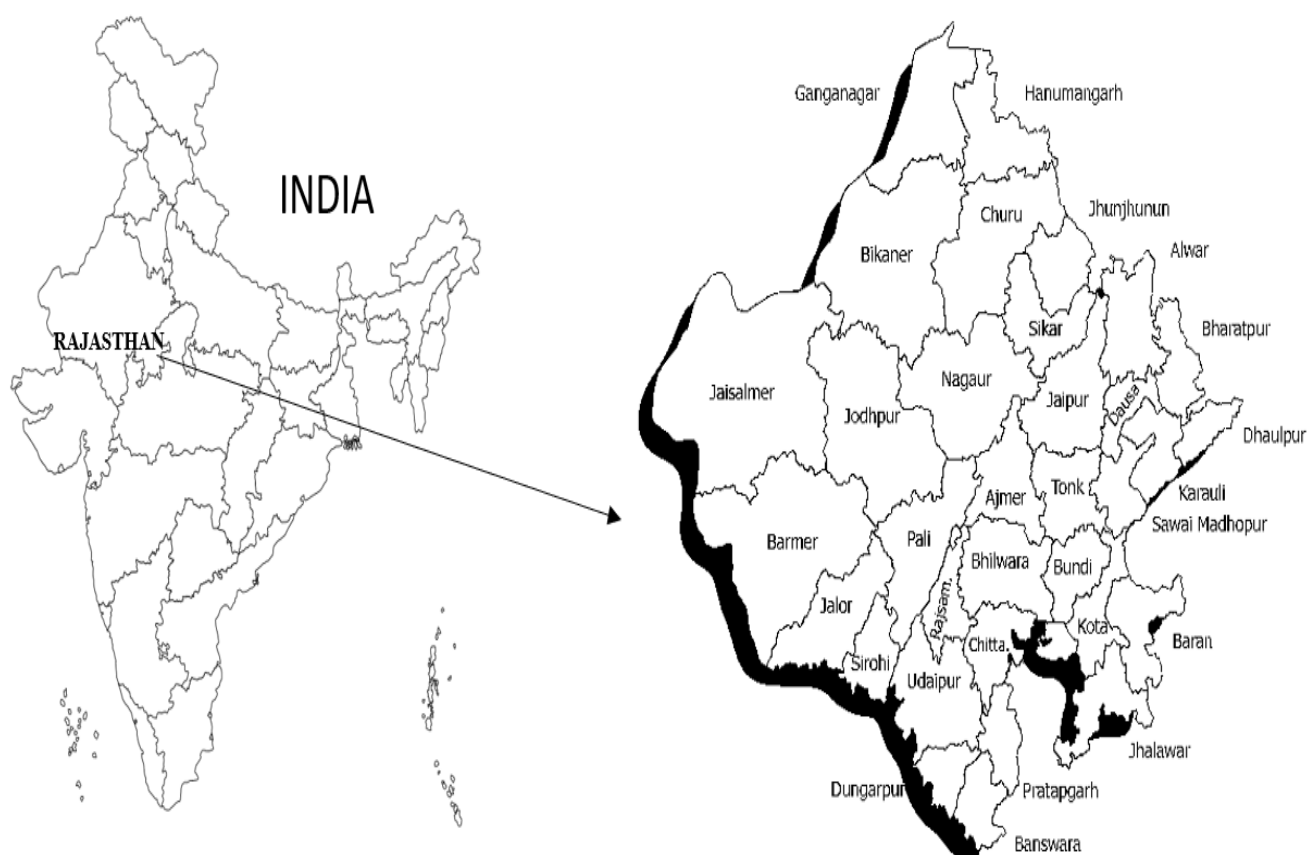


Fig. 1. The Study area included different districts of Rajasthan (Source: Google Maps).

Table 1: Ethnomedicinal plants of the family Apocynaceae, Asteraceae, and Fabaceae with their medicinal uses among the tribes of Rajasthan

S. No	Botanical name and growth habit	Vernacular name	Tribes	Plant parts	Compounds isolated	Medicinal uses	Family	References
1	<i>Abrus precatorius</i> L. Tree	Chirmi Gunja Chirmati	Bhil Damor Kathodia Garasia	Leaves Seeds Root	Abrol Abrin Alkaloids Abrine	Chewing the leaves for 2-3 days can cure mouth blisters. The seeds can boost the nervous system and cure disorders. A seed paste can cure joint pain. Root decoction treats cough, cold, and intestinal worms.	Fabaceae	(10)
2	<i>Acacia hockii</i> De Wild. Tree	Chekanti Chakanti	Bhil, Damor	Leaves Shoots Bark	Flavonoids Terpenoids Saponins Phenols	Helps in curing stress-related issues.	Fabaceae	(11)
3	<i>Acacia nilotica</i> (L.) Delile Tree	Kikar/ Babool	Bhils	Leaves Bark	Polyphenolic compounds	Plant leaves treat throat infections and the bark powder cures skin problems, asthma, and bronchitis.	Fabaceae	(12)
4	<i>Adenium multiflorum</i> Klotzsch Shrub	Impala lily Sabie Star kudu lily	Damor Garasia	Bark fleshy part of the trunk	Carbohydrate Cardiac glycosides Flavonoids Terpenoids	The plant has different medicinal uses; its lotion treats skin diseases and lice, while the white latex is used for tooth decay and septic wounds. The isolated latex is toxic and used as a pesticide. Used by Somalian to treat nasal infections, headaches, muscle pain, joint pain, and wounds.	Apocynaceae	(13)
5	<i>Aganosma dichotoma</i> (Roth.) K. Schum Tree	Malati	Bhils Kathodia	Leaves	β -sitosterol, ursolic, vanillic and ferulic acids quercetin and Glycosides Rutin Hyperin Arabinosides Quercetin kaempferol Glycoflavones Leucoanthocyanins Vanillic acid	Helps in the treatment of inflammation and pain, eye disorders, and fractures, and treats kapha.	Apocynaceae	(14)
6	<i>Ageratum conyzoides</i> L. Herb	Jangli pudina Visadodi Semandulu Ghabuti Bhakumbar Mukhada	Bhil Kathodia Garasia	Whole plant	Flavonoids Chromene Alkaloids Terpenoids Coumarins Sterols Fumaric acid Caryophyllene	This particular medicinal herb has been traditionally used to treat a wide range of ailments, including but not limited to fever, burns, rheumatism, headache, colic, dyspepsia, pneumonia, eye problems, and uterine disorders. In addition to its multi-functional properties, it is also believed to possess anti-asthmatic, antispasmodic, and hemostatic properties, making it a highly valued herb in traditional medicine. Whether taken orally or applied topically, this herb has been known to provide relief and healing to those who utilize its natural benefits.	Asteraceae	(15)

7	<i>Albizia leebek</i> Benth. Tree	Siris	Damor	Leaf Seed	Saponin Tannin	Act as an Antidote, to cure skin disease, Piles, Asthma, and Diarrhea.	Fabaceae	(16)
8	<i>Allamanda cathartica</i> L. Shrub	Alokananda	Bhils Garasia	Flowers	Iridoid lactones Glycosides iridoid Lactones (isoplumericin and plumericin)	Scabicide is a medication used to treat various ailments including jaundice, malaria, and ringworm infection. It is also a purgative and emetic and can act as a hyperthermic and laxative agent. Additionally, it can be used as an antidote for poisoning.	Apocynaceae	(17)
9	<i>Alstonia scholaris</i> (L.) R. Br. Tree	Saptarni	Kathodia Bhils Damor	Whole plant	Terpenoid Alkaloids Alstonoside Flavonoids Iridoids Coumarins Reducing sugars Saponins Phenols Steroids Tannins	Act as a sedative in wound healing and to treat hypertension.	Apocynaceae	(18)
10	<i>Ambrosia artemisiifolia</i> L. Herb	Bitterweed	Bhil Garasia	Leaves Roots	Phenols Carboxylic acids Coumarins Flavonoids	The leaves have medicinal properties and can be used to treat fevers, pneumonia, nausea, cramps, diarrhea, and skin ailments. Juice prepared from withered leaves can disinfect infected toes. Tea made from the roots can help with menstrual difficulties and stroke.	Asteraceae	(19)
11	<i>Ambrosia confertiflora</i> DC. Herb	Estafiate Istafiate	Garasia Kathodia	Leaves Flowers Root	Santamarine Reynosin 1,10- Epoxyparthenolide	Treats Intestinal parasites, stomachache, fever, controls appetite, and menstrual symptoms	Asteraceae	(20)
12	<i>Anodendron paniculatum</i> (Roxb.) A. DC. Liana	bada dudheli mal	Kalbelia	Roots	Alkaloids Terpenoids Flavonoids Phenols	Cuts and wounds can be cured by it. It is also used to treat jaundice, hepatitis, dyspepsia, dementia, antipyretic, antifertility, and antirheumatic.	Apocynaceae	(21)
13	<i>Artemisia dracuncululus</i> L. Herb	Naagadaun a Terragon Tarkhun	Garasia	Roots	Flavonoid Phenolic acids Coumarins Alkamides	Shows effects that are associated with carminative properties, which aid in digestion, as well as anti-inflammatory, antipyretic, antispasmodic, antiseptic, antiparasitic, antimicrobial, fungicidal, and anthelmintic properties.	Asteraceae	(22)
14	<i>Asclepias curassavica</i> L. Herb	Scarlet milkweed	Bhils	Root Leaves Latex flower	Fixed oils Quinines Flavonoids Tannin Phenols Quinines Saponin Terpenoid Steroids Sugars Xanthoprotein	Having anthelmintic, purgative, and astringent properties, treats gonorrhoea, good styptic, and Cures Cancer and skin diseases	Apocynaceae	(23)

15	<i>Atylosia scarabaeoids</i> (Wight & Arn.) Druce Shrub	Gulsuni	Kathodia	Roots	Phenols Tannins Niacin Ascorbic acid Flavonoids	Paste prepared using roots for treating rheumatism	Fabaceae	(24)
16	<i>Bauhinia variegata</i> L. Tree	Kachnar	Meena	Leaf, Seed Pods Root Flower bud Bark	Stigmasterol β -sitosterol	Bark has a high fiber content and can be used to treat diarrhea. The root has a carminative effect, while the flower bud has laxative and anthelmintic properties.	Fabaceae	(25)
17	<i>Bellis perennis</i> L. Herb	Daisy Gowlan	Sehariya	Whole plant	Flavonoids Phenols Saponins	This remedy can treat a variety of conditions, such as headaches, colds, eye problems, skin issues, and respiratory infections. Additionally, it has been used to treat bruises, fractured bones, and wounds.	Asteraceae	(26)
18	<i>Butea monosperma</i> (Lam.) Taub. Tree	Dhak khakhra	Meena Bhil Damor	Whole plant	Butyryn, Palssonin Glycocides β -Sitosterol	It is used in the treatment of excessive bleeding, sun stroke, diarrhea, delivery pain, and leucorrhoea.	Asteraceae	(27)
19	<i>Caesalpinia crista</i> L. Prickly shrub/ woody vine	Fever nut	Bhil Kalbelia	Leaf Seed	d-Caesalpin	Helps in the treatment of Burns, stomach-related problems, Liver problems, and Skin diseases.	Fabaceae	(28)
20	<i>Calotropis procera</i> (Aiton) Dryand. Herb	Arka Arki Mudar Safed-ak	Meena Bhils	Latex Flower Leaves Root Bark Vegetative buds	Cardenolides Flavonoids Saponins	Leaves are used as an antidote for snake bites and other parts help in the treatment of rheumatism, sinus fistula, mumps, burns, body pain, and jaundice.	Apocynaceae	(29)
21	<i>Cajanus cajan</i> (L.) Millsp. Shrub	Arhar Tuvar	Meena	Leaves	Flavonoids Tannin Resins Terpenoids	Leaf paste is used in the treatment of Oral ulcers and inflammation.	Fabaceae	(30)
22	<i>Caralluma adscendens</i> (Roxb.) R. Br. Herb	Mankulli	Meena Kathodia	Whole plant	Glycosides Flavonoids Steroids	It has been reported to show antibacterial, anti-inflammatory, antioxidant, analgesic, anti-diabetic, and hypoglycemic activities. This plant has traditional uses for dermatitis, bloating, anti-	Apocynaceae	(31)
23	<i>Carissa spinarum</i> L. Shrub	Jungli Karaunda	Bhil Kalbelia	Leaf root Bark stem	Triterpenes Cardiac glycosides Sesquiterpenes Monoterpenes Flavonoids Lignans Sterols Phenolic compounds fatty acids Esters	Utilized for treating various conditions such as inflammation, arthritis, microbial and viral infections, epilepsy, and cancer.	Apocynaceae	(32)

24	<i>Carrisa carandas</i> L. Shrub	Karandang, Kerenda	Bhils	Leaves Root Fruit Bark	Triterpenes Cardiac glycosides Sesquiterpenes Monoterpenes Flavonoids Lignans Sterols Phenolic compounds fatty acids Esters	Used for treating diarrhea, malaria, constipation, epilepsy, pain, neurological disorders, leprosy, myopathic spasms, cough, anorexia, pharyngitis, fever, diabetes, seizures, and scabies	Apocynaceae	(33)
25	<i>Cascabela thevetia</i> (L.) Lippold Shrub	Peeli Kaner	Meena Damor	Seed Fruit	Alkaloids Steroids Saponins Flavonoids Tannins Unsaturated steroids, Triterpenoids Essential oils	Treat venereal disease; abortion	Apocynaceae	(34)
26	<i>Cassia alata</i> L. Shrub/small tree	Dadmari	Kalbelia Damor	Leaves	Anthraquinone	Treatment of cuts and sores, Piles, wound healing, asthma	Fabaceae	(35)
27	<i>Cassia fistula</i> L. Tree	Amaltash	Meena	Roots leaves	Anthraquinones Flavonoids Flavanol	The roots of this plant can be used to treat leprosy and skin diseases while the leaves can help with rheumatism.	Fabaceae	(36)
28	<i>Cassia occidentalis</i> L. Shrub	Senna Kasunda Bari Kasondi	Damor	Root Seeds Leave Fruit	Glycosides β - Sitosterol Anthraquinone	Leaf paste treats bone fractures and scabies. Seeds help the liver and act as purgative.	Fabaceae	(37)
29	<i>Cassia tora</i> L. Small shrub	Charota Panwad	Meena	Leaf Seed	d-manitol, Anthroquinone β - Sitosterol	When applied to the skin, the paste made from leaves has a soothing effect. Meanwhile, the seeds can be used to treat fungal infections and inflammation.	Fabaceae	(38)
30	<i>Catharanthus roseus</i> (L.) G. Don. Herb/sub-shrub	Nayantara	Minas	Whole plant Flowers Leaves Roots	Urosolic acid Daucesterol Tetrahydroalstonine β -sitosterol Vindoline	The plant is believed to be a folk remedy for diabetes and has tonic and stomachic properties. It contains alkaloids that have hypertensive, sedative, and tranquilizing properties, as well as the ability to relax plain muscles and depress the central nervous system. The leaves and latex of the plant are commonly used for treating blood dysentery and piles.	Apocynaceae	(39)
31	<i>Chondrilla juncea</i> L. Herb	Rush Skeleton- weed Lampri	Garasia	Leaves Stems	Phenols Terpenes Coumarins Caffeoyltartonic acid	Helps cure insomnia, lowers blood pressure, purifies the blood, and heals wounds and gouts.	Asteraceae	(40)
32	<i>Chrysanthemum</i> × <i>grandiflorum</i> Ramat. Herb/Shrub	Guldaudi	Bhils	Flowers	Terpenes Flavonoids Alkaloids Phenolics	Used in chest pain (angina), type 2 diabetes, cold, high blood pressure, fever, dizziness, headache, and swelling treatment.	Asteraceae	(41, 42)

33	<i>Chrysanthemum× morifolium</i> Ramat. Herb/Shrub	Mums Guldaudi	Bhil Damor	Flowers	Flavonoids Alkaloids Phenolics Triterpene	Treats inflammation, respiratory diseases, and hypertension. Helps in tea preparations and tinctures.	Asteraceae	(43)
34	<i>Cicer arietinum</i> L. Herb	Chana	Minas	Seeds	Unsaturated fatty acids Lipids Sterols Starch	The seed coats are used to cure sprains.	Fabaceae	(44)
35	<i>Clitoria ternatea</i> L. Tree	Vardia	Meena Bhil Damor	Leaf Seed Roots	Anthocyanins Steroids Triterpenoids Glycosides	To treat swelling in the eyes caused by syphilis, tonsillitis, white patches on the skin, and cough.	Fabaceae	(45)
36	<i>Cyanthillium cinereum</i> (L.) H. Rob. Herb	Sahadevi Sadodi	Kathodia Kalbelia	Leaf Stem Flower	β-amyrin Lupeol Betulin	It has therapeutic potential against various illnesses such as Cancer, Asthma, Colic pain, Dysentery, Cough, Cholera, night blindness, and impotence. The seeds can be an alternative to leprosy and chronic skin illness.	Asteraceae	(46)
37	<i>Dalbergia sissoo</i> DC. Tree	Talli Shisham	Bhils Meena Damor Gadolia luhar	Leaves Bark	Alkaloids Glycosides Flavanols Tannins Saponins Sterols Terpenoids	The leaves help to treat gonorrhoea, leprosy skin, and diseases. The powder of bark helps in curing children suffering from pneumonia	Fabaceae	(47, 48)
38	<i>Delonix regia</i> (Hook.) Raf. Tree	Gulmohar	Bhils Garasia Saharia	Leaves	Saponins Alkaloids Carotene, Hydrocarbons Terpenoids Glycosides Hydrocarbons Flavonoids Steroids Tannins Carotenoids	Leaves are used to treat some disorders such as inflammation, and constipation.	Fabaceae	(49)
39	<i>Derris indica</i> (Lam.) Benn. Small tree	Karanj	Gadolia luhar	Whole plant	Flavonoids Phenols Steroids Isoflavonoids	Helps in the treatment of Bleeding piles, Beri, Ulcers, Bronchitis, and Leukoderma	Fabaceae	(50)

40	<i>Desmodium trifolium</i> L. Herb	Nilambaranda	Garasia Saharia	Leaves	β -Phenylamine Trigonelline Alkaloids	Act as an Antidote, Diuretic, Carminative, and Tonic. Helps in the treatment of Wounds, Diarrhea, and Skin disease.	Fabaceae	(51)
41	<i>Entada abyssinica</i> A. Rich Small tree	Splinter bean	Bhil Garasia	Leaves Bark	Flavonoids Terpenoids Phenols Monoglyceride	Treats stomachache, bronchial pains, ulcers, and cold	Fabaceae	(52)
42	<i>Erigeron bonariensis</i> L. Herb	Goojugha, Gulava, Mrichbooti	Bhil	Leaf	Flavonoids Steroids Terpenes Caffeoylic derivatives	treat gastrointestinal-related problems Roots are used as a remedy to cure dysentery and diarrhea	Asteraceae	(53)
43	<i>Erigeron canadensis</i> L. Herb	Makshikavisha, Jarayupriya	Meena Sehariya Kathodia	Leaf	Saponins Terpenoids Tannin Glycosides Anthraquinone Flavonoids Steroids	Treat diarrhea, stomatitis, conjunctivitis, and acute toothache	Asteraceae	(54)
44	<i>Erythrina abyssinica</i> Lam. ex DC. Tree	Pangara	Gadolia Garasia	Bark Leaf Root	Alkaloids Flavonoids Triterpenoids Lectin	Toothache, Fever, Menstrual disease	Fabaceae	(55)
45	<i>Gaillardia aristata</i> Pursh Herb	Blanket flower	Kalbelia Bhil	Root	Pinene Limonene Myrcene	treat wounds, cure painful urination, diuretics, and settle fevers	Asteraceae	(56)
46	<i>Gaillardia pinnatifida</i> Torr. Herb	Red dome blanket flower	Kalbelia Bhil	Leaf	Flavonoids	Root tea is a remedy for gastroenteritis, while powdered root can be used to treat skin diseases and painful eyes when chewed.	Asteraceae	(56)
47	<i>Gnaphalium coarctatum</i> Willd. Herb	Gordolobo	Meena Garasia	Leaf	Flavonoids Sesquiterpenes Phytosterols Anthraquinone Caffeoylquinic acid derivatives	This herb helps with many respiratory illnesses, such as the flu, fever, asthma, cough, cold, bronchitis, and other bronchial problems. It can also help with stomach issues, swelling, wounds, prostate problems, back pain, nerve pain, and chest pains. Additionally, it can be used to lower blood pressure or as a diuretic.	Asteraceae	(57)
48	<i>Helianthus annuus</i> L. Herb	Surajmukhi Suryakanti Suryamukhi Sooryamukhi	Kathodia Garasia	Seeds Leaves Flowers	Sesquiterpenes Lactones Diterpenes Flavonoids	The tincture is used for treating respiratory illnesses like coughs, colds, bronchitis, and malarial fever. A tincture of flowers and leaves mixed with balsamic vinegar is used for bronchiectasis, while a warm milk-soaked towel is placed over leaves on the bed.	Asteraceae	(58)

49	<i>Helichrysum luteoalbum</i> L. Herb	Balraksha	Minas Meena	Leaf	Limonene Pinene Linalool	Plants' leaves have medicinal benefits like treating tumors, gout, dermatitis, and bone damage. They also work as a tonic, astringent, diuretic, and febrifuge. Kavirajes of Chalna uses it for treating tumors, gout, and dermatitis. It is also employed for breast cancer treatment in Belgium.	Asteraceae	(59)
50	<i>Hoya revoluta</i> Wight ex Hoof. f. Climber	Waxplant	Gadolia Luhar	Leaves Root	Phenolics Terpenoids Flavonoids	Eye infection; prolapse of uterus; heart pain	Apocynaceae	(60)
51	<i>Indigofera tinctoria</i> L. Tree	Nai	Bhil Kathodia Meena	Roots	Tannins Terpenoids Flavonoids Glycosides Alkaloids	The powder of roots is taken orally by the tribal people	Fabaceae	(61)
52	<i>Melilotus indica</i> (L.) All. Herb	Ban methi Senji Metha	Kathodia	Leaves seeds	Seleno-amino acids	Seeds are used in infantile diarrhea and bowel complaints. Used as emollient and discutient.	Fabaceae	(62)
53	<i>Millettia pinnata</i> (L.) Panigrahi Tree	Karanj	Bhil Gurjar		Bitter fatty oil Pongam oil Karanjin Sterols	Cures skin disease, and leukoderma, stops excessive bleeding	Fabaceae	(63)
54	<i>Mimosa pudica</i> L. Herb	Chuimui	Bhil Meena	Whole plant	β -Amyrin β -Sitosterol	Helps in treating Allergy, Ulcer, Asthma, and Bleeding	Fabaceae	(64)
55	<i>Mucuna pruriens</i> (L.) DC. Tree	Kirmich	Minas	Seed Root	Alkaloids Amino acids Tetrahydro Isoquinoline	Seed powder mixed with honey treats asthma, while the roots cure nervous system diseases like facial paralysis.	Fabaceae	(65)
56	<i>Nerium indicum</i> Miller Shrub/small tree	Kaner	Bhil	Flowers Leaves Leaf Juice Latex Bark Roots	Carbohydrates Alkaloids Terpenoids Glycosides Saponins Tannins	It can treat various health conditions including snake bites, ulcers, asthma, cardiac diseases, cancer, joint pains, skin-related problems, and more. It can also cause abortion.	Apocynaceae	(66)
57	<i>Nerium oleander</i> L. Shrub	Korobi	Meena	Leaves Flowers Roots Seeds	α -tocopherol Digitoxigenin Oleandrin Ursolic acid Quercetin	Plant parts are poisonous. Leaf decoction reduces swellings. Macerated leaves treat itch and hair fall. Flowers work for inflammations, pains, headaches, and scabies.	Apocynaceae	(67)
58	<i>Parthenium hysterophorus</i> L. Herb	Gajarghas Vayaribhama	Bhil	Whole plant	Parthenin	remedy for rheumatic pain, skin inflammation, diarrhea, dysentery, urinary tract infections, malaria, and neuralgia	Asteraceae	(68)

59	<i>Plumeria alba</i> L. Shrub	Chameli	Kathodia	Bark	Alkaloids Cardiac glycosides Flavonoids Terpenoids Steroids Tannins Carbohydrates Saponins	The bark of a tree can be used to cover complex tumors, and the seeds can stop bleeding. The tree sap can help with digestion, heart health, urination, and lowering blood pressure. This tree can also treat ulcers, herpes, and scabies.	Apocynaceae	(69)
60	<i>Prosopis cineraria</i> (L.) Druce Tree	Khejri Khejra Janti	Bhil	Bark Flower Fruit	Alkaloids Saponins Tannins Flavonoids Flavanols Phenolics	This plant can cure rheumatic disorders and help pregnant women prevent abortion. It can also improve memory power and treat piles.	Fabaceae	(70)
61	<i>Prosopis juliflora</i> (Sw.) DC. Tree	Shammi	Meena Bhil	Leaves Pods	Alkaloids, Flavonoids Terpenoids Steroids	Grounded pod syrup for motor retardation, leaf for oral infection, and powdered leaf for irritation.	Fabaceae	(71)
62	<i>Pterolobium stellatum</i> (Forssk.) Brenan Small tree	Beneka Gorsa	Kalbelia Shariya	Roots Leaves	Tannins	Cures Pneumonia, infertility, and snake bites.	Fabaceae	(72)
63	<i>Rhanterium eppanosum</i> Desf. Shrub	Arfaj	Bhil Meena Gadolia	Leaf	Camphene Myrcene Limonene Pinene	Helps in the treatment of hydrophobia, fevers, rabies, cancer, diarrhea, rheumatoid arthritis	Asteraceae	(73)
64	<i>Senegalia catechu</i> (L.f.) P.J.H. Hurter & Mabb. (Syn. <i>Acacia catechu</i> (L.F.) Willd.) Tree	Khair	Damor Garasia		Catechin Catechutanic Acid Tannin	Cures toothache, diarrhea, headache, Cough, Digestive, and skin disease	Fabaceae	(74)
65	<i>Senegalia senegal</i> (L.) Britton Tree	Kumbat	Kathodia Garasia	Bark Flower Gum	Phenols Flavonoids Tannins	Demulcent, Emollient, Inflammation, Hemorrhage, Intestinal mucous, Diabetes.	Fabaceae	(75)
66	<i>Sonchus asper</i> (L.) Hill Herb	Doodhi	Bhil Garasia	Young shoot Seeds Whole plant	Saponins Flavonoids Phenols	Treats various health issues such as wounds, burns, respiratory problems, gastrointestinal infection, inflammation, diabetes, heart, kidney, and liver disorders, reproductive disorders, jaundice, and cancer.	Asteraceae	(76)
67	<i>Stevia rebaudiana</i> Cav. Herb	Madhu Patrika	Meena	Whole plant	Flavonoids Phenols	Regulating blood pressure and strengthening the heart and the circulatory system are some benefits that can be achieved.	Asteraceae	(77)

68	<i>Symphytotrichum novi-belgii</i> (L.) G. L. Nesom Herb	Michaelmas daisy	Garasia	Flowers Roots Stem	Saponins Flavonoids	Cures Fever, Snake bites, cold, tonsillitis, and bee sting	Asteraceae	(78)
69	<i>Tabernaemontana divaricata</i> R.Br. ex Roem. & Schult. Shrub/small tree	Chandni	Meena Kathodia	Roots Leaves Flowers	Saponins Tannins Phenols Glycosides Steroids Proteins Fixed oils	The root treats hypertension, headaches, scabies, and toothaches. The roots, flowers, and leaves are also used to treat snake and scorpion poisoning.	Apocynaceae	(79)
70	<i>Tagetes erecta</i> L. Herb	Genda Hajara	Garasia Meena	Leaves Flowers	Carotenoids Flavonoids Monoterpenoids	Leaves are mainly used as an antiseptic for treating kidney troubles, muscular pain, piles, boils, and carbuncles. Flowers treat fever, epileptic fits, astringent, carminative, stomachic, scabies, liver ailments, and eye disorders.	Asteraceae	(80)
71	<i>Tagetes patula</i> L. Herb	Genda	Garasia	Leaves Flowers	Volatile oils Glycosides Sesquiterpenes Limonene Saponins Ocimenones Flavonoids Spathulenol	lowers blood sugar, treatment of cuts and wounds, pain, and inflammation	Asteraceae	(81)
72	<i>Tamarindus indica</i> L. Tree	Imli	Bhil Meena Garasia Kathodia Damor Saharia	Fruit Seed	Triterpenes Lupeol Fatty acids	Helps curing fever, skin rashes	Fabaceae	(82)
73	<i>Taraxacum officinale</i> F.H. Wigg Herb	Dudhali Dudal Dudhbatthal Dudhal	Garasia Bhil	Whole plant	Sesquiterpene Lactones Monoterpene Phytosterol Terpenes Coumarin	The root has several beneficial qualities, including digestive-stimulant, tonic, and anti-rheumatic properties. Meanwhile, the leaf has anti-inflammatory and choleric activities. It can be helpful for diabetes, hypertension, irritable bowel syndrome, dyspepsia, and ovarian androgen excess.	Asteraceae	(83)
74	<i>Tephrosia purpurea</i> (L.) Pers. Herb	Dhamosa, Sarphonka	Bhils Garasia Saharia Gadolia- Lohar	Root	β -sitosterol Lupeol Purpurin Purpurenone	The powder made from the root, along with black pepper, is ingested to treat snake venom, acts as an anthelmintic for children, and treats enlarged liver. It is also used as a blood purifier. A paste made from the leaves is applied topically to treat piles and leprosy.	Fabaceae	(84)
75	<i>Trachelospermum jasminoides</i> (Lindl.) Lem. Shrub	Star jasmine	Gadolia Lohar	Leaves Stems	Lignans Triterpenoids Flavonoids	Star Jasmine is great for seniors. It has various medicinal properties, including anodyne, antibacterial, analgesic, anti-rheumatic, depurative, antispasmodic, resolvent, emmenagogue, tonic, febrifuge, and vasodilator. The leaf also has restorative and tonic properties.	Apocynaceae	(6)

76	<i>Trigonella foenum-graecum</i> L. Herb	Methi	Kathodia Lohar	Leaves Seeds	Phenols	Consuming seeds mixed with food can reduce blood sugar levels, and intake of powdered seeds can alleviate menstrual pain in females.	Fabaceae	(85)
77	<i>Verbesina encelioides</i> (Cav.) Benth. & Hook. f. ex A. Gray Herb	Jungli surajmukhi	Bhil Meena	Flowers Leaves	Alkaloids Flavonoids Tannin Saponin	Helps in curing Spider bites, gum sores, and hemorrhoid therapy	Asteraceae	(86)
78	<i>Wrightia tinctoria</i> R. Br. Tree	Shwetha kutaj	Lohar	Seed Leaves Fruit Latex Root	Alkaloids Triterpenoids Steroids Flavonoids Lipids Carbohydrates	Helps treat boils, blisters, wounds, fever, dandruff, and headache. Helps in easy delivery, cures mouth ulcers, epilepsy, psoriasis, sore throat, skin diseases, cough, and toothache, and has aphrodisiac properties	Apocynaceae	(87)

Ethnic value of Apocynaceae species in Rajasthan

In India, several plant species are of little economic value but are still grown for their ornamental beauty or medicinal properties. Some of these plants include *Alstonia scholaris* (L.) R. Br., which is a small tree grown for its ornamental value and carvings made from its light wood. *Beaumontia grandiflora* Wall., and *Beaumontia jerdoniana* Wight are both climbing shrubs that are highly valued for their large white fragrant flowers. *Anodendron paniculatum* A. DC. is another plant that possesses medicinal properties, particularly in its leaves and roots. *Carissa carandas* L. is a spiny shrub that is widespread throughout India and is grown for its sour edible fruits, which are often used in pickles. It also makes a great hedge. *Carissa grandiflora* (E. Mey.) A.DC., *Carissa spinarum* L., and *Carissa arduina* Lam. are all spiny shrubs that are grown for their edible fruits and ornamental value. *Landolphia kirkii* Dyex ex Hoof. f is a plant whose latex is used to make rubber, and its leaves have hook tendrils. *Ichnocarpus frutescens* (L.) W. T. Aiton is a twining ornamental shrub that is commonly used for baskets, making ropes, and fishing traps. Its leaves also have medicinal properties. *Nerium indicum* L. is a shrub that is grown for its ornamental value and as a hedge plant. It also possesses medicinal properties. *Plumeria rubra forma acutifolia* L. is another ornamental plant that possesses several medicinal properties. Its flowers and fruits yield a blue dye, and its bark and seeds also possess medicinal properties. *Wrightia tinctoria* R. Br. is a plant that yields a blue dye from its flowers and fruits, and its bark and seeds also possess medicinal properties. *Wrightia tomentosa* (Roxb.) Roem. & Schult. is a plant whose seeds yield a yellow dye, and its leaves and fruits are also edible. Its soft wood is often used for carvings. *Aganosma dichotoma* (Roth). K. Schum. is a climbing shrub that is grown for its ornamental value in gardens (88).

Ethnic value of Asteraceae species in Rajasthan

The Asteraceae family represents a crucial resource for food and other valuable products. *Helianthus tuberosus* L. and *Lactuca sativa* L. are edible, and other species are cultivated for their nutritional value. The oil produced from species such as sunflower and safflower is a prime

example of the Asteraceae's potential as a food source. Additionally, Asteraceae plants are known to produce essential oils that are used in aromatherapy, containing flavonoid and terpenoid derivatives that demonstrate anti-amebic properties and can reduce the risk of infections caused by *Leishmania*, *Trypanosoma*, and *Plasmodium*. Even the leftover plants after the extraction of cooking oil have their uses. The cake is highly nutritious and is used as animal fodder. Many species belonging to the Asteraceae family have medicinal properties. For instance, *Artemisia* spp. produces santonin, which possesses cooling effects and relieves digestive issues and bowel disorders. In addition, some Asteraceae species can help alleviate asthma and cure bleeding piles and coughs. These compounds also have stimulant and appetizing effects that help maintain a proper diet. The beautiful flowers produced by Asteraceae plants are widely used for ornamental purposes. Flowers from species of genera *Alyssum*, *Hesperis*, and *Iberis* are grown as ornamental crops for decorating venues and occasions. The Asteraceae family is a valuable and versatile resource with numerous benefits for humans and animals (89).

Ethnic value of Fabaceae species in Rajasthan

This family is known for producing fruit with commercial value, specifically legumes or pods. However, it's worth noting that different species within this family have various other uses. For example, some species are used as dye, timber, and fodder sources. Additionally, certain species have been historically used as remedies or even poisons. These species have recently been evaluated for their potential pharmaceutical benefits (90). The legume family is known to have a diverse range of species, with an estimated number of around 17000. Some of these species, including *Cicer arietinum* L., *Phaseolus vulgaris* L., and *Cajanus cajan* (L.) Mills., are highly regarded as critical nutritional components providing protein to over 300 million individuals worldwide. These legumes are known for their ability to supply the human body with essential amino acids, making them an excellent source of protein for vegetarians, vegans, and individuals on a low-meat diet. Legumes, such as Soybean [*Glycine max* (L.) Merr.] and Peanut (*Arachis hypogaea* L.), are also widely used for

their nutritional value in the hog and poultry industries. These are responsible for over 35 percent of the world's refined vegetable oil production, making them a crucial component of the global food supply chain. In addition to their nutritional benefits, pulses are considered safe and non-toxic grains that offer a variety of medicinal applications and food supplements. They possess anti-inflammatory and antioxidant properties and have been shown to lower the risk of chronic diseases such as cancer, diabetes, and heart disease. Legumes are also known to benefit the environment by improving soil health and reducing greenhouse gas emissions (91).

Pharmacologically important Phytoconstituents of Family Apocynaceae

The family Apocynaceae has a rich history of being a source of various natural products and pharmacologic tool compounds. Several members of this family have been used in drug research and, sometimes in actual prescription drugs. One such example is cardiac glycosides, found in several genera including *Nerium*, *Apocynum*, *Cerbera*, *Thevetia*, *Acokanthera*, and *Strophanthus*. These glycosides have been known to have a direct effect on heart function. *Rauvolfia serpentina* (L.) Benth. ex Kurz, commonly known as Indian snakeroot, is another member of this family found to contain the alkaloid reserpine. Reserpine was found to be used as both an antipsychotic and antihypertensive drug, although its clinical use is limited due to its adverse effects. For the treatment of Cancer *Catharanthus roseus*, also known as Madagascar periwinkle, yields alkaloids. *Tabernaemontana undulata* R.Br. ex Roem. & Schult., *Tabernanthe iboga* Baill., and *Voacanga Africana* Stapf are genera that have the alkaloid called ibogaine. Ibogaine is a psychedelic drug that is believed to help with drug addiction, however, its use is limited due to the significant adverse effects that it can cause. In fact, ibogaine is both cardiotoxic and neurotoxic. Ajmalicine is an alkaloid found in *Mitragyna speciosa* (Korth.) Havil., *Catharanthus roseus* (L.) G. Don and *Rauvolfia spp.*, is yet another example of a natural product found in Apocynaceae that has been used as an antihypertensive drug in the field of pharmaceuticals (92).

Pharmacologically important Phytoconstituents of Family Asteraceae

Phytochemicals are the compounds found in plants that have biological activity. These bioactive substances are classified as primary or secondary phytochemicals based on how they affect plant metabolism. Primary phytochemicals include chlorophylls, amino acids, proteins, and sugars; secondary phytochemicals include terpenoids, tannins, alkaloids, phenolic compounds, saponins, and flavonoids (93). The phytochemical screening of *Tridax procumbens* L., a wild Asteraceae plant, revealed the presence of carotenoids, luteolin, β -sitosterol, alkaloids, quercetin, flavonoids, fumaric acid, n-hexane, luteolin, glucoluteolin, rutin, ester, myristic acid, dexamethasone, lauric acid, palmitic acid, tannin, arachidic, and linoleic acid. These findings support the plant's ability to heal wounds and have hepatoprotective, hypotensive, anticancer, and antidiabetic effects (94). A

weed called *Ageratum conyzoides* L. is known for its healing properties, used to treat burns, wounds, bacterial infections, headaches, pneumonia, and more. It contains many chemical compounds such as terpenoids, sterols, and benzofurans, and has pharmacological activities. *Bidens pilosa* L. is a plant that contains 301 phytochemical compounds including phenolic acids, phytosterols, terpenes, flavonoids, fatty acids, essential oils, and polyacetylenes. The pharmacological activity of the plants depends on these chemical constituents (95). Weeds belonging to a particular family have been traditionally known for their medicinal properties and have been used for treatments. However, their use in the pharmaceutical sector has been limited due to insufficient knowledge, awareness, and screening. It's worth noting that certain plants that are commonly known as weeds can prevent soil erosion, offer nourishment to wildlife and birds, and act as a substantial resource for medicinal purposes. Many plants from this category are present in semi-arid regions located in subtropical and lower temperate latitudes. Rajasthan boasts various plant species that grow naturally in areas such as roadside areas, railway tracks, cultivated fields, forests, and barren lands. These plants add to the region's natural beauty and play a crucial role in the local ecosystem.

Pharmacologically important Phytoconstituents of Family Fabaceae

The Leguminosae family has the remarkable ability to synthesize a diverse range of natural products including dyes, flavors, and poison. These plants are also highly valued for their medicinal properties, making them an essential medical resource (95). Polyphenols are a group of naturally occurring compounds commonly found in many plants, particularly in fabaceous plants. These compounds include Protocatechuic acid, Gallic acid, Epicatechin, Caffeic acid, Resveratrol, Rutin, Sitamata, Ferulic Acid, Rosmarinic acid, Coumaric acid, Quercetin, and others. Polyphenols have been found to possess various potential health benefits, including anti-inflammatory and antioxidant properties. They are also associated with a reduced risk of chronic diseases, such as cancer, cardiovascular disease, and diabetes (96). Legumes, such as beans, peas, and lentils, contain a variety of bioactive secondary metabolites in their leaves and seeds. These compounds are stored in different plant parts, including the vacuoles, cuticles, and resin ducts (96). Among these compounds are flavonoids, triterpenes, aldehydes, and lipids, which are in significant concentrations. Legumes contain a chemical complex with nitrogen that comp alkaloids and amines, such as glucosides, phenylethylamine, imidazole alkaloids, and tryptamine derivatives (97). Legumes contain natural antioxidants such as polyphenols, carotenoids, and vitamins. These antioxidants have medicinal uses for major diseases such as cancer and cardiovascular diseases. Antioxidants are essential in preventing human disorders. They perform various functions such as quenching singlet oxygen, reducing agents, scavenging free radicals, and eliminating pro-oxidant metals. Butylated Hydroxyanisole (BHA) and butylated Hydroxytoluene (BHT), two artificial antioxidants, are considered carcinogenic, so their use in

food is restricted. Because of this, scientists have concentrated on natural compounds found in the kingdom of plants and natural antioxidants found in crude extracts. A study on the Fabaceae family discovered that the secondary metabolites extracted from this plant family exhibit various biological activities such as anticancer, antidiabetic, antidiuretic, and anti-inflammatory. Pyrrolizidine alkaloids, a secondary metabolite commonly found in Fabaceae plant extracts, possess antiviral, hepatotoxic, and neuroactive properties (98).

Cultural Importance Index of Medicinal Plants and its use in Rajasthan

The Cultural Importance Index (CI) is a metric that quantifies the cultural significance of a particular species in a given locality. By calculating the Use Report (UR) of the species in each use category and dividing it by the number of participants (N) in that locality (99), the CI of each species in that locality is obtained. In addition, the mean Cultural Importance Index (mCI) of each species is carefully selected. Finally, the Cultural Significance Index (CI_f) is determined by adding up the CI of all the species in that family. The Cultural Importance Index serves as a valuable tool in identifying culturally significant plants or species within a given community. It provides a ranked list of important plants, enabling researchers to understand the cultural value and significance of plants within a community.

Discussion

After conducting an in-depth analysis of the floral diversity present among the tribal population of Rajasthan, it was observed that the extensive knowledge of these families regarding ethnobotanical uses has paved the way for the development of new natural source therapies that can offer long-term solutions for a wide range of ailments. The process of knowledge discovery has led to the extraction of numerous components of metabolites that possess significant industrial and pharmacological value. However, the conventional wisdom that has been passed down through generations is at risk of being lost due to the rapid pace of urbanization, and it is crucial to consider conservation strategies to preserve this valuable information.

The depletion of forest resources and the departure of tribal populations raises a critical question as to whether their absence will have a positive or negative impact. Despite human negligence towards the reality of the situation and the need for survival, the most important thing that needs to be addressed is whether we are taking the right steps to handle forest resources ethically and honestly, despite the skewed desires of humans. This urgency is because the beneficent forest may be hiding something valuable that could be lost to future generations, a world that has yet to be discovered. Besides the fundamental dispute, the discovery of hidden wealth requires a prolonged and meticulous scientific investigation that can lead to the development of new avenues for disease remedies, while also corroborating the age-old knowledge of the tribes (100).

Conclusion

Rajasthan is home to a diverse population of tribal communities who possess a wealth of knowledge regarding the ethnobotanical uses of various plant species. Among the families of plants that are found in this region, Apocynaceae, Asteraceae, and Fabaceae are particularly noteworthy due to their diverse range of species that contain essential phytochemicals with potent medicinal and industrial properties. To further harness the benefits of these medicinal plants, concerted efforts are being made to increase their yield and understand their activities at the molecular level. However, given the increasing threat of climate change and habitat destruction, it is crucial to restore and maintain conservational paths that will ensure the survival of these plant species for future generations.

Acknowledgements

The authors would like to express their profound gratitude to the esteemed Vice-Chancellor of Banasthali Vidyapith, Prof. Ina Aditya Shastri, for her invaluable support and unwavering encouragement. We also acknowledge the Department of Science and Technology (DST) for generous networking support through the FIST program at the Department of Bioscience and Biotechnology, Banasthali Vidyapith. Furthermore, we sincerely thank the Bioinformatics Center at Banasthali Vidyapith, funded by the Department of Biotechnology (DBT), for their contribution.

Authors' contributions

SKS carried out the completion of the manuscript. The manuscript was checked and reviewed by AA. All authors read and approved the final transcript of the manuscript.

Compliance with ethical standards

Conflict of interest The authors declare no conflicts of interest associated with this paper.

Ethical issues: None.

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