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Vegetational and Remote Sensing Analysis of a Sacred Grove from Sub-Mountainous Region of Punjab, INDIA

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Abstract

The Charpat Bani Sacred Grove, located in the village of Kataru Chak, District Pathankot, Punjab is a treasure trove of biodiversity, harboring 87 floral species of Trees, Shrubs, Herbs & Grasses belonging to 44 families and providing an vital habitat to variety of faunal species. The sacred grove was extensively studied for its ecological, religious & cultural significance and conservation challenges. The sacred grove is particularly abundant with naturally occurring species such as *Putranjiva roxburghii*, *Ficus racemosa*, *Mallotus philippensis*, *Murraya koenigii*, and *Murraya paniculata*. The other species like *Artocarpus lakoocha*, *Artocarpus heterophyllus*, *Butea monosperma*, *Callicarpa macrophylla*, *Coccinia cordifolia*, *Shorea robusta*, *Terminalia chebula*, *Vallis heynei*, *Ziziphus mauritiana*, *Ziziphus nummularia*, etc. are also quite endemic to the grove and very rarely found in the surrounding agricultural areas. Remote sensing analysis of the site from 1991 to 2023 by preparing Land Use Land Cover (LULC) and Normalized Difference Vegetation Index (NDVI) maps using Landsat data, revealed a predominance of dense vegetation cover within the grove, confirming its rich biodiversity and the effectiveness of community-driven conservation efforts. However, a significant increase in the built-up area within the sacred grove over the past 32 years has emerged as a major conservation challenge. The grove is promising site for eco-education and meditation, offering unique opportunities for biodiversity research, education and community engagement. The study emphasizes for need to prepare a comprehensive management plan of sacred grove involving all stakeholders and advocates for adopting principle of Nature-Based Solutions for minimal expansion of built-up area, if needed. It further recommends for designating the site as a Biodiversity Heritage Site under the Indian Biological Diversity (Amendment) Act, 2023, to secure formal recognition and protection. Through concerted efforts and scientific management practices, Charpat Bani sacred grove can serve as a model for conservation of other sacred groves of state of Punjab.

Keywords: Charpat Bani Sacred Grove, Biodiversity Conservation, Community Conservation, Biodiversity Heritage Site (BHS), Biodiversity Management Committee (BMC), LULC, NDVI, Eco-education, Ecosystem Services.

Introduction

Biodiversity and culture are deeply interconnected and this bond is particularly evident in sacred sites or sacred groves which hold religious and spiritual significance. Sacred groves represent a traditional form of community led *in-situ* conservation practice, which is largely driven by religious beliefs, customs and taboos, resulting in the preservation of immensely valuable biological resources over long periods of time (Adeyanju et al., 2022). Beyond being a source of well-being, biodiversity has also been recognized as the bedrock of cultural and spiritual identities of over 400 million members of indigenous and local communities throughout the world (Anonymous, 2010). The sacred groves serve as repositories of genetic and species diversity by harboring rare and native natural flora, act as habitats for many faunal species and also provide various ecosystem services such as nutrient recycling, carbon sequestration and microclimate regulation. These groves also harbour high diversity of medical & herbal plants as compared to their surrounding areas (Kumar and Sharma, 2018).

The global conservation target to protect 30% of the planet's land and sea areas by 2030, known as "30 x 30", under the Post-2020 Global Biodiversity Framework (GBF) of the Convention on Biological Diversity (CBD), has highlighted the importance of conserving sacred groves. These groves often exist outside conventional protected areas and lack any sort of legal protection. Therefore, conserving sacred groves through the active involvement of local communities by declaring them as Biodiversity Heritage Sites or recognizing them as Other Effective Area-based Conservation Measures (OECMs) can significantly contribute to the overarching *in-situ* biodiversity conservation objectives of the GBF (Singh et al., 2024).

Conservation of nature has long been an ancient tradition in India, with one of the best examples being the dedication of patches of natural vegetation to local deities and goddesses in the form of sacred groves (Gadgil and Vartik, 1981). Another example of such traditions is the worshipping of various tree species as representatives of Gods by different communities across various parts of India (Mahabaleshwarkar et al., 2023).

Punjab, a small state in the northwestern part of India, consists of only 1.57% of the country's total geographic area. Despite having merely 5.93% of its geographic area (50,362 sq. km) under forest cover, the state's Shivalik region, comprising the sub-mountainous zones of the Districts of Gurdaspur, Hoshiarpur, Pathankot, S.B.S. Nagar, and Ropar, is considered as biodiversity hotspot. Like in other parts of India, conservation of nature in all its forms is deeply embedded in ethos, values, traditions, culture, heritage and religious precepts of the Punjabi people. (Arora and Singh, 2022).

A total of nine prominent sacred groves have been identified in the state of Punjab based on their size, vegetation and traditions. Among these, one grove, Charpat Bani, is situated in the Lower Shiwalik Hills or Sub-Mountainous Region (Kandi Belt) of District Pathankot, which is the northern most District of the State (Singh et al., 2024). The sacred grove is of great spiritual significance to communities of surrounding areas, attracting visitors from all faiths and religions.

In the present research study, a detailed investigation was conducted from 2018 to 2022 to assess the vegetational status, cultural significance, ecological dimensions, and conservation issues of the sacred grove of Charpat Bani, District Pathankot.

Similar assessments for sacred groves located in the Mulshi region of Maharashtra revealed that local communities value these groves for economic considerations and aesthetic purposes rather than for pro-nature reasons (Vipat & Bharucha, 2014). Mahabaleshwarkar et al. in 2023 utilized remote sensing and GIS technology to analyze various land use changes over three decades for a particular sacred grove in the Pune District, located in the Western Ghats. The study on sacred groves

of Central India reported that these sites were rich in tree diversity and have high carbon stock (Dar et al., 2019). Research on sacred groves in the Kaboli forest area of Togo, highlighted that such sites have much higher tree cover and biodiversity richness compared to forest areas without sacred groves (Lynch et al., 2018).

A study on two sacred groves in the Rudraprayag District, Uttarakhand emphasized the critical role of local communities residing around these sites for their long-term conservation (Singh et al., 2017). Vegetation analysis of 12 sacred groves in the Kachchh District of Gujarat reported that compared to surrounding areas, the floral biodiversity of sacred groves was much higher, which was linked to religious beliefs and taboos (Malsatar & Mehta, 2017). The study of three sacred groves in the Kodagu District of Karnataka reported higher species richness and regeneration potential, highlighting the need for conservation of sacred groves through sustainable management strategies (Prashad & Bharathi, 2015).

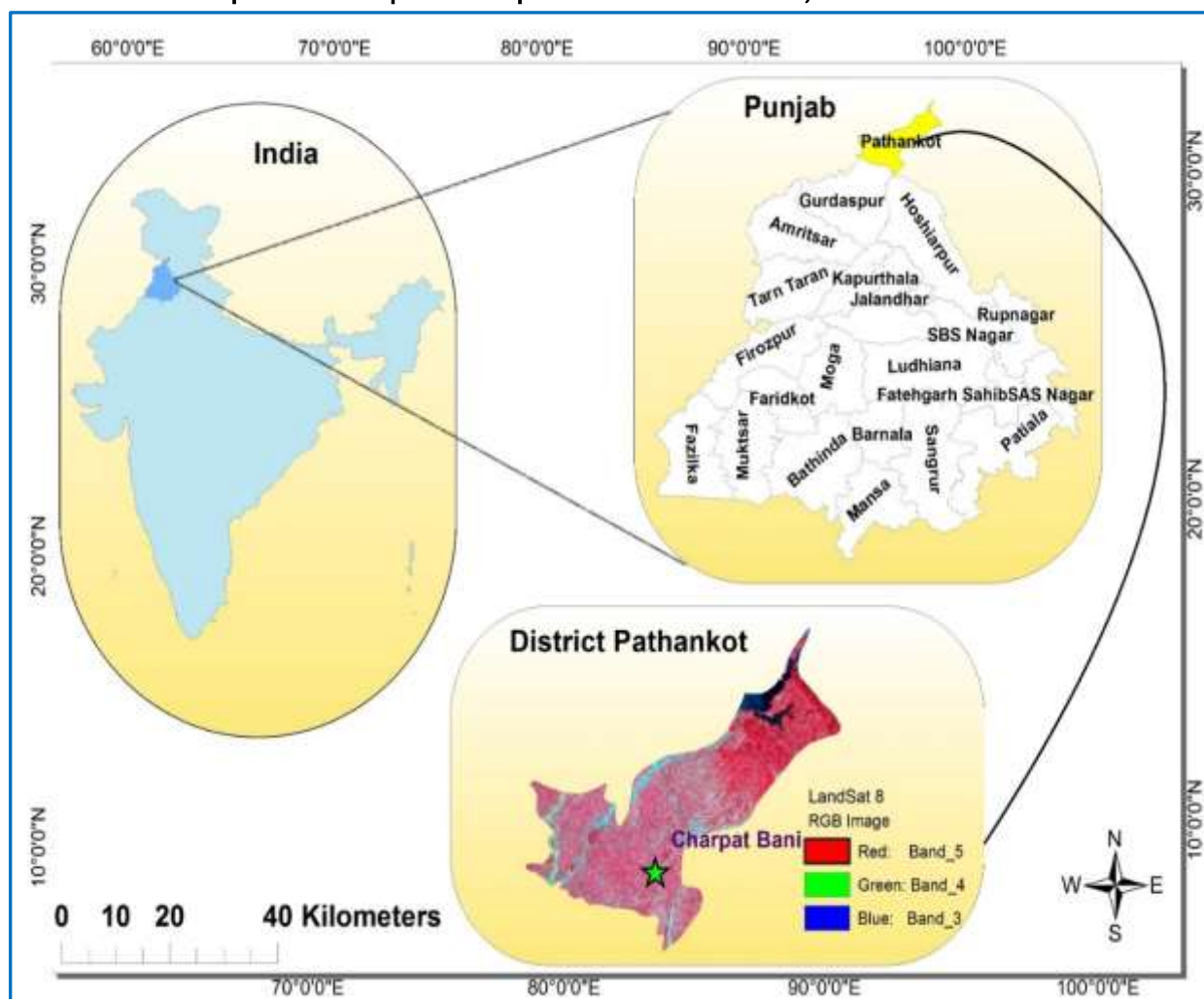
Negi (2014) explored the scope and significance of declaring sacred natural sites as Biodiversity Heritage Sites under the Indian Biological Diversity Act, 2002, involving Biodiversity Management Committees (BMCs) through case studies of 13 sites of 8 districts of Uttarakhand. Ormsby (2013), through an analysis of 17 communities in two Indian states, namely Meghalaya and Karnataka, reported that cultural change and increased demand for biological resources are significant factors hindering the conservation of sacred groves. It was also reported that the area of sacred groves in Karnataka may be diverted to coffee production and the frequency of rituals associated with sacred groves in Meghalaya is on the decline.

Material and Methods

The sacred grove of Charpat Bani, encompassing an area of 14.65 hectares (36.20 acres as per land record), is located in the outskirts of Village Kataru Chak, Block Ghorta, District Pathankot, Punjab. The GPS coordinates of the site are Longitude 75.5684 N and Latitude 32.2042 E. The location map of the sacred grove is provided in **Map 1**.

District Pathankot with a total geographic area of 929 square kilometers, is located in extreme north of Punjab in the foothills of the Shiwalik range (Lower Himalayas), locally known as the Kandi Belt. The landscape of the District features varied topography comprising hilly tracts, undulating plains, flood plains of the rivers Ravi & Beas and upland plains. The 2,682 hectare of forest area of Pathankot District is primarily categorized under dry deciduous scrub forests and Shiwalik chir pine forests (Singh et al., 2014). These forest types contribute to the District's ecological diversity and provide essential habitat for fauna. The alluvial soil of District is very fertile, contributing to its agricultural productivity. The District receives an annual rainfall of 688 mm. In addition to its rich biodiversity, Pathankot District is also home to Kathlour Wildlife Sanctuary and Ranjit Sagar Dam Conservation Reserve, which further emphasizes its ecological importance.

Map 1 Local Map of Charpat Bani Scared Groves, District Pathankot



The sacred grove of Charpat Bani was identified through the leads received from District Biodiversity Management Committee and the Department of Forests & Wildlife Preservation. The semi-structured interviews with various stakeholder such as Sarpanch (Head, Village Panchayat), Priest of sacred grove, Head of local management committee/trust, Village BMC members, visitors and farmers of adjoining fields were conducted to gather comprehensive information about historical, cultural, management & religious practices and ecological value of sacred grove. The vegetation of sacred groves (tree, shrub, and herb species) was studied through extensive field visits during different seasons (Winter and Pre and Post Monsoon) using the quadrat methods (10 m x 10 m for trees and 5 m x 5 m for herbs & shrubs). The morphological characteristics of various plant species were matched with descriptions in renowned botanical references (Hooker, 1897; Nair, 1978; Sharma, 2021) to accurately identify and authenticate the species. The expertise of various taxonomists and plant specialists was utilized during the field visits for on-site identification of species. The presences of important faunal species at the sacred groves were also documented during different seasons.

The Normalized Difference Vegetation Index (NDVI) and Land Use & Land Change (LULC) maps of the site were prepared to analyze changes in vegetation and land use over a period 32 years using Landsat 5 satellite data from 1991 to 2011 and Landsat 8 satellite data for 2023. Additionally, Google Earth imagery was used to observe the physical characteristics of sacred grove (Figure 1).

Extensive photography of various facets of the sacred grove was also carried out using a Canon DSLR Camera and a Mobile HD Camera to maintain a visual record. The selected photographs of the sacred grove are provided in **Plate 1**.

Cultural & Spiritual Significance of Charpat Bani Sacred Grove: Charpat Bani, a biodiversity-rich sacred grove, holds significant cultural and spiritual importance for the local community. Dedicated to the deity "Charpat Yogi," the grove features a central temple surrounded by very old Mango trees. The name "Charpat" according to local lore originated from the belief that the forest appeared overnight ("Jhatpat" or quickly). One story recount how tree would purportedly move down the mountains at night until a woman witnessed this phenomenon before dawn, causing them to halt. Another tale involves Charpat Yogi meditating in the fields, leading to the emergence of a spring when his elbow dug into the ground. This event was seen as a miraculous occurrence by farmers, who ceased their plowing and revered the sacred land.

Figure 1: Google Earth Image of Charpat Bani, District Pathankot



Source: Google Earth, 2024

The location of Charpat Bani in the Shivalik Range near an irrigation canal adds to its significance, providing both natural resources and cultural context. The presence of an ancient Shiv temple, though rebuilt, adds to the historical and religious importance of the site. The natural water spring near the main temple, channeled into a central tank, holds special significance for locals and pilgrims who believe in its therapeutic properties. Anointing hands and feet in the pond, is a ritual believed to cure various ailments. The sacred groves believed to be approximately 300-hundred-year-old, is situated on Panchayat land (Common land).

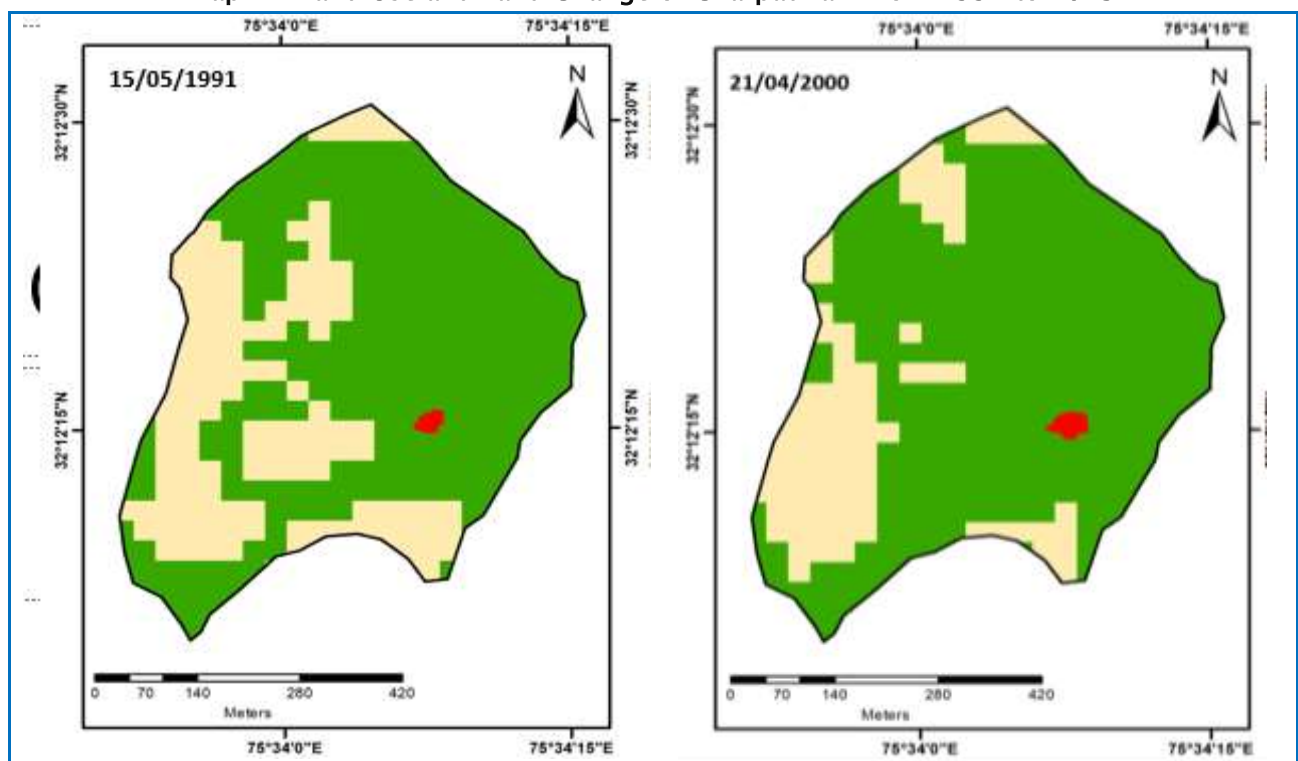
The cultural practice of refraining from taking any twig or branch from the site reflects a deep respect for the sacredness of the grove and the belief in the repercussions of disrupting its natural balance. This reverence extends to the surrounding fields, which are believed to benefit from the natural water springs, enhancing soil quality and agricultural productivity.

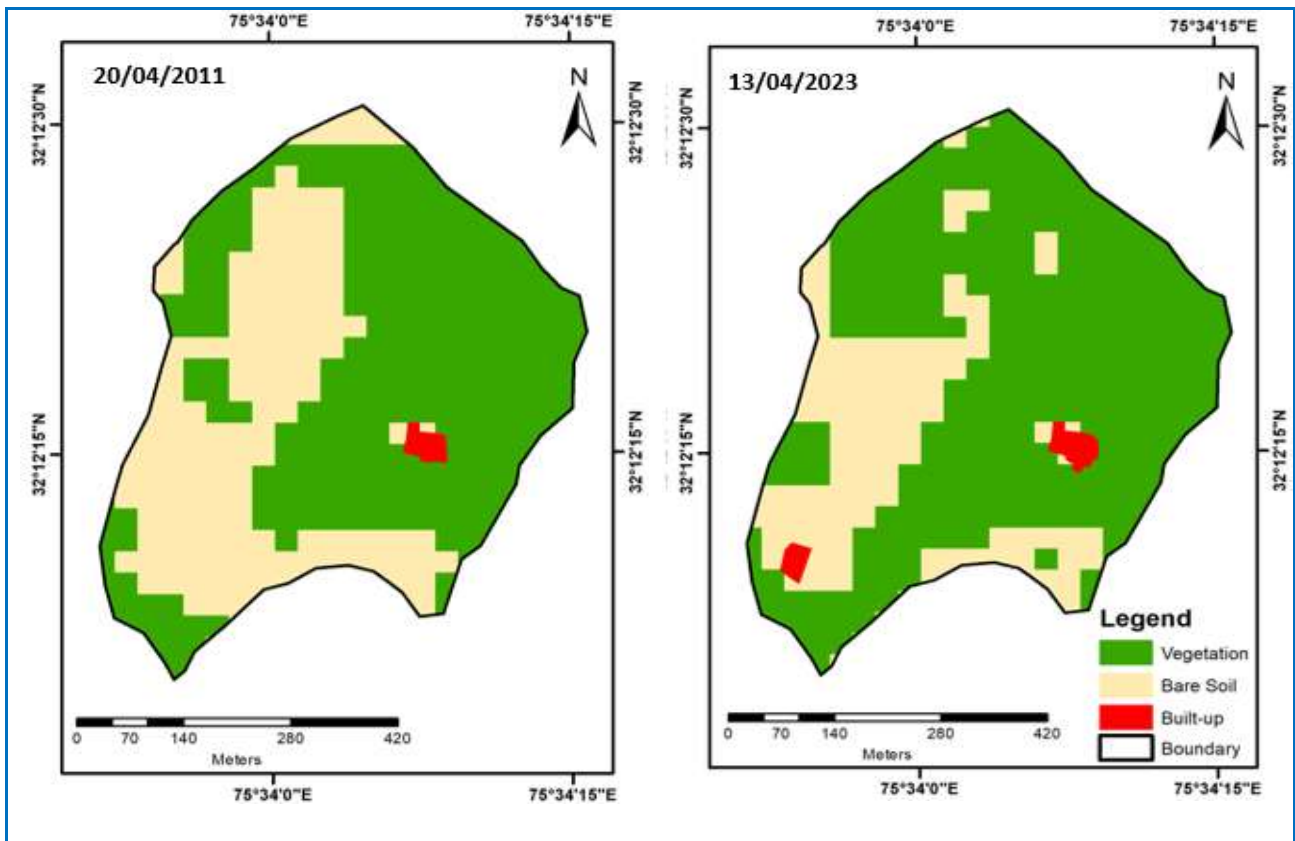
A Trust on the name of “Shivala Charpat Bani Management Committee” was formed in Year 1999 for management of the site. The annual three–day celebration on the occasion of "Maha Shivratri" (March 8th) brings together people from all faiths, highlighting the site's cultural significance as a place of communal gathering and religious reverence.

Ecological Significance of Charpat Bani Sacred Grove: The biodiversity of Charpat Bani is indeed remarkable, showcasing a rich tapestry of flora and fauna. The site fosters a diverse and vibrant ecosystem as 87 floral species were identified and documented from the site during the various visits. The important species include *Putranjiva roxburghii*, *Ficus racemosa*, *Mallotus philippensis*, *Pongamia pinnata*, *Bauhinia variegata*, *Artocarpus lacucha*, *Terminalia chebula*, *Melia azedarach*, *Murraya koenigii*, *Murraya paniculate*, *Tamarindus indica*, *Phyllanthus emblica*, *Ricinus communis*, *Aegle marmelos*, *Dalbergia sisso*, *Ficus bengalensis*, *Ficus carica*, *Ficus virens*, *Ficus relegiousa*, *Bambusa bambos*, *Ficus virens*, *Manigifera indica*, *Shorea rubusta*, *Terminalia chebula*, *Zinzphus Jujuba*, *Morus indica*, *Ocimum sanctum*, *Syzygium cumini*, *Phoenix Sylvestri*, *Cordia dichotom* and *Butea monosperma*,. The detail list of recorded major floral species including their International Union For Conservation of Nature (IUCN) Red List status as well as status in the surrounding areas of sacred grove, has been provided in **Appendix 1**.

The presence of many native species of trees, herbs and shrubs adds to the overall biodiversity and ecological balance of the site. This lush vegetation provides an ideal habitat for a variety of wildlife, including fruits bats, many reptiles such snakes & lizards and numerous bird species including peacock. The presence of such diverse flora and fauna underscores the ecological importance of Charpat Bani as a haven for native species. Additionally, the grove is rich in fungal diversity, particularly on deadwood, further enhancing its ecological importance.

Map 2 – Land Use and Land Change of Charpat Bani from 1991 to 2023



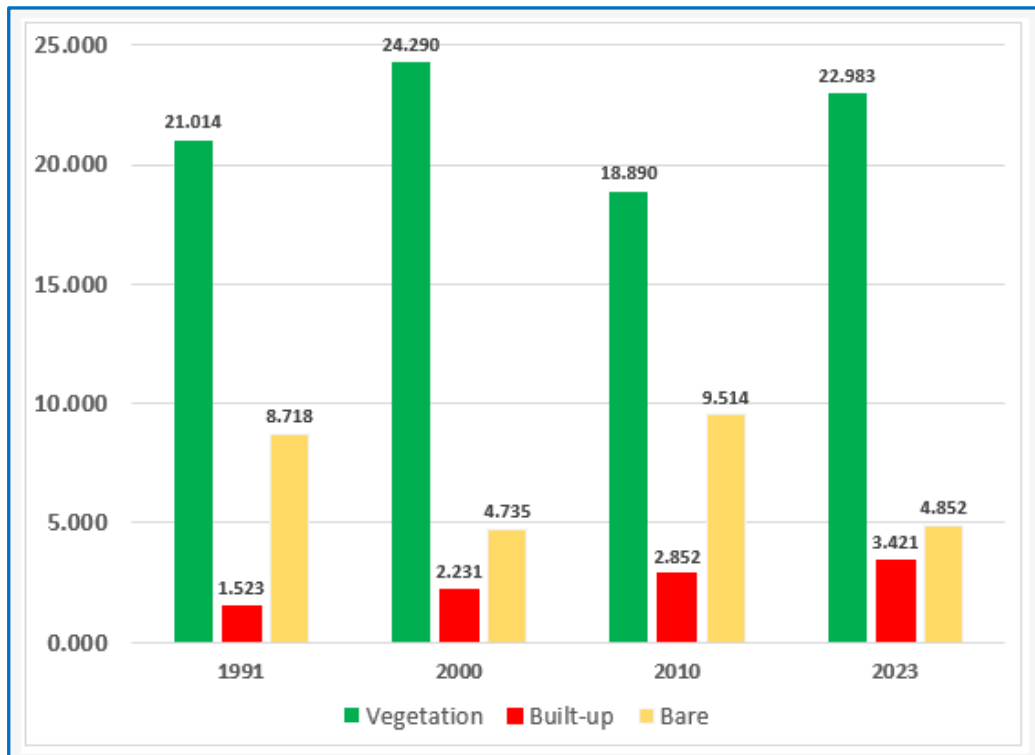


Conservation Issue of Charpat Bani Sacred Grove: The conservation challenges facing the grove primarily revolve around managing the balance between accommodating the needs of pilgrims and preserving the natural integrity of the site. The expansion of built-in areas over last 30 years to accommodate ever increasing pilgrims has certainly led to habitat destruction, soil erosion and disruption of wildlife populations. Additionally, the vagaries of weather, including extreme events such as heavy rainfall or diseases, proliferation of existing invasive species such as *Lantana camara*, *Parthenium hysterophorus* and *Lacunae leucocephala* have further exacerbated these challenges.

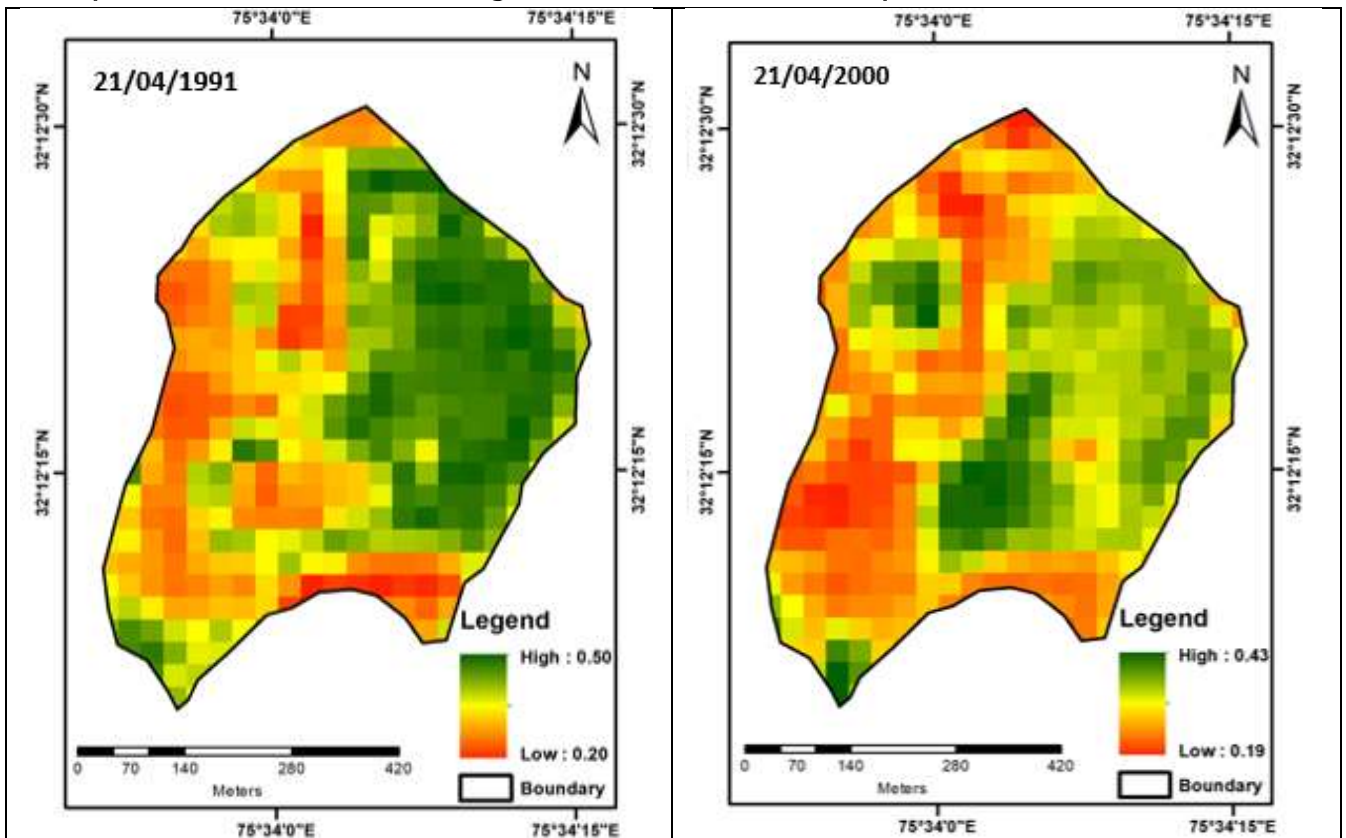
The land use change of the sacred grove from 1991 to 2023 is shown in **Map 2**, with individual maps depicting specific dates throughout the period of 32-years. The vegetation and built-up areas have increased, while the area under bare soil category has decreased over the years. The built-up area, shown in red, has expanded over time, particularly during between 2011 and 2023. The extent of vegetation (green) has also increased, whereas the bare soil area (light yellow) has seen a reduction.

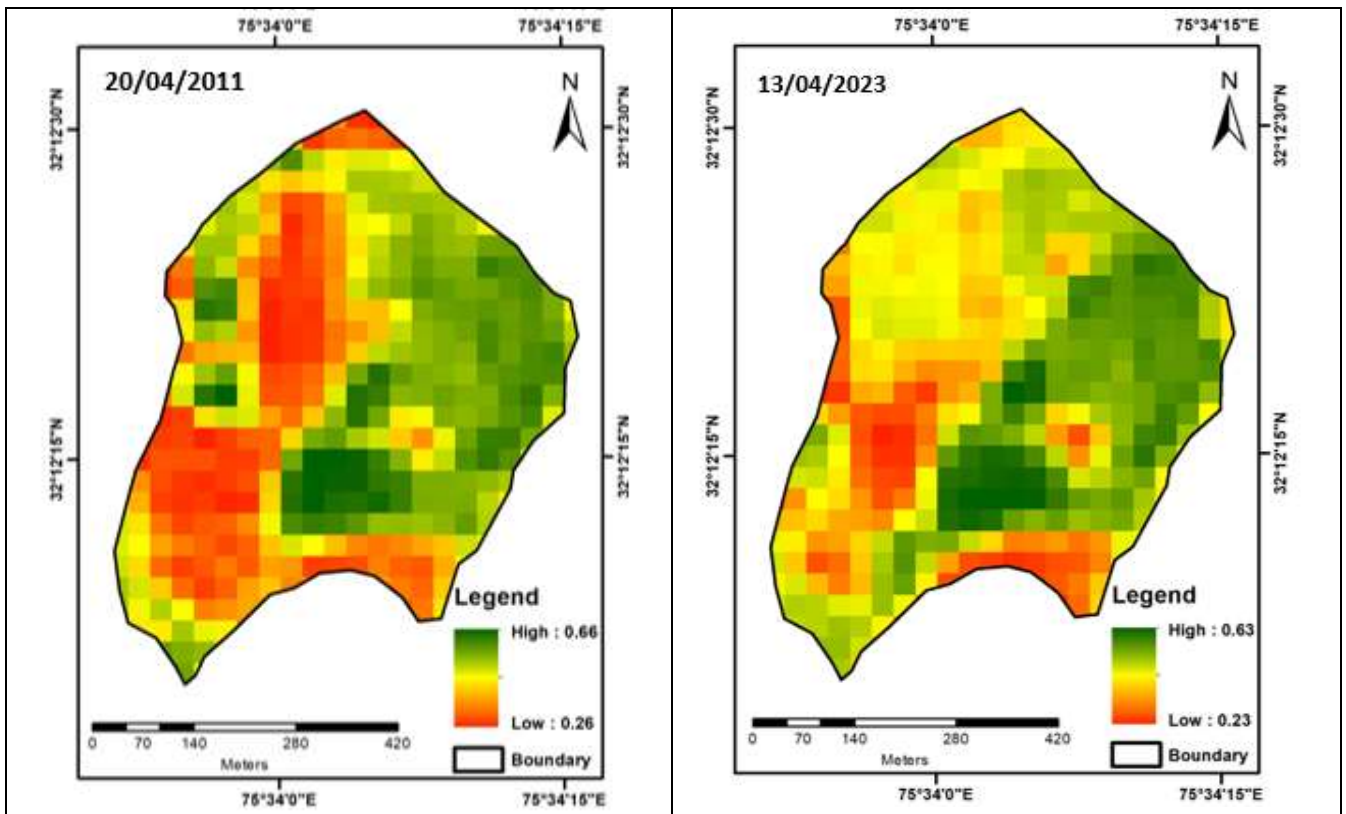
Similarly, **Figure 2** depicts that in terms of total areas of 31.25 acre as per satellite data which is in variance with land record area of 36.20 acres, vegetation cover of sacred grove has increased significantly from 21 acres in 1991 to 24.2 acres in 2000, decreased to 18.89 acres in 2010, and then increased again to 22.98 acres in 2023. However, built-up areas have steadily increased over the years from 1.52 acres in 1991 to 3.42 acres in 2023, while overall the extent of bare soil decreased from 8.7 acres in 1991 to 4.85 acres in 2023. Further investigation is also needed to understand the factors contributing to the fluctuations in vegetation and bare soil areas and mismatch in satellite & land record area of sacred grove.

Figure 2: Land Use Change of Charpat Bani in terms of Area (in Acres) from 1991 –2023



Map 3 : Normalized Difference Vegetation Index (NDVI) of Charpat Bani from 1991 to 2023





The Normalized Difference Vegetation Index (NDVI) Maps sacred groves for period between 1991 to 2023 provide insights into the vegetation density and health over time (Map 3). NDVI, calculated from the visible and near-infrared light reflected by vegetation (ranges from -1 to +1) is a measure of vegetation health, where higher values typically indicate healthier or dense vegetation. The NDVI values can also be influenced by various factors such as seasonal changes and climatic conditions.

The NDVI map of the sacred grove for 1991 having the value from 0.20 to 0.50, shows a mix of moderate and high vegetation density, with significant portions also displaying lower values (yellow and red color). The NDVI maps for 2000, 2011 and 2023 further illustrate fluctuations in vegetation health (Green color), with significant improvements observed between 2000 (0.19 to 0.43) to 2011 (0.26 to 0.66), which thereafter remain steady till 2023 (0.23 to 0.63).

Results and Discussions

The sacred grove is a rich repository of biodiversity, with 87 floral species belonging to 44 families reported from the site (Figures 3 and 4). These include 44 trees, 16 shrubs, 21 herbs, 5 climbers and 1 grass species (Bamboo). This diverse array of plant life highlights the ecological importance and the biodiversity value of the sacred grove. The Moraceae family boasts the highest species count at 10, followed closely by Fabaceae with 9 species, Asteraceae with 6 species, and Amaranthaceae, Rutaceae, and Apocynaceae each contributing 4 species. Other families such as Myrtaceae, Rhamnaceae, and Lamiaceae have a limited presence, each with 3 species, reflecting their sparse and irregular distribution within the grove. Further, 6 families are represented by two species each and 29 families are represented by a single species each, highlighting their unique roles in the ecosystem.

Figure 3: Habit wise Distribution of Floral Species of Charpat Bani Sacred Grove

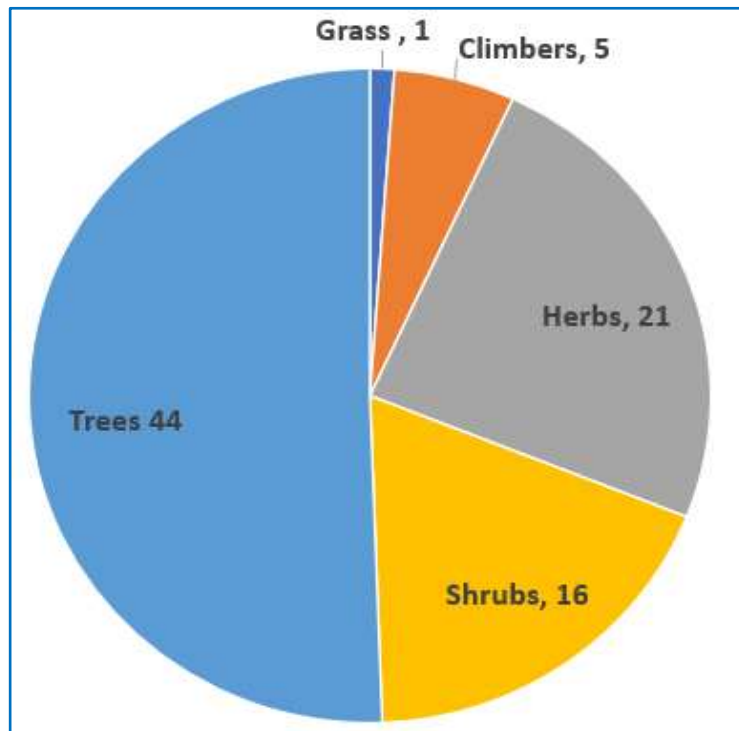
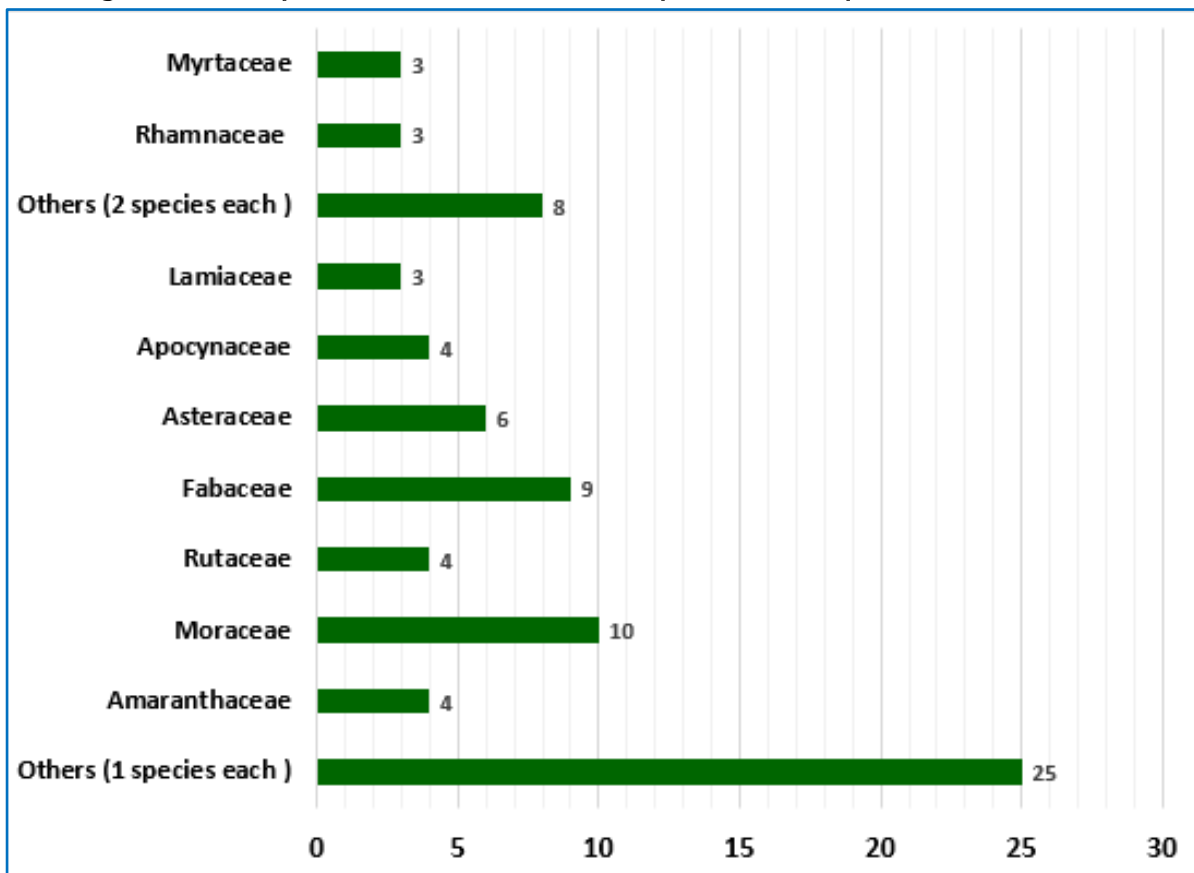


Figure 4 : Family wise Distribution of Floral Species of Charpat Bani Sacred Grove



The diverse distribution of these plant families throughout the sacred grove is likely the result of a complex interplay of ecological and evolutionary factors. This mosaic of influences has shaped the unique biodiversity of the grove, making it a vital and dynamic component of this natural landscape.

The sacred grove is particularly abundant with naturally occurring species such as *Putranjiva roxburghii*, *Ficus racemosa*, *Mallotus philippensis*, *Murraya koenigii*, and *Murraya paniculata*. In addition to these, other species like *Artocarpus lakoocha*, *Artocarpus heterophyllus*, *Butea monosperma*, *Callicarpa macrophylla*, *Coccinia cordifolia*, *Shorea robusta*, *Terminalia chebula*, *Vallis heynei*, *Ziziphus mauritiana* and *Ziziphus nummularia* are also quite endemic to the sacred grove. These species are very rare and scarcely found in the surrounding agricultural areas.

Conclusion

Charpat Bani is one of the largest and most renowned sacred grove, located in the Majha Region (Area between River Ravi and River Sutlej) of Punjab. The self-sustaining grove serves as a repository of floral biodiversity, encompassing almost all elements of the Shiwalik ecosystem and rendering immense ecosystem services to the area. The customs, religious beliefs and rituals associated with the sacred grove are also deeply ingrained in the culture of the surrounding communities. It is paramount to conserve the vital habitat of the sacred grove, therefore further infrastructure development ideally may not be done or be kept minimal, if required and same should adhere to the principle of "Nature-Based Solutions" by utilizing environmentally friendly materials. This approach would ensure harmonization with the natural environment of the sacred grove and have a minimal ecological footprint. The other sustainable and scientific management practices such as enhancing biodiversity & ecological resilience through reforestation in necessary patches & soil erosion measures, management & control invasive species, disease management protocols, implementing visitor & waste management strategies, demarcating a no-vehicle zone and involving scientific community & forestry experts in decision-making processes, are crucial for the long-term conservation of the sacred grove.

The sacred grove also possesses all the requisite attributes of a potential Biodiversity Heritage Site (BHS). By adopting a unique people-driven conservation approach of BHS as envisaged in Section 37 of the Indian Biological Diversity (Amendment) Act, 2023, the sacred grove can gain formal recognition and protection. A village-level Biodiversity Management Committee (BMC) of Kataru Chak village has already been established under Section 22 of the Biodiversity Act by the Village Panchayat. Besides this, People's Biodiversity Register (PBR) of the village for documentation of local flora, fauna & agricultural biodiversity, has been also prepared jointly by Village BMC and Village Panchayat with technical support of Punjab State Biodiversity Board. These initiatives provide a strong foundation for the formal conservation and management of the sacred grove.

The Management Trust of the sacred grove should involve the Village BMC, Village Panchayat, State Biodiversity Board and Forest Department to develop a Management Plan for the sacred grove and same be implemented & monitored regularly by Village Local Body. The sacred grove has great potential for promotion as a center for meditation and eco-education, facilitating understanding & research on various aspects of biodiversity & natural ecosystem, thereby enhancing its role in conservation, education and community engagement. Concerted efforts should be made by all the stakeholders to get the sacred grove declared as Biodiversity Heritage Site to enhance its conservation status and promote sustainable management practices so that grove can serve as a model for conservation of other sacred groves of state.

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Competing Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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6. **Indian Institute of Science – Flora of Peninsular India:** <http://flora-peninsula-indica.ces.iisc.ac.in/>
7. **IUCN RED List of Threatened Species:** www.iucnredlist.org/
8. **Punjab State Biodiversity Board, India:** <http://pbb.punjab.gov.in/>
9. **Royal Botanical Garden, Kew London– Plants of World Online:** <http://powo.science.kew.org/>
10. **World Flora Online Consortium:** <http://www.worldfloraonline.org/>

Plate 1: Selected Photographs of Charpat Bani Sacred Grove



Entrance from the village side



Main Temple Area



Inner view of samadhi temple



Vegetation inside the grove



Fruit Bats hanging from tree



Southern side of Grove



Ficus racemose tree in full fruiting stage



Natural water channel



Vegetation in the northern side



Snake peeping out from water channel

Appendix 1: List of Major Floral Species of Scared Grove of Charpat Bani, District Pathankot, Punjab

Sr. No	Scientific Name	Family	Common Name	Vernacular Name	Habit	IUCN Status, 2024 (Global)	Origin (Native / Non-Native to India)	Status in surrounding areas of Sacred Grove
1	<i>Achyranthes aspera</i>	Amaranthaceae	Prickly Chaff Flower	Puthkanda/ Latjerra	Herb	Not Evaluated	Native	Common
2	<i>Adhatoda vasica</i>	Acanthaceae	Malabar Nut	Vasaka	Shrub	Not Evaluated	Native	Common
3	<i>Artocarpus lakoocha</i>	Moraceae	Monkey Jack	Dheu	Tree	Not Evaluated	Native	Very Rare
4	<i>Aegle marmelos</i>	Rutaceae	Stone Apple	Beal, Bil	Tree	Near Threatened	Native	Less common
5	<i>Albizia lebbek</i>	Fabaceae	Black Siris	Kala Sirinh	Tree	Least Concern	Native	Less Common
6	<i>Aloe vera</i>	Asphodelaceae	India aloe	Ghi Kwar	Herb	Not evaluated	Exotic/ Introduced	Common
7	<i>Ageratum conyzoides</i>	Asteraceae	Goat Weed	Jangli Pudina	Herb	Least Concern	Exotic/ Introduced	Common
8	<i>Amaranthus viridis</i>	Amaranthaceae	Slender/ Wild Amaranth	Chulai	Herb	Not evaluated	Exotic/ Introduced	Common
9	<i>Anacyclus pyrethrum</i>	Asteraceae	Pellitory /Atlas Daisy	Akarkara	Herb	Vulnerable	Exotic/ Introduced	Rare
10	<i>Araucaria araucana</i>	Araucariaceae	Monkey Puzzle Tree	Araucaria	Tree	Endangered	Exotic	Common
11	<i>Argemone mexicana</i>	Papaveraceae	Prickly Poppy	Satyanasi / Kandiali	Herb	Not evaluated	Exotic/ Introduced	Common
12	<i>Alstonia scholaris</i>	Apocynaceae	Devil Tree	Satpatia/ Satni	Tree	Least Concern	Exotic /Introduced	Common
13	<i>Artocarpus heterophyllus</i>	Moraceae	Jack Fruit	Kathal	Tree	Not Evaluated	Native	Rare
14	<i>Atriplex nummularia</i>	Amaranthaceae	Oldman Saltbush	-	Shrub	Not Evaluated	Exotic	Rare
15	<i>Azadirachta Indica</i>	Meliaceae	Indian lilac	Nim/ Neem	Tree	Least Concern	Native	Common

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16	<i>Bambusa bambos</i>	Poaceae	Bambo	Bans	Grass	Not Evaluated	Native	Common
17	<i>Bauhinia variegata</i>	Fabaceae	Butter Fly Tree	Kachnar	Tree	Least Concern	Native	Common
18	<i>Bidens pilosa</i>	Asteraceae	Spanish needle	Chorpushpi / Chirchitta	Herb	Not Evaluated	Exotic/ Introduced	Common
19	<i>Boerhavia diffusa</i>	Nyctaginaceae	Hogweed	Itsit / Gadha Bel	Herb	Not Evaluated	Native	Common
20	<i>Butea monosperma</i>	Fabaceae	Flame of Forest	Dhak / kesu	Tree	Least Concern	Native	Less Common
21	<i>Callicarpa macrophylla</i>	Lamiaceae	Beauty Berry	Priyang	Shrub	Least Concern	Native	Rare
22	<i>Calotropis procera</i>	Apocynaceae	Milkweed	Aak/ Ak	Shrub	Not Threatened	Native	Very Common
23	<i>Canna indica</i>	Cannaceae	Indian Shot	Keli	Herb	Not evaluated	Native	Common
24	<i>Cannabis sativa</i>	Cannabaceae	Indian Hemp	Bhang / Sukha	Herb	Not evaluated	Exotic/ Introduced	Common
25	<i>Carica papaya</i>	Caricaceae	Papaya	Papeeta	Shrub	Not evaluated	Exotic/ introduced	Common
26	<i>Cassia occidentalis</i>	Fabaceae	Septic weed	Kasandi	Shrub	Least Concern	Exotic/ introduced	Common
27	<i>Chenopodium album</i>	Amaranthaceae	Lamb`s Quarter	Bathu	Herb	Not evaluated	Native	Common
28	<i>Cissampelos pareira</i>	Menispermaceae	Velvet Leaf Pareira	Akanadi/ Harjori	Climber	Not evaluated	Native	Common
29	<i>Citrus pseudolimon</i>	Rutaceae	Hill lemon	Galgal	Small Tree	Not evaluated	Exotic/introduced	Rare
30	<i>Coccinia cordifolia</i>	Cucurbitaceae	Ivy gourd	Kundururu	Climber	Not evaluated	Native	Rare
31	<i>Convolvulus arvensis</i>	Convolvulaceae	Lesser Bindweed	Hiranpaddi / Hirankhuri	Climber	Not evaluated	Exotic/introduced	Common

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32	<i>Cordia dichotoma</i>	Boraginaceae	Indian Cherry	Lasora/Lasura	Tree	Least Concern	Native	Less Common
33	<i>Dalbergia sissoo</i>	Fabaceae	Indian Rosewood/ Sheesham	Tahli	Tree	Not threatened	Native	Common
34	<i>Eriobotrya japonica</i>	Rosaceae	Japanese medlar	Louqat	Small Tree	Not Evaluated	Exotic	Less common
35	<i>Eucalyptus tereticornis</i>	Myrtaceae	Forest Red Gum	Safaeda	Tree	Least Concern	Exotic	Common
36	<i>Ficus benghalensis</i>	Moraceae	Banyan	Bargad/Bohr	Tree	Not Evaluated	Native	Common
37	<i>Ficus carica</i>	Moraceae	Edible Fig	Anjeer	Tree	Least Concern	Exotic /Introduced	Common
38	<i>Ficus racemosa</i>	Moraceae	Cluster Fig	Gular	Tree	Least Concern	Native	Common
30	<i>Ficus religiosa</i>	Moraceae	Sacred Fig	Pipal	Tree	Not Evaluated	Native	Common
40	<i>Ficus virens</i>	Moraceae	White Fig	Pilkhan	Tree	Least Concern	Native	Common
41	<i>Gnaphalium indicum</i>	Asteraceae	Cudweeds		Herb	Not Evaluated	Native	Common
42	<i>Grevillea robusta</i>	Proteaceae	Silky Oak	Silver Oak	Tree	Not Evaluated	Exotic /Introduced	Common
43	<i>Lantana camara</i>	Verbenaceae	Lantana	Ghaneri/ Chuder Buti	Shrub	Not evaluated	Exotic/ Introduced	Common
44	<i>Leucaena leucocephala</i>	Fabaceae	Wild Tamarind	Subabul	Tree	Not evaluated	Exotic /Introduced	Common
45	<i>Mallotus philippensis</i>	Euphorbiaceae	Kaamala Tree	Kamala	Tree	Least Concern	Native	Less common
46	<i>Malvastrum oromandelianum</i>	Malvaceae	False Mallow /Broom Weed	Kharenti	Herb	Not evaluated	Exotic /Introduced	Common
47	<i>Mangifera indica</i>	Anacardiaceae	Indian Mango	Amb	Tree	Not Evaluated	Native	Common

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48	<i>Melia azaderach</i>	Meliaceae	Persian Lilac	Dek/Drek/ Bakain	Tree	Not Evaluated	Native	Common
49	<i>Millingtonia hortensis</i>	Bignoniaceae	Indian cork tree	Akash neem/ /Vilyeti Nim	Tree	Not Evaluated	Introduced	Common
50	<i>Moringa oliefera</i>	Moringaceae	Drum stick tree	Sohanjana	Tree	Not Evaluated	Native	Common
51	<i>Morus alba</i>	Moraceae	White Mulberry	Toot/Shatoot	Tree	Least Concern	Introduced	Common
52	<i>Morus indica</i>	Moraceae	Mulberry	Toot/Shatoot	Tree	Not Evaluated	Native	Less Common
53	<i>Murraya koenigii</i>	Rutaceae	Curry Leaf Tree	Karhi patta /Gandla	Shrub	Not Evaluated	Native	Common
54	<i>Murraya paniculata</i>	Rutaceae	Orange Jasmine	Murraya/ Kamini	Shrub	Not Evaluated	Native	Common
55	<i>Ocimum sanctum</i>	Lamiaceae	Sweet Basil	Tulsi	Herb	Not Evaluated	Native	Common
56	<i>Oxalis corniculata</i>	Oxalidaceae	Indian Sorrel	Champa Methi / Teen Patti	Herb	Not Evaluated	Exotic	Common
57	<i>Parthenium hysterophorus</i>	Asteraceae	Carrot Grass/ Famine Weed	Congress Grass / Gajar Ghaa	Herb	Not Evaluated	Exotic /Introduced	Common
58	<i>Phoenix sylvestris</i>	Arecaceae	Wild Date Palm	Khajoor	Tree	Not Evaluated	Native	Less Common
59	<i>Phyllanthus emblica</i>	Phyllanthaceae	Indian Goose Berry	Aola / Amla	Tree	Least Concern	Native	Common
60	<i>Platycladus orientalis</i>	Cupressaceae	Oriental Thuja / Chinese Thuja	Morpankhi/ Vidya Phardi	Shrub	Near Threatened	Exotic	Common
61	<i>Pongamia pinnata</i>	Fabaceae	Indian Elm	Karanj / Sukhchain	Tree	Least Concern	Native	Common
62	<i>Psidium guajava</i>	Myrtaceae	Guava	Amrood	Tree	Least Concern	Introduced	Common
63	<i>Putrinjiva roxburghii</i>	Putranjivaceae	Lucky Bean Tree	Putranjiva / Putardatta	Tree	Not Evaluated	Native	Common

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64	<i>Ricinus communis</i>	Euphorbiaceae	Castor	Arind / Erind	Shrub	Not Evaluated	Introduced	Common
65	<i>Shorea robusta</i>	Dipterocarpaceae	Sal Tree	Sal	Tree	Least Concern	Native	Very Rare
66	<i>Solanum nigrum</i>	Solanaceae	Black Nightshade	Makoh	Herb	Not Evaluated	Native	Common
67	<i>Sonchus asper</i>	Asteraceae	Sow thistle	Doodak/ Pili Dudhi	Herb		Exotic /Introduced	Common
68	<i>Syzygium cumini</i>	Myrtaceae	Black Plum	Jamun	Tree	Least Concern	Native	Common
69	<i>Syzygium nervosam</i>	Myrtaceae	Black Plum	Rai Jamum/ Jamoa	Tree	Least Concern	Native	Rare
70	<i>Sapindus mukorossi</i>	Sapindaceae	Chinese soapberry	Reetha	Tree	Least Concern	Native	Less Common
71	<i>Tamarindus indica</i>	Fabaceae	Tamarind tree/ Indian date	Imli	Tree	Least Concern	Native	Less Common
72	<i>Tecoma stans</i>	Bignoniaceae	Yellow Bells	Tecoma	Shrub	Least Concern	Introduced	Common
73	<i>Tectona grandis</i>	Lamiaceae	Teak	Sangwan	Tree	Not Evaluated	Native	Common
74	<i>Terminalia bellerica</i>	Combretaceae	Belliric myrobalan	Baheda	Tree	Not Evaluated	Native	Less common
75	<i>Terminalia chebula</i>	Combretaceae	Chebulic myrobalan	Harar/Harard	Tree	Least Concern	Native	Very Rare
76	<i>Thevetia neriifolia</i>	Apocynaceae	Yellow oleander	Peeli Kaner	Shrub	Not Evaluated	Exotic	Common
77	<i>Tinospora cordifolia</i>	Menispermaceae	Gulancharinospora	Giloy/ Glo	Climber	Not Evaluated	Native	Rare

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78	<i>Tribulus terrestris</i>	Zygophyllaceae	Puncture Vine	Bhakhda	Herb	Not Evaluated	Native	Common
79	<i>Urena lobata</i>	Malvaceae	Caesar weed / Congo jute	Valaiti San	Shrub	Least Concern	Native	Common
80	<i>Vachellia nilotica</i>	Fabaceae	Gum Arabic Tree	Kikar	Tree	Least Concern	Native	Less Common
81	<i>Vallaris heynei</i>	Apocynaceae	Bread Flower	Dhudhi vel	Climber	Not Evaluated	Native	Rare
82	<i>Vernonia cinerea</i>	Asteraceae	Purple Feabane	Sahdevi	Herb	Not Evaluated	Native	Common
83	<i>Verbascum thapsus</i>	Scrophulariaceae	Common Mullein	Gidder Tabaco	Herb	Least Concern	Exotic / Introduced	Common
84	<i>Withania somnifera</i>	Solanaceae	Winter Cherry	Ashwagandha / Asgandh	Shrub	Data Deficient	Native	Less common
85	<i>Ziziphus mauritiana</i>	Rhamnaceae	Desert apple	Ber / Beri	Tree	Least Concern	Native	Less common
86	<i>Ziziphus jujuba</i>	Rhamnaceae	Chinese date	Ber	Tree	Least Concern	Exotic / Introduced	Less Common
87	<i>Ziziphus nummularia</i>	Rhamnaceae	Round leaved jujube / Wild jujube	Malha / Jhar	Shrub	Not Evaluated	Native	Very Rare