



RESEARCH PAPER

OPEN ACCESS

Survey of Ethnomedicinal Plants at Sacred Grove (Bherunath Ji Bani) Located at Alwar District of Rajasthan

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Received:

2025/03/01

Accepted:

2025/03/24

Published:

2025/04/02

Abstract

The current study shows a survey of ethnomedicinal plants in a popular sacred grove, Bherunath Ji Bani, located in the Alwar district of Rajasthan, India. The study shows that Bherunath Ji Bani inhabits 99 different plants belonging to 45 different families and 80 unique genera. The highest number of plants belonged to Fabaceae (17), Malvaceae (12), Asteraceae (8), Euphorbiaceae (7), Moraceae (6), Mimosaceae (5), Caesalpiniaceae (4), Solanaceae (4) and Tiliaceae (3) followed by others. The enlisted plants belonged to 15 different habits, including, Herb (51), Tree (31), Shrub (15), Large tree (7), Erect herb (2), Twining shrub (1), Small tree (1), Evergreen tree (1), Climbing shrub (1), Grass (1), Annual herb (1), Large herb (1), Prostrate herb (1), Shrub like grass (1), Climber shrub (1). The study shows various forms in which ethnomedicinal plants can be used for curing various ailments, including fresh plant material including juices or crushed leaves, dried plant material including powders and teas, infusions, decoctions, ointments, essential oils, poultices, plant extracts and several other forms, in order to cure ailments of different systems of the body.

Keywords: Bherunath ji Bani; Sacred grove; Ethnomedicinal plants; Fabaceae; Malvaceae

Introduction

The state of Rajasthan is renowned across the world for its vibrant cultural heritage and natural beauty inhabiting the most iconic forts and palaces constructed in Rajput era, traditional arts and crafts showcasing exquisite forms of embroidery, colourful festivals and flairs, breathtakingly diverse landscapes including desert, Aravali range and wildlife sanctuaries, architectural marvels and rich culinary delicacies. Apart from these, despite its semi-arid climatic conditions, harbours a rich animal and plant biodiversity, inhabiting more than 70 species of mammals, 500 species of birds, 70 species of reptiles, amphibians and birds, while more than 1000 species of flowering plants and 300 species of trees, herbs, shrubs and grasses have been reported. Rajasthan has been home to a number of tribal communities, including, Bheels, Meenas, Gonds, Kols, Siddis, Rathwas, Pardhis, Lohars, Banjaras and Jaats, who have played a major role in conservation of plant and animal biodiversity across the state (Krishna et al., 2014; Sharma, 2013; Singh et al., 2022; Dunkwal et al., 2014; Kumari and Joshi, 2023; Bairwa, 2024).

People belonging to these ancient tribes have been actively involved in preserving environmental biodiversity owing to various practices that are deeply rooted in their cultural and spiritual beliefs and have profound impact on the local ecosystems. These practices include the establishment of sacred groves and their maintenance by tribals belonging to Bhils, Meenas and Garasias, protecting these groves from different forms of exploitation by humans and animals, while conserving several plant species, ethnobotanical knowledge and practise encompassing culinary and medicinal uses ensuring selective harvesting of important plant species, community-based conservation by village forest communities, comprising a formulation of stringent laws and regulations to preserve plant biodiversity, agroforestry and mixed cropping to maintain diverse plant ecosystem, ceremonial planting during festivals to aid in reforestation, conservation of endangered species of plants for medicinal or cultural practices and transmission of knowledge about environment conservation by



elders to younger generations (Prasad et al., 2021; Pandey et al., 2017; Malhotra et al., 2001; Kapur et al., 2016; Shrimali et al., 2021; Nair and Mathew, 2024).

However, the last few years have been dominated by increased globalization and industrialization and have been a great setback to the rich plant and animal biodiversity of the region, owing to several reasons, including, habitat destruction, climate change and extreme weather events; introduction of invasive species; air, water and soil pollution; overexploitation; faulty agricultural practices; usage of chemical fertilizers and pesticides as well as loss of ecosystem services.

In this context, the current study has been crafted to highlight the pivotal role of sacred groves in the conservation of plant biodiversity in Rajasthan. The study highlights the rich plant biodiversity of a sacred groves of Rajasthan- Bherunath Ji Bani, located in the Alwar district of Rajasthan, India, wherein the sacred groves have been elucidated to inhabit a huge number of medicinal plants.

Material and methods

Study area

Bhrunath Ji Bani is a popular sacred grove in Alwar district of Rajasthan. It covers 40 hectares area near Bakhtpura village, Alwar. It is located between 27.539114° N to 76.505525° E. The main deity is Bheru Baba in the temple with a popular pond. It is rich with various plant species like *Anogeissus pendula*, *Butea monosperma*, *Grewia hirsuta*, *Zizyphus mauritiana*, *Calotropis procera*, *Capparis decidua*, *Balanites egyptiaca* etc.

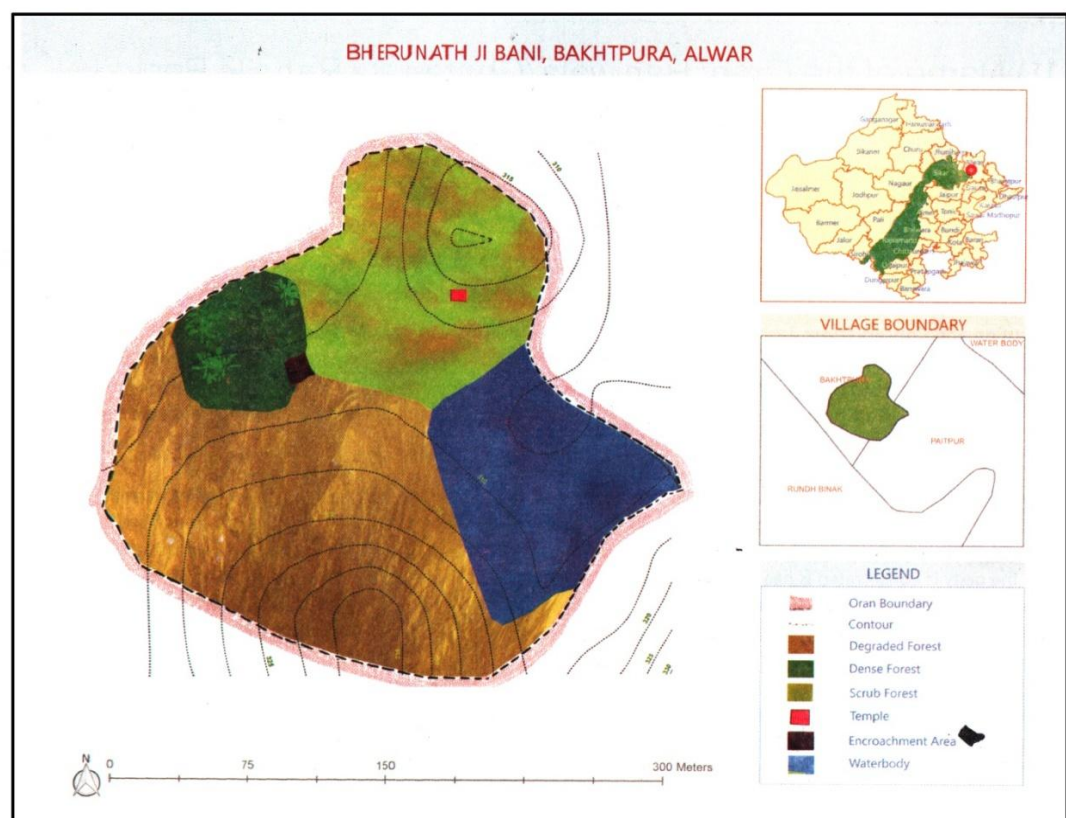


Fig. 1. Map of the study area (Singh and Bathla, 2021)

Survey and data collection

A list of plants utilized for various medicinal purposes was prepared after frequent surveys and interaction with local people. Tribal people were interviewed about their knowledge of using plant parts for treating any ailment and about the procedure of taking that. During the survey, photographs were collected and plants were identified using local knowledge, and confirmed by Flora of Rajasthan (Shetty and Singh, 1987; Bhandari, 1995).

Results and discussion

Studies conducted by ethnomedicinalists on sacred groves demonstrate the complex interrelationship between cultural practices and biodiversity, emphasizing the role that these places play as essential repositories of traditional knowledge and medicinal plants. According to research, communities frequently keep sacred groves because of their spiritual value while also using the varied flora to make herbal medicines for a range of health problems (Bhan et al., 2018).

As an illustration of the close ties between cultural identity and medical practices, certain plants in these groves may be used in regional healing rituals (Kumar et al., 2020). Numerous species with therapeutic potential have been identified by ethnobotanical surveys, highlighting the necessity for conservation measures since many medicinal plants are threatened by habitat destruction and climate change (Tiwari et al., 2021). Researchers not only get important insights into sustainable practices by examining these sacred areas, but they also emphasize how important it is to preserve both natural and cultural legacy (Mishra et al., 2019).

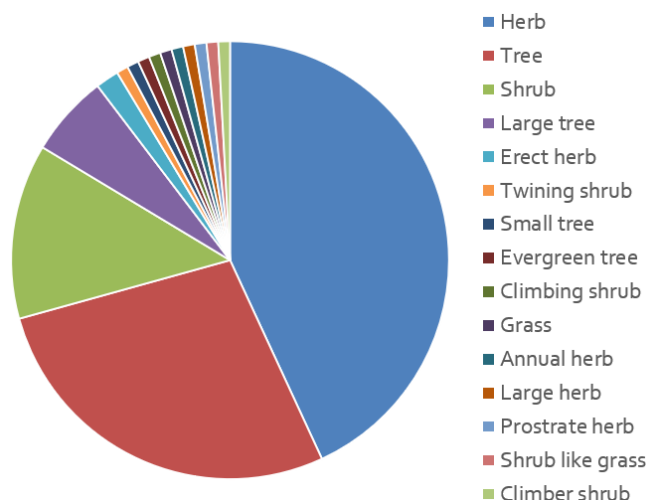


Fig. 1. Habit-wise distribution of plants at Bherunath Ji Bani

The current study shows a survey of ethnomedicinal plants in a sacred grove of Rajasthan-Bherunath Ji Bani, located in Alwar district of Rajasthan, India. The study mentioned in Table 1 which enlists the scientific name, family name, common name, habitat and ethnomedicinal uses of the specified plant. It shows a total of 99 plants belonging to 45 different families and 80 unique genera. The plants enlisted in table 1 belonged to 45 families, including, Fabaceae, Malvaceae, Moraceae, Euphorbiaceae, Acanthaceae, Lamiaceae, Caesalpiniaceae, Steraceae, Nyctaginaceae, Poaceae, Asclepiadaceae, Convolvulaceae, Zygophyllaceae, Anacardiaceae, Rutaceae, Mimosaceae, Achyranthaceae, Pteridaceae, Cornaceae, Meliaceae, Papaveraceae, Burseraceae, Capparaceae, Colchicaceae, Ulmaceae, Verbenaceae, Linderniaceae, Arecaceae, Myrtaceae, Rhamnaceae, Simaroubaceae, Saptoaceae, Apocynaceae, Combretaceae, Bombacaceae, Burceraceae, Liliaceae, Vitaceae, Bambusaceae, Ebenaceae, Tiliaceae, Sterculiaceae and Cucurbitaceae. The highest number of plants belonged to Fabaceae (14), Malvaceae (6), Moraceae (5), Euphorbiaceae (4), Acanthaceae (4) and Lamiaceae (4) followed by others. The enlisted plants belonged to 7 different habits, herbs (28), trees (17), shrubs (12), climbers (2), small tree (2), twining shrub (1), climbing shrub (1), large herb (1) and annual herb (1) respectively. The enlisted plants can be used to cure ailments of different systems of the body, including the digestive system, cardiovascular system, respiratory system, immune disorders, musculoskeletal system, nervous system, skin disorders, endocrine system, reproductive system, metabolic disorders, urinary system and blood disorders.

S. No.	Species	Family	Local Name	Habit	Medicinal uses
1	<i>Abrus precatorius</i>	Fabaceae	Gunja	Twining shrub	Used in headaches and seed is used in hair fall and inflammation
2	<i>Abelmoschus manihot</i>	Malvaceae	Jangli Bhindi	Herb	Flowers are used to treat toothache
3	<i>Abutilon indicum</i>	Malvaceae		Herb	Helps in colds, earaches, and lung problems
4	<i>Acacia catechu</i>	Mimosaceae	Kala Khair	Small tree	The root is used for skin problems and used as a mouthwash for mouth and gums
5	<i>Acacia leucophloea</i>	Mimosaceae	Rouch	Tree	Used to treat malaria, stomachache and toothache

6	<i>Acacia nilotica</i>	Mimosaceae	Babul	Tree	Useful in stomachaches and diarrhoea
7	<i>Acacia senegal</i>	Mimosaceae	Safed Khair	Tree	Gum anti-diarrhoeal, reduce cholesterol level
8	<i>Acanthospermum hispidum</i>	Asteraceae	Gokhru, Gondhichedi	Herb	Used in jaundice, constipation, fever, Skin diseases, cough, fever and snake bite
9	<i>Achyranthes aspera</i>	Achyranthaceae	Unga, Chipchipi	Erect herb	Used to treat asthma, cough, wounds, snake bite, and dog bites
10	<i>Actiniopteris dichotoma</i>	pteridaceae	Mayura shikki	Herb	Antihelmintic, antibacterial, used in leprosy
11	<i>Aegle marmelos</i>	Rutaceae	Bel	Tree	Used in diabetes, stomachache, vomiting and gastric ulcers
12	<i>Albizia lebbek</i>	Mimosaceae	Siris	Large Tree	Leaves used in cough, toothaches and allergy
13	<i>Anogeissus latifolia</i>	Crassulaceae	Dhok	Large tree	Used in cough, cold, diarrhoea, snake bite
14	<i>Anogeissus pendula</i>	Crassulaceae	Safed Dhok	Tree	Used to treat gastric
15	<i>Argemone mexicana</i>	Papaveraceae	Kateli	Erect herb	Used in skin diseases, jaundice, and microbial infections
16	<i>Azadirachta indica</i>	Meliaceae	Neem	Evergreen tree	Leaves are used for wounds, skin problems, and burns. Seed is beneficial for hair growth, twig as a toothbrush and in measles. helps in brain, liver, and oral health
17	<i>Balanites aegyptiaca</i>	Balanitaceae	Hingot	Tree	Seed is used to treat ear problems, bark is treat dog bite and hemorrhoids
18	<i>Barleria cristata</i>	Acanthaceae.	Vajradanti	Herb	Root used in anemia, swellings, leaves in toothache and cough
19	<i>Barleria prionites</i>	Acanthaceae	Vajradanti	Herb	Useful in stomach problems, fever, and root paste in swellings. Complete plant with honey is given for asthma
20	<i>Blumea lacera</i>	Asteraceae	Kakranda	Herb	Anti-inflammatory, anti-diarrheal, antipyretic, stimulant, Vermifuge
21	<i>Boerhavia diffusa</i>	Nyctaginaceae	Punernava	Herb	Used in jaundice, cataracts, blood purification, ulcers, and Root is used in night blindness.
22	<i>Bombax ceiba</i>	Bombacaceae	Rogal	Tree	Decoction of the bark is given in fever, used in constipation, piles
23	<i>Boswellia serrata</i>	Burceraceae	Salar	Tree	Used in inflammation, skin disorders, asthma, rheumatism, wounds
24	<i>Bauhinia racemosa</i>	Caesalpiniaceae	Kachnar	Small tree	Root bark in inflammation, seeds as a tonic, leaves in headache
25	<i>Bridelia retusa</i>	Euphorbiaceae	Ungna	Small tree	Bark-astringent, used in urinary infection, and wounds
26	<i>Butea monosperma</i>	Fabaceae	Chhila	Small tree	Helps in leucoderma. Flowers are used to treat ulcers, itch, and herpes

					treated by plant juice and oil. Root used in snake bite
27	<i>Calotropis gigantea</i>	Asclepiadaceae	Aakda	Shrub	Used in skin disease, inflammation, asthma, wound healing, and joint pain.
28	<i>Calotropis procera</i>	Asclepiadaceae	Aakda	Shrub	Antidote for snake bite, used in mumps, burn, injury
29	<i>Capparis decidua</i>	Capparidaceae	Keri, Teti	Small tree	Fruit and bark decoctions are used in ulcers, cough, asthma and stomachache, rheumatism; scurvy treat by dried buds
30	<i>Capparis sepiaria</i>	Capparidaceae.	Jal	Shrub	Used in inflammation, diabetes, tumor, and bacterial diseases
31	<i>Cassia fistula</i>	Caesalpiniaceae	Amaltas	Small tree	Leaves used in skin irritation, fruit used in stomachache, wounds
32	<i>Cassia sophera</i>	Caesalpiniaceae	Pawar	Large herb	Leaves antiasthmatic, anti-inflammatory, antioxidant
33	<i>Cassia tora</i>	Caesalpiniaceae	Pawar	Herb	Used in skin diseases, seeds help in improve eyesight, anti-inflammatory
34	<i>Celosia argentea</i>	Amaranthaceae	Dhudi	Herb	Seeds used to treat dysentery, antibacterial, flower-depurative, astringent, uterine sedative.
35	<i>Centella asiatica</i>	Apiaceae	Brahmi-buti	Herb	Used in wounds, skin diseases, brain health
36	<i>Chlorophytum tuberosum</i>	Liliaceae	Musli	Annual herb	Root tubers in kidney stones
37	<i>Cissus quadrangularis</i>	Vitaceae	Harjadi	Climbing shrub	skin irritation, anti-inflammatory, antioxidant, wound healing
38	<i>Cleome viscosa</i>	Cleomaceae	Jakhya, Hulhul	Herb	Worm infection, skin diseases, antidiarrheal, Rheumatic, arthritis
39	<i>Corchorus aestuans</i>	Tiliaceae	Titpatti	Herb	Used in fever and stomachache
40	<i>Corchorus olitorius</i>	Tiliaceae	Kosta	Herb	Anti-tumorous
41	<i>Cordia dichotoma</i>	Ehretiaceae	Lisoda	Small tree	Used in cough, ulcer
42	<i>Cynodon dactylon</i>	Poaceae	Dubghas	Grass	Juice applied on cuts and wounds and help in migraine. Used in stomach diseases.
43	<i>Dalbergia latifolia</i>	Fabaceae	Shisam	Tree	Juice of leaves cure ulcer and used as gargles in sore throat. bark in worm infection, diarrhoea
44	<i>Dendrocalamus strictus</i>	Bambusaceae	Bas	Tree	Anti-oxidant, fever
45	<i>Desmodium gangeticum</i>	Fabaceae	Salpalnu	Herb	Cough, tonic, digestive, anti-inflammatory, asthma, eye infection, vomiting and fever
46	<i>Desmodium heterocarpon</i>	Fabaceae	Sarivan	Herb	Asthma, Fever, anti-inflammatory, tonic
47	<i>Diospyros melanoxylon</i>	Ebenaceae	Tendu	Tree	Astringent, anti-diabetic, used in skin diseases, diuretic, laxative

48	<i>Eclipta alba</i>	Asteraceae	Bringaraj	Herb	Used in burn, skin irritation. Leaf promotes hair growth. Its extract in oil is used in insomnia
49	<i>Emblica officinalis</i>	Euphorbiaceae	Amla	Tree	Used to cure jaundice. Anti-inflammatory, anti-diarrheal, used in stomachache, anti-diabetic
50	<i>Euphorbia hirta</i>	Euphorbiaceae	Dudhiya Rokdi	Herb	Asthma, cough, jaundice, fever, menstrual problems
51	<i>Ficus benghalensis</i>	Moraceae	Bargad	Tree	Anti-diabetic, Leaves and bark used in skin disorders
52	<i>Ficus racemosa</i>	Moraceae	Gular	Tree	Used as an astringent and antiseptic, for urinary problems, skin disorders, swellings antidiarrheal. Root and fruit-hypoglycemic, anti-inflammatory
53	<i>Ficus religiosa</i>	Moraceae	Pipal	Tree	Astringent, antiseptic, anti-diabetes, anti-diarrheal, used in ulcer and wounds
54	<i>Grewia flavescens</i>	Tiliaceae	Chapun	Shrub	Stomach problems, anti-inflammatory
55	<i>Helicteres isora</i>	Sterculiaceae	Maror	Shrub	Diarrhoea, piles, cough, asthma, skin diseases, seed extract in colic, and dysentery
56	<i>Holoptelea integrifolia</i>	Ulmaceae	Papdi	Tree	Anti-inflammatory, used in worms, skin problems, diabetes, rheumatism, fatness
57	<i>Ipomoea nil</i>	Convolvulaceae	Kaladana	Herb	Laxative, Respiratory problems, abdominal disorder
58	<i>Ipomoea pes-tigridis</i>	Convolvulaceae	Kaladana	Herb	Rheumatism, inflammation, hypertension, skin diseases, burns
59	<i>Kydia calycina</i>	Malvaceae	Phuilau, Pulao	Tree	Swellings, body pain, boils, anti-diabetic, increases saliva, anti-inflammatory
60	<i>Lansea coromandelica</i>	Anacardiaceae	Gurjan	Tree	Leaves given in diabetes, ulcers, cardiac diseases
61	<i>Lantana camara</i>	Verbenaceae	Lalten	Shrub	Leaves help in hemorrhoids, asthma
62	<i>Mallotus philippensis</i>	Euphorbiaceae.	Rohni, Roli	Small Tree	Used in worms, ringworm, antibacterial
63	<i>Mangifera indica</i>	Anacardiaceae	Aam	Tree	Mango leaf extract is useful in diarrhea, diabetes, liver disorders
64	<i>Milium tomentosum</i>	Annonaceae	Bakayan	Small tree	Fruits are used to cure respiratory diseases, and anti-bacterial
65	<i>Mitragyna parvifolia</i>	Rubiaceae	Kaddam	Tree	Bark and root are used to treat fever, colic, muscle pain, burns, cough
66	<i>Momordica balsamina</i>	Cucurbitaceae	Karela	Herb	Fruit used on burns, antibacterial, antifungal, hypoglycemic
67	<i>Morus alba</i>	Moraceae	Sahtut	Small tree	Used in diabetes, colds, sores, chronic fever,

					dental problems, inflammations
68	<i>Mucuna pruriens</i>	Fabaceae	Kouch	Climber shrub	Anti-diabetic, Root used to treat skin problems and Parkinson's disorder
69	<i>Naringi crenulata</i>	Rutaceae	Banasa Kaith	Small tree	Anti-diarrheal, anti-asthmatic, anti-tumors, used to treat wounds, cough, and headache.
70	<i>Nicotiana tabacum</i>	Solanaceae	Tambaku	Herb	Leaves are helpful in sores, and skin disorders. Also useful for rheumatism. Not used internally as a medicine
71	<i>Nyctanthes arbor-tristis</i>	Nyctanthaceae	Har singar	Small tree	Swellings, hypertension, asthma. fevers, rheumatism,
72	<i>Ocimum basilicum</i>	Lamiaceae	Manbawchi	Herb	fever, cough, worm infection, skin problems and piles
73	<i>Ocimum sanctum</i>	Lamiaceae	Tulsi	Herb	Helpful in catarrh, skin diseases, cough, urinary problems, fever
74	<i>Opuntia elatior</i>	Cactaceae	Takna thour	Shrub	Antidiabetic, skin problems and eye problems
75	<i>Phoenix sylvestris</i>	Arecaceae	Khajur	Small tree	Good in heart complaints, stomach problems, chronic fevers, vomiting and mental problem
76	<i>Phyllanthus niruri</i>	Euphorbiaceae	Hajardane	Herb	Extract of young shoots given in dysentery. anti-diabetic, skin diseases, urinary problems
77	<i>Pongamia pinnata</i>	Fabaceae	Karanj	Tree	Seed powder is used to cure dandruff problems; Leaf juice is used in migraine
78	<i>Prosobis julifera</i>	Mimosaceae	Vilayati babul	Small tree	Leaves used in fever and antimicrobial, worm infection
79	<i>Ricinus communis</i>	Euphorbiaceae	Arandi	Shrub	Antibacterial, antifungus, insect repellent
80	<i>Sida acuta</i>	Malvaceae	Kristi	Herb	Used in headaches, malarial fever, skin diseases
81	<i>Sida cordifolia</i>	Malvaceae	Krasti	Herb	Used in cold, flu, headache and nasal congestion
82	<i>Sida rhombifolia</i>	Malvaceae	Krasti	Herb	Used in fever, heart diseases, and inflammations.
83	<i>Solanum xanthocarpum</i>	Solanaceae	Kateri, Ringni	Herb	Used for cough, asthma, fever, heart diseases
84	<i>Soymida febrifuga</i>	Meliaceae	Rohan	Shrub	Bark is used in dental problems, and sore throat.
85	<i>Sterculia urens</i>	Sterculiaceae	Katira, Kaday	Large tree	Anti-diarrhoeal, used for throat problems and fever
86	<i>Syzygium cumini</i>	Myrtaceae	Jamun	Tree	The bark is astringent and used in sore throats, purifying blood the fresh juice of bark with goat milk is given in scour
87	<i>Tephrosia pumila</i>	Fabaceae	Chhota Pawar	Herb	Anti-inflammatory, used in ringworms and cough

88	<i>Terminalia arjuna</i>	Combretaceae	Tal	tree	Bark is helpful in cardiac problems, Juice of fresh leaves juice used to treat earache.
89	<i>Terminalia bellirica</i>	Combretaceae	Baheda	Large tree	Helps cough and sore throat
90	<i>Tribulus terrestris</i>	Zygophyllaceae	Gokhru	Prostrate herb	used in heart problems, skin, and eye disorders
91	<i>Tridax procumbens</i>	Asteraceae	Gharpala	Herb	Helps in wound healing
92	<i>Vernonia cinera</i>	Asteraceae	Nili rokdi	Herb	Used in malarial fever
93	<i>Vetiveria zizanioides</i>	Poaceae	Khas	Shrub like grass	Sunstroke, fever, acidity, urinary disorders
94	<i>Vitex negundo</i>	Verbenaceae	Nigad Large	Shrub	Leaves used in cough, & plant extract used as a diuretic
95	<i>Withania somnifera</i>	Solanaceae	Asawagandha	shrub	Used in asthma, hypertension, ulcer, anti-inflammatory
96	<i>Woodfordia fruticosa</i>	Lythraceae	Ladokadi	Shrub	Cure fever, wounds, bleeding issues
97	<i>Wrightia tinctoria</i>	Apocynaceae	Dudhi, Khirni	Tree	fever, skin problem, eczema
98	<i>Ziziphus mauritiana</i>	Rhamnaceae	Beri	Tree	used in mental retardation, cold, flu, and in hair care
99	<i>Ziziphus nummularia</i>	Rhamnaceae	Jhad	Shrub	Fruit used in cold and indigestion

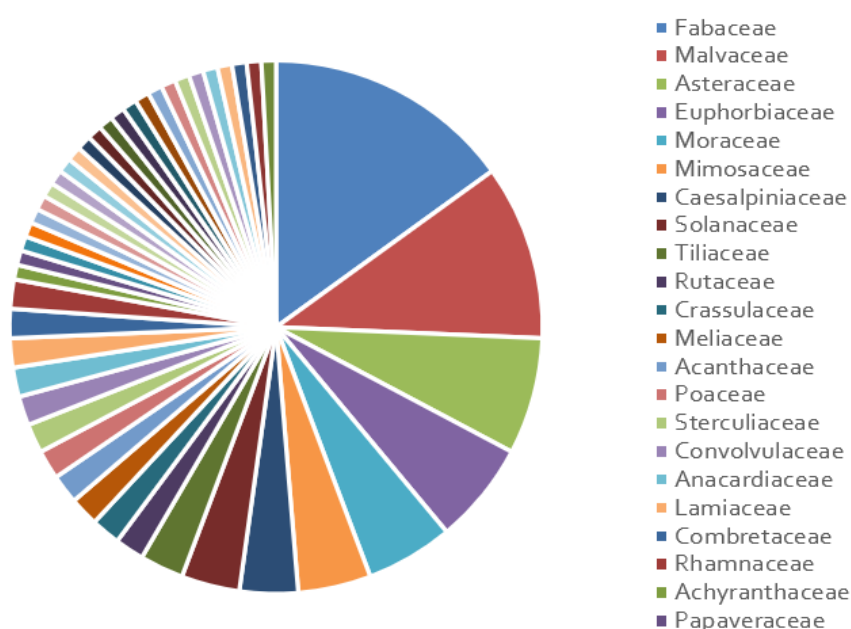


Fig. 2. Family-wise distribution of plants at Bherunath Ji Bani

.There are several forms in which ethnomedicinal plants can be used for curing various ailments including fresh plant material including juices or crushed leaves, dried plant material including powders and teas, infusions, decoctions, ointments, essential oils, poultices, plant extracts and several other forms. Several other ethnomedicinal surveys have highlighted the pivotal role of sacred groves in conservation of plant biodiversity in different areas of Rajasthan as well as Indian subcontinent (Singh, 2016; Agarwal, 2016; Pandey et al., 2017; Behera et al., 2015; Kandari et al., 2014; Yadav et al., 2010; Sharma et al., 2021; Rajesh, 2016; Singh et al., 2011; Bairwa, 2024). Similarly, several other studies have shown conservation of plant biodiversity using sacred groves at global level (Imarhiagbe et al., 2022; Mgumia et al., 2003; Ray et al., 2022; Dudley et al., 2012; Msuya et al., 2009; Sheridan et al., 2009; Muhando et al., 2005; Von Hellermann et al., 2016; Beressa et al., 2024).

Conclusion

The current study highlights that the maintenance of sacred groves is much more than just ancient traditional practices followed by tribals for their religious and cultural beliefs, and unveils the pivotal role of these sacred groves in the conservation of plant biodiversity, both at national and global levels. Our survey of the Bherunath temple area in Alwar has revealed a remarkable diversity of ethnomedicinal plants within the sacred groves. This study not only underscores the rich traditional knowledge embedded in local practices but also highlights the importance of these sacred spaces as vital reservoirs of biodiversity. The plants identified hold significant potential for medicinal applications, reflecting the deep cultural ties that communities have with their natural environment. As we face increasing threats to these ecosystems, our findings emphasize the urgent need for conservation efforts to protect both the flora and the cultural heritage associated with them. By fostering collaboration between local communities and conservationists, we can ensure the preservation of these invaluable resources for future generations, while also promoting sustainable practices that honour both ecological and cultural integrity.

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Author Contributions

S, VS and PM conceived the concept, wrote and approved the manuscript.

Acknowledgements

Not applicable.

Funding

Not applicable.

Availability of data and materials

Not applicable.

Competing interest

The authors declare no competing interests.

Ethics approval

Not applicable.



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Citation: Suman, Sharma V and Meena P (2025) Survey of Ethnomedicinal Plants at Sacred Grove (Bherunath Ji Bani) Located at Alwar District of Rajasthan. *Environmental Science Archives* 4(1): 182-192.