

Socio-ecological and Religious Perspective of a Sacred Grove in the Traditional Way of In Situ Plant Conservation

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ABSTRACT Sacred groves are socio-culturally protected patches of plants mainly maintained by tribal communities. These groves are generally considered as abodes of gods, goddesses, spirits or supernatural objects. They are worshipped, managed and protected by mainly tribal communities with religious zeal. Such groves serve as less disturbed benchmarks for vegetation. Taboos and societal prohibitions defend the sacred groves from destruction as a result of human activity. From sacred groves, several relics, endemic and endangered species have been reported. Based on this premise, this paper highlights the conservation and cultural values of a sacred grove of Jhargram District in West Bengal. The study reveals that in addition to conserving 150 species of angiosperms, the grove provides some direct and indirect socio-economic benefits. Therefore, there is an urgent need not only to protect the sacred forest but also to revive and reinvent such a traditional way of plant conservation.

INTRODUCTION

Conservation of nature and natural resources has been an integral part of cultural ethos, particularly in isolated rural and indigenous communities in many parts of the world, including India. These communities consider themselves associated with their biophysical environment in a network of spiritual connection (Taylor and Lennon 2011). These rural communities believe specific plants as their ancestors and protect them. In India, worship of nature dates back to the pre-Vedic period and is based on the principle that all-natural creations must be preserved. One of the important traditions of nature reverence is to conserve those patches of forest that have been dedicated to a god or goddess or ancestral spirits as *sacred groves* (Singh et al. 2017).

Sacred groves are mostly associated deities with giant trees and are also culturally important. They express the spiritual and ecological ethos of indigenous peasant communities. Within these patches different cultural and religious festivals are often arranged by local people. As a way of conservation of nature, sacred groves have proven to be a suitable method for thousands of years (Kent 2013). Although they may

cover a minuscule proportion of the country's total area, it is estimated that there are between 100,000 and 150,000 such groves (Malhotra 1998). Of nearly 600,000 villages in the Indian countryside, sacred groves form an integral part of the countryside. This informal network of nature reserves plays an important role in maintaining plant diversity (Bhagwat and Rutte 2006; Bhakat et al. 2010). Results of a comparison between sacred groves and formal reserves show that sacred groves shelter a high diversity of medicinal plants and regenerate plants more vigorously than formal reserves (Boraiah et al. 2003). Sacred groves also have a higher diversity of plant species diversity than do formal reserves (Jamir and Pandey 2003; Ramanujam and Cyril 2003). With ever-increasing pressure on the Indian countryside, sacred groves have become patches of semi-natural forest in an otherwise cultivated landscape.

Some studies on traditional conservation of plants in sacred groves have been reported recently. Role of some sacred grove in the conservation of plants was carried out in the sacred groves of Jhargram district under West Bengal (Sen 2018a,b). The present investigation was carried out with the following aims:

1. To list the floristic composition of sacred groves in Jhargram district with detailed their ethnic uses.
2. To provide a method of identification and communication.

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3. To uncover the district's rare, endangered, endemic and threatened plants.

MATERIAL AND METHODS

Study Site

The study was conducted in a forested sacred grove called Kalua Sarnd Than (KST) on the outer edge of a tribal-dominated Nimainagar village under the block of Nayagram (latitude 22°02'58.53"- 22°02'59.12" N and longitude 87°08'40.39" - 87°08'40.55" E, average altitude 47 metres) in West Bengal's Jhargram district. The grove is located in the southern part of West Bengal, India, about 71 km southeast from district headquarters at Jhargram town. This district's geographical position lies underneath India's middle tribal zone. On the north, it is bordered by the Purulia and Bankura districts and on the east it is bordered by River Kangsabati (from the western border of the district of West Midnapore) and partly by River Subarnarekha from the western border of the district of West Midnapore. It has shared boundaries with the southern state of Odisha, and with the Jharkhand state in the west (Figs. 1a and 1b).

The district of Jhargram covers an area of 3037.64 km² and had a population of 11,36,548 during the 2011 census. The total population was 96.52 percent rural and only 3.48 percent urban. Of the total population, 20.11 percent belonged to scheduled castes and 29.37 percent belonged to scheduled tribes. The population

growth rate was 10.9 percent over the decade 2001-2011. In 2011, the literacy rate was 72.0 percent, wherein the literacy rate was 81.0 percent for males and 64.0 percent for females. The sex ratio for every 1000 males was 979 females (Anon 2011).

The strategic position of the district between the plateau of Chotanagpur and the plain of lower Bengal form a continuum, facilitating plant and human migration. Because of its unique location, a large part of the district is covered with predominant dry-deciduous forests with *Shorea robusta* plantations, which are naturally regenerated. Since the region falls under India's middle tribal zone, it supports a substantial population of various ethnic groups such as *Bagdi*, *Kora*, *Munda*, *Sabar*, *Santal* and others who live in the forest-fringe villages. Those people have distinct socio-cultural attachments to the plants and forests around them. They rely not only on the forest resources but also in the form of sacred groves to protect and preserve plant resources.

The Sacred Grove

The present sacred grove popularly known as *Kalua Sarnd Than* (named after its presiding god *Kalua Sarnd*) is situated in the Nayagram block of Jhargram district. The grove is spread over an area of 2.24 hectare in forestland along the outskirts of the village Nimainagar on the western side of Nayagram-Rameswaram roadways. It represents a 400- to 450-year-old relict



Fig. 1a. People participation in KST



Fig. 1b. Deity Kalua Sarnd

forest patch consisting of evergreen, deciduous and semi-deciduous plants. After the eight days of annual *Paus Sankranti* (a ritual celebrated on the last day of the Bengali Month *Paus* or middle of January) and every Tuesday and Saturday local people, both tribal and non-tribal of Nayagram and adjoining blocks, visit the grove and worship the deity. Since the grove is the deity's abode, the entire area is considered sacred, along with plants and other forms of life. Local people do not cut or disturb the grove flora because of this socio-cultural tag on the grove, thus adhering strictly to the taboos and ethics.

Field Survey and Data Collection and Analysis

The study was conducted from March 2013 to April 2018 throughout all the seasons of the year. Participants were selected based on their traditional knowledge. The interviews were carried out on traditional use(s) of plants among the villagers. The support of the village elders identified individuals who were locally regarded as knowledgeable on plant use. The selection in the questionnaire was described as systematic way and Participatory Rural Appraisal (PRA) method. The questionnaire was conducted in the local dialect of Bengali language. Due to the dynamic nature of ethno-botanical information, this study included plants mentioned by three or more informants to increase the reliability of the obtained data (Martin 2004).

In the systematic enumeration of the taxa were species with their family along with the vernacular name, habit, life-span, flowering and fruiting time, IUCN status (IUCN 2020) and purpose and plant part(s) used (Table 1). All the species were categorised alphabetically. After knowing the specific use(s) of the plants, informers were taken to the field to identify the plants on the basis of vernacular names. Photographs were taken of the plant habit and reproductive structures and specific plants were collected for the preparation of herbariums. Herbariums were deposited in the herbarium section, Department of Botany, Vidyasagar University. Rare or endangered plants were kept untouched. The collected plants have been com-

pared with the literature and identified using standard keys for the specimens (Prain 1903; Pakrashi and Mukhopadhyay 2004; Paria 2005; Anon 2010).

RESULTS AND DISCUSSION

Different Plant Taxa

In the present study, a total of 150 species belonging to 141 genera distributed over 59 families were recorded from the sacred grove. The ten well-represented families included Malvaceae (10 or 6.67%), Apocynaceae (8 or 5.33%), Asteraceae (8 or 5.33%), Poaceae (7 or 4.67%), Rubiaceae (7 or 4.67%), Euphorbiaceae (6 or 4%), Fabaceae (6 or 4%), Convolvulaceae (5 or 3.33%), Lamiaceae (5 or 3.33%) and Phyllanthaceae (5 or 3.33%) (Table 1). Acanthaceae, Amaranthaceae, Cyperaceae, Orobanchaceae and Solanaceae comprised 4 (2.67%) species each. Five families contained 3 (2%) and 9 families covered 2 (1.33%) species. Another 30 families each carried only a single species (Table 1). Similar types of distribution of dominant families has been found in sacred groves of India and were highlighted by Rajendraprasad et al. (1998), Gnanasekaran et al. (2012), Ghildiyal et al. (2016), Sen (2016) and Sen and Bhakat (2019) amongst others.

The eight dominant plant families encompassed more than 38.0 percent genera with descending numbers (≥ 5 species) including Malvaceae (9 or 6.38%), Apocynaceae (8 or 5.67%), Asteraceae (8 or 5.67%), Poaceae (7 or 4.96%), Euphorbiaceae (6 or 4.26%), Rubiaceae (6 or 4.26%), Fabaceae (5 or 3.55%) and Lamiaceae (5 or 3.55%) (Table 1).

The nine well-represented genera containing two species were *Bridelia*, *Cissus*, *Dioscorea*, *Diospyros*, *Evolvulus*, *Phyllanthus*, *Senna*, *Sida* and *Solanum*. Another 132 species belong to a single genus respectively (Table 1).

Species Diversity in Different Growth Form

The present floristic study of the sacred grove showed that it harboured a total of 150 plant species [123 dicots (82%) and 27 monocots (18%)] belonging to genera 141 [115 dicots (81.56%) and 26 monocots (18.44%)] of 59 families [47 dicots (80%) and 12 monocots (20%)].

Table 1: List of ethnomedicinal plants in KST sacred grove

Name of the species	Family	Vernacular name	Habit	Life-span	Fl. & Fr. Time	IUCN Red list status	Purpose and plant part(s) used
1. <i>Abelmoschus crinitus</i> Wall.	Malvaceae	Gumbo	S	A	Mar.-Sep.	NE	E:Fr;M:Se
2. <i>Abrus precatorius</i> L.	Fabaceae	Kunch	C	P	Aug.-Mar.	NE	I:Se;M:Se;Or:Se; Sa:Se
3. <i>Achyranthes bidentata</i> Blume	Amaranthaceae	Apang	H	A	Oct.-Dec.	NE	D:W;M:W
4. <i>Aeghnetia indica</i> L.	Orobanchaceae	Bankuri	H	A	Aug.-Oct.	NE	M:W
5. <i>Aegle marmelos</i> (L.) Corrêa	Rutaceae	Bel	T	P	May-Jul.	NE	D:Fr;E:Fr;Le:M:Fr, Le;Sa:Fr;Le,W
6. <i>Afrohybanthus enneaspermus</i> (L.) Flicker	Violaceae	Numbora	H	P	Jul.-Nov.	NE	M:W
7. <i>Ageratum conyzoides</i> L.	Asteraceae	Dochunti	H	A	Nov.-Mar.	NE	M:Le,Ro
8. <i>Alangium salvifolium</i> (L.f.) Wangerin	Cornaceae	Ankar	T	P	Mar.-Jul.	NE	E:Fr;M:Fr;Le, Rb,Sb;Se;Ti:St
9. <i>Alectra sessiliflora</i> (Vahl) Kuntze	Orobanchaceae	Rakhaphool	H	A	Oct.-Dec.	NE	M:W
10. <i>Allophylus serratus</i> (Roxb.) Kurz	Sapindaceae	Kulanjan	C	P	Jul.-Oct.	NE	M:Sb
11. <i>Alpinia calcarata</i> (Andrews) Roscoe	Zingiberaceae		H	P	Apr.-Jun.	NE	M:Rh
12. <i>Amaranthus spinosus</i> L.	Amaranthaceae	Kantanotey	H	A	All	NE	M:W
13. <i>Andrographis echitoides</i> (L.) Nees	Acanthaceae	Kalmegh	H	A	Jul.-Oct.	NE	M:Le,Ro,W
14. <i>Anisomeles indica</i> (L.) Kuntze	Lamiaceae	Gopali	H	A	Sep.-Jan.	NE	M:W
15. <i>Annona squamosa</i> L.	Annonaceae	Ata	T	P	Mar.-Sep.	NE	E:Fr;I:Le;Se;M: Fr,Le,Ro
16. <i>Antigonon leptopus</i> Hook. & Arn.	Polygonaceae	Anantialata	C	A	Aug.-Jan.	NE	E:Tu;M:Or,Tu
17. <i>Ardisia solanacea</i> Roxb.	Primulaceae	Banyam	S	P	Mar.-Nov.	NE	M:Ro
18. <i>Aristida setacea</i> Retz.	Poaceae		H	P	Aug.-Dec.	NE	Fo:Le;M:W
19. <i>Aristolochia indica</i> L.	Aristolochiaceae	Isarmul	C	A	Jul.-Jan.	NE	M:Le,Ro,Se
20. <i>Asparagus racemosus</i> Willd.	Asparagaceae	Satamuli	C	P	Aug.-Dec.	NE	M:Le,Tu
21. <i>Azanza lampas</i> (Cav.) Alef.	Malvaceae	Bankapash	S	A	Sep.-Dec.	NE	Fr:St;M:W
22. <i>Bambusa bambos</i> (L.) Voss	Poaceae	Bansh	T	P	Jul.-Feb.	NE	Fo:Le;St.;M: W, Sa:St;Ti:St
23. <i>Blumea axillaris</i> (Lam.) DC.	Asteraceae	Kukshima	H	A	Aug.-Jan.	NE	M:Le;Ro,W
24. <i>Boerhavia erecta</i> L.	Nyctaginaceae	Punarnaba	H	A	Jul.-Sep.	NE	M:Ro,W
25. <i>Bombax ceiba</i> L.	Malvaceae	Shimul	T	P	Jan.-May.	NE	Fo:Le;M:W Oi:Se;Ti:St
26. <i>Bridelia retusa</i> (L.) A. Juss.	Phyllanthaceae	Bhuas	T	P	Mar.-Dec.	NE	M:Fr;Le;Ta:Sb;Ti:St
27. <i>Bridelia tomentosa</i> Blume	Phyllanthaceae	Kasai	T	P	Mar.-Dec.	NE	M:Fr;Le;Ta:Sb;Ti:St
28. <i>Buddleja asiatica</i> Lour.	Scrophulariaceae	Budbhota	S	P	Jan.-Oct.	NE	M: Le,St,
29. <i>Canscora diffusa</i> (Vahl)	Gentianaceae	Dhankuni	H	A	Oct.-Jan.	NE	M: W
30. <i>Capparis zeylanica</i> L.	Capparaceae	Rohini	C	P	Mar.-Oct.	NE	R.Br. ex Roem. & Schult. M:Le,Ro,Se;St;Or:W
31. <i>Cardiospermum halicacabum</i> L.	Sapindaceae	Shibjhul	C	A	Jul.-Dec.	NE	M:Le;Ro,Se;Sa:W

Table 1: Contd....

Name of the species	Family	Vernacular name	Habit	Lif-span	Fl. & Fr. Time	IUCN Red list status	Purpose and plant part(s) used
32. <i>Casearia graveolens</i> Dalzell	Salicaceae	Kokra	T	P	Jan.-Mar.	NE	M:W
33. <i>Cassia fistula</i> L.	Fabaceae	Bandarlathi	T	P	Feb.-Dec.	NE	M:Fr,Se,Or:Fl; Ta:Fr,Sb,Se;Sa:W
34. <i>Cayratia pedata</i> (Lam.) Gagnep.	Vitaceae	Goyalalata	C	P	Aug.-Feb.	VU	M:Le,Ro
35. <i>Centranthera hispida</i> R. Br.	Orobanchaceae	Dudhali	H	A	Aug.-Nov.	LC	D:W;M:W
36. <i>Cereus hexagonus</i> (L.) Mill.	Cactaceae	Manasa	S	P	Jun.-Jul.	LC	M:St
37. <i>Chloris barbata</i> Sw.	Poaceae	Chamarghas	H	P	Aug.-Nov.	NE	Fo:Le;M:W
38. <i>Chlorophytum arundinaceum</i> Baker	Asparagaceae	Musli	H	P	May-Oct.	NE	M:Ro
39. <i>Chromolaena odorata</i> (L.) Spreng.	Asteraceae	Bhabri	H	A	Mar.-Sep.	NE	I:Le,St;M:W R,M,King & H,Rob. M:Le,Ro
40. <i>Chrozophora rotleri</i> (Geiseler)	Euphorbiaceae	Suryavari	H	A	Jul.-Feb.	NE	
41. <i>Cissampelos pareira</i> L.	Menispermaceae	Akanadi	C	P	Jul.-Jan.	NE	M:Le,Ro
42. <i>Cissus quinquangularis</i> Chiov.	Rubiaceae	Harjora	C	P	Feb.-Apr.	NE	M:Le,St
43. <i>Cissus repanda</i> (Wight & Arn.) Vahl	Rubiaceae	Harjora	C	P	Feb.-Apr.	NE	M:Le,St
44. <i>Cleome viscosa</i> L.	Cleomaceae	Hurhura	H	A	Sep.-Apr.	NE	M:Le,Ro,Se
45. <i>Clerodendrum infortunatum</i> L.	Lamiaceae	Ghentu	S	P	Feb.-Jul.	NE	M:Le,Ro
46. <i>Coccolus hirsutus</i> (L.) W.Theob.	Menispermaceae	Huyr	C	P	Aug.-Nov.	NE	M:Le,Ro;Sa:W
47. <i>Combretum decandrum</i> Jacq.	Combretaceae	Atang	C	P	Nov.-May	NE	D:Rb,Sb;M:Fl, Rb, Sb;Ta:Fr,Sb; Ti:St
48. <i>Croton bonplandianus</i> Baill.	Euphorbiaceae	Churchuri	H	P	All	NE	M:La,Le
49. <i>Curculigo capitulata</i> (Lour.) Kuntze	Hypoxidaceae	Talmuli	H	P	Jun.-Sep.	NE	M:Bu
50. <i>Cuscuta reflexa</i> Roxb.	Convolvulaceae	Swarnalata	C	P	Oct.-Feb.	NE	M:W
51. <i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Durbaghas	H	P	All	NE	Fo:Le;M:Rh,W; Sa:Le,W
52. <i>Cyperus corymbosus</i> Rottb.	Cyperaceae	Nagermutha	H	P	Jul.-Sep.	LC	Fo:Le;M:W
53. <i>Cyperus mindorensis</i> (Steud.) Huygh	Cyperaceae	Banda	H	P	Nov.-Mar.	LC	Fo:Le;M:W
54. <i>Dendrophthoe falcata</i> (L.f.) Etingsh.	Loranthaceae	Bhuipat	S	A	Nov.-Mar.	NE	M:W
55. <i>Dentella repens</i> (L.) J. R.Forst. & G.Forst.	Rubiaceae	Bhuipat	H	A	Feb.-May	LC	M:Le,W
56. <i>Dioscorea pentaphylla</i> L.	Dioscoreaceae	Suaralu	C	P	Sep.- Feb.	NE	E:Rh;M:Rh
57. <i>Dioscorea pubera</i> Blume	Dioscoreaceae	Kukur alu	C	P	Oct.-Jan.	NE	E:Rh;M:Rh
58. <i>Diospyros malabarica</i> (Desr.) Kostel.	Ebenaceae	Makarkend	T	P	Mar.-Jun.	NE	E:Fr,Le;Fo:Le;M:Fr,Sb;O:Se; Ta:Sb;Ti:St
59. <i>Diospyros melanoxylon</i> Roxb.	Ebenaceae	Kendu	T	P	Apr.-Jul.	NE	E:Fr,Le;Fo:Le;M:Fr,Sb;O:Se; Ta:Sb;Ti:St
60. <i>Diplocyclos palmatus</i> (L.) C.Jeffrey	Cucurbitaceae	Bonkakra	C	P	Aug.-Oct.	NE	M:Fr
61. <i>Dysphania ambrosioides</i> (L.) Mosyakin & Clemants	Amaranthaceae	Betho	H	A	Apr.-Jul.	NE	E:St;M:W

Table 1: Contd....

Name of the species	Family	Vernacular name	Habit	Life-span	Fl. & Fr. Time	IUCN Red list status	Purpose and plant part(s) used
62. <i>Elaeodendron glaucum</i> (Rottb.) Pers.	Celastraceae	Murmaria	T	P	Feb.-Aug.	NE	M:Fr,Rb,Se; Ti:St
63. <i>Elephantopus scaber</i> L.	Asteraceae	Hatikan	H	A	Sep.-Jan.	NE	M:Fl,Le,Ro
64. <i>Eragrostis ciliaris</i> (L.) R.Br.	Poaceae	Borokeruie	H	P	Oct.-Jan	NE	Fo:Le;M:W
65. <i>Euphorbia thymifolia</i> L.	Euphorbiaceae	Hatsur	H	P	All	NE	M:W
66. <i>Euploca strigosa</i> (Willd.) Diane & Hilger	Boraginaceae	Shankhpushpi	H	A	Dec.-Feb.	NE	M:W
67. <i>Evolvulus alsinoides</i> (L.) L.	Convolvulaceae	Ankra	H	A	Jul.-Feb.	NE	M:W,Sa:W
68. <i>Evolvulus nummularius</i> (L.) L.	Convolvulaceae	Bat	T	P	All	NE	M:W
69. <i>Ficus benghalensis</i> L.	Moraceae				Mar.-Sep.	NEE:Fr;Fi;Ro;Fo:Le; M:Fr;Ro;SbSe;Or:W;Sa:Le,W;Ti:St	
70. <i>Fimbristylis dichotoma</i> (L.) Vahl	Cyperaceae	Bainchi	H	P	Aug.-Oct.	LC	Fo:Le;M:W
71. <i>Flacourtia indica</i> (Burm.f.) Merr.	Salicaceae	Kaloada	S	P	Sep.-May	NE	M:W
72. <i>Globba sessiliflora</i> Sims	Zingiberaceae	Ulat-Chandal	H	P	Jul.-Oct.	LC	M:Rh
73. <i>Gloriosa superba</i> L.	Colchicaceae	Ashaora	C	P	Jul.-Sep.	LC	M:Rh
74. <i>Glycosmis pentaphylla</i> (Retz.) DC.	Rutaceae	Natakaranj	S	P	Sep.-Feb.	NE	M:Le,Ro;Sa:W
75. <i>Guilandina bonduc</i> L.	Fabaceae	Sabuni	C	P	Aug.-Apr.	NE	M:Le,Ro,Se
76. <i>Gypsophila vaccaria</i> (L.) Sm.	Caryophyllaceae	Jaba	H	A	Jan.-Mar.	NE	M:W
77. <i>Hibiscus rosa-sinensis</i> L.	Malvaceae	Kurchi	S	P	All	NE	M:Fl,Le,Ro;Sb;Sa:F
78. <i>Holarthena pubescens</i> Wall. ex G.Don	Apocynaceae	Shyamalata	T	P	Apr.-Feb.	LC	M:Le,Ro;Sb;Se;Oi:Fi
79. <i>Ichnocarpus frutescens</i> (L.) W.T.Aiton	Apocynaceae	Bhuikumra	C	P	Sep.-Mar.	NE	M:Le,Ro
80. <i>Ipomoea mauritiana</i> Jacq.	Convolvulaceae	Chameli	C	P	Aug.-Dec.	NE	M:Ro
81. <i>Jasminum multiflorum</i> (Burm.f.) Andrews	Oleaceae	Lalbharenda	C	P	Dec.-Mar.	NE	M:Fl,Le,Ro;Sa:Fi,W
82. <i>Jatropha gossypifolia</i> L.	Euphorbiaceae	Jagat- madan	S	P	Apr.-Aug.	NE	M:La,Le,Se;Oi:Se
83. <i>Justicia gendarussa</i> Burm.f.	Acanthaceae	Hathikan	S	P	Feb.-Apr.	NE	M:Le
84. <i>Knoxia sumatrensis</i> (Retz.) DC.	Rubiaceae	Bhubhairabi	H	A	Aug.-Nov.	NE	M:W
85. <i>Leea rubra</i> Blume ex Spreng.	Vitaceae	Bandgul	S	P	Mar.-Sep.	NE	M:Le,St
86. <i>Leonotis nepetifolia</i> (L.) R.Br.	Lamiaceae		H	A	Apr.-Jul.	NE	M:Fl,Le,Ro
87. <i>Macrosolen capitellatus</i> (Wight & Arn.) Danser	Loranthaceae	Bonbhandi	S	A	Mar.-Sep.	NE	M:W
88. <i>Malachra capitata</i> (L.) L.	Malvaceae	Ghundie	H	A	Sep.-Nov.	NE	M:Fl,Le,Ro
89. <i>Mallotus philippensis</i> (Lam.) Müll.Arg.	Euphorbiaceae	Am	T	P	Oct.-Mar.	NE	M:Fr,Rb;Sb
90. <i>Mangifera indica</i> L.	Anacardiaceae	Maha Neem	T	P	Feb.-Jun.	DD	E:Fr;G;Sb;M:W
91. <i>Melia azedarach</i> L.	Rutaceae	Koondhal	T	P	Feb.-Nov.	NE	Sa:Le;Ti:St
92. <i>Merremia hederacea</i> (Burm. f.) Hallier f.	Convolvulaceae	Taralata	C	A	Sep.-Dec.	NE	M:Fr,Le;Sb;Ti:St
93. <i>Mikania micrantha</i> Kunth	Asteraceae		C	A	Sep.-Feb.	NE	M:Le,Ro

Table 1: Contd....

Name of the species	Family	Vernacular name	Habit	Life-span	Fl. & Fr. Time	IUCN Red list status	Purpose and plant part(s) used
94. <i>Mimosa pudica</i> L.	Fabaceae	Lajjabati	H	P	Jul.-Nov.	LC	M:Le,Ro
95. <i>Morinda citrifolia</i> L.	Rubiaceae	Anch	T	P	Feb.-May	NE	M:Fr,Le,Sb;E:Fr;Fo:Le
96. <i>Murdannia spirata</i> (L.) G.Brückn.	Commelinaceae	Koshapuspi	H	A	Sep.-Jan.	LC	Fo:Le;M:Le
97. <i>Nelsonia canescens</i> (Lam.) Spreng.	Acanthaceae	Chhotobasak	H	A	Mar.-May	NE	M:Le
98. <i>Nicotiana plumbaginifolia</i> Viv.	Solanaceae	Bantamak	H	A	May-Sep.	NE	M:Le,Ro,Se
99. <i>Ocimum tenuiflorum</i> L.	Lamiaceae	Tulshi	H	P	Aug.-Jan.	NE	M:Le,St,W;Sa:Le,W
100. <i>Opuntia stricta</i> (Haw.) Haw.	Cactaceae	Phani-mansa	S	P	Apr.-Aug.	LC	M:St
101. <i>Oxalis corniculata</i> L.	Oxalidaceae	Anrul	H	A	All	NE	M:Le,W
102. <i>Parthenium hysterophorus</i> L.	Asteraceae	Gajarghas	H	A	Oct.-Mar.	NE	M:W
103. <i>Phoenix acaulis</i> Roxb.	Arecaceae	Bankhejur	S	P	Feb.-Jun.	NE	E:Fr;M:Fr;Ti:St
104. <i>Phyllanthus lanceolarius</i> (Roxb.) Müll.Arg.	Phyllanthaceae	Kechhua	S	A	Mar.-Dec.	NE	M:Fr,Le
105. <i>Phyllanthus urinaria</i> L.	Phyllanthaceae	Hazarmani	H	A	Apr.-Sep.	NE	M:W
106. <i>Phyllanthus virgatus</i> G.Forst.	Phyllanthaceae	Amla	H	A	Apr.-Sep.	NE	M:W
107. <i>Physalis angulata</i> L.	Solanaceae	Bantevariya	S	A	Aug.-Dec.	NE	M:Le,Ro,Se
108. <i>Plumeria rubra</i> L.	Apocynaceae	Golakchampa	T	P	Oct.-May	NE	M:Fl,La,Or;Fl,W;Sa:Fl
109. <i>Pterospermum acerifolium</i> (L.) Willd.	Malvaceae	Muchkunda	T	P	Jan.-Aug.	NE	E:Fl;M:Fl,Le, Sb;Sa: W;Ti:St
110. <i>Pupalia lappacea</i> (L.) Juss.	Amaranthaceae	Nagdamani	H	P	Sep.-Jan.	NE	E:Fr;M:Le,Fr
111. <i>Rauvolfia tetraphylla</i> L.	Apocynaceae	Gokul	S	P	Feb.-Dec.	NE	M:Le,Ro,W
112. <i>Rungia pectinata</i> (L.) Nees	Acanthaceae	Sibjata	H	A	All	NE	M:Le,Ro,W
113. <i>Schoenoplectella roylei</i> (Nees) Lye	Cyperaceae		H	P	Feb.-Aug.	LC	Fo:Le;M:W
114. <i>Scindapsus officinalis</i> (Roxb.) Schott	Araceae	Gaipipul	C	P	-	NE	M:Le,Rh;Or:W
115. <i>Scleromitrium diffusum</i> (Willd.) R.J.Wang	Rubiaceae	Kheipapra	H	A	Aug.-Feb.	LC	M:Le,W
116. <i>Scurrula cordifolia</i> (Wall.) G.Don	Loranthaceae	Banda	S	A	Jul.-Nov.	NE	M:W
117. <i>Senna sophora</i> (L.) Roxb.	Fabaceae	Kalkasunda	S	A	Apr.-Sep.	NE	M:Sb;Ta:Fr;Sb;Ti:St
118. <i>Senna tora</i> (L.) Roxb.	Fabaceae	Chakunda	H	A	Sep.-Dec.	NE	L:Fr,Le;M:Le,P,Se
119. <i>Seseli diffusum</i> (Roxb. ex Sm.)	Apiaceae	Ban Jowan	H	A	Feb.-May	NE	E:Se;M:Se
120. <i>Setaria flavidia</i> (Retz.) Veldkamp	Poaceae		H	P	Aug.-Nov.	LC	Fo:Le;M:W
121. <i>Shorea robusta</i> C.F.Gaertn.	Dipterocarpaceae	Sal	T	P	Mar.-Jun.	LR/LC	G:Sb;M:W;O:;Se;Sa:W;Ti:St
122. <i>Sida cordifolia</i> L.	Malvaceae	Berela	S	A	Aug.-Dec.	NE	M:Fr,Le,Ro,Se;Fr;Sb;Fo:Le
123. <i>Sida rhombifolia</i> L.	Malvaceae	Swetberela	H	P	Sep.-Dec.	NE	M:Le,Ro,St
124. <i>Smilax zylantica</i> L.	Smilacaceae	Kumarika	C	P	Jun.-Dec.	NE	M:Ro
125. <i>Solanum americanum</i> Mill.	Solanaceae	Kakmachi	H	A	Oct.-Apr.	NE	M:Fr,Le,Ro,Se
126. <i>Solanum torvum</i> Sw.	Solanaceae	Kantabegun	S	P	Jul.-Mar.	NE	M:Fr,Le,Ro,Se
127. <i>Spermacoce lasiocarpa</i> R.Br. ex Wall.	Rubiaceae	Madhabata	H	A	All	NE	M:W

Table 1: Contd....

Name of the species	Family	Vernacular name	Habit	Life-span	Fl. & Fr. Time	IUCN Red list status	Purpose and plant part(s) used
128. <i>Siriga angustifolia</i> (D. Don) C.J. Saldanha	Orobanchaceae	<i>Pivlaaga</i>	H	A	Jul.-Nov.	NE	M:W
129. <i>Strychnos nux-vomica</i> L.	Loganiaceae	<i>Kuchila</i>	T	P	Mar.-Jan.	NE	I:Fr,Se;M:Fr,Le, Rb,Se;Ti:St
130. <i>Tabernaemontana divaricata</i> (L.) R.Br. ex Roem. & Schult.	Apocynaceae	<i>Tagar</i>	S	P	Mar.-Dec.	NE	M:Ro,St; Or: Fl,W; Sa:Fl
131. <i>Tacca leontopetaloides</i> (L.) Kuntze	Dioscoreaceae	<i>Chikri</i>	H	P	Aug.-Nov.	LC	E:Rh;M:Rh
132. <i>Telosma pallida</i> (Roxb.) Craib	Apocynaceae	<i>Gharilata</i>	C	P	Sep.-Feb.	NE	M:Le,St
133. <i>Terminalia chebula</i> Retz.	Combretaceae	<i>Haritaki</i>	T	P	Apr.-Mar.	NE	Fo:Le;Ta:Fr,Le, Sb; Sa:W;Ta:Fr,Sb;Ti:St
134. <i>Tiliacora racemosa</i> Colebr.	Menispermaceae	<i>Teliakora</i>	C	P	Nov.-May	NE	M:Le, Ro
135. <i>Tragia involucrata</i> L.	Euphorbiaceae	<i>Bichhuti</i>	C	P	Mar.-Jan.	NE	M:Fr,Le, Ro
136. <i>Trichosanthes cucumerina</i> L.	Cucurbitaceae	<i>Banpatol</i>	C	P	Aug.-Dec.	NE	E:Fr;M:Fr
137. <i>Tridax procumbens</i> L.	Asteraceae	<i>Bhringaraj</i>	H	A	All	NE	M:Le, Ro
138. <i>Trigastroleuca pentaphylla</i> (L.) Thulin	Molluginaceae	<i>Khet papra</i>	H	A	Aug.-Nov.	NE	M:W
139. <i>Triumfetta rhomboidea</i> Jacq.	Malvaceae	<i>Laiberela</i>	H	A	Sep.-Jan.	NE	Fi:Sb;M:Fl,Le, Ro,St
140. <i>Urena lobata</i> L.	Malvaceae	<i>Bano chra</i>	S	A	Sep.-Dec.	NE	Fi:Sb;M:Fl,Le, Ro,St
141. <i>Urochloa reptans</i> (L.) Stapf	Poaceae	<i>Haparmali</i>	H	A	Aug.-Oct.	LC	Fo:Le;M:W
142. <i>Vallisneria spiralis</i> (L.) Kuntze	Apocynaceae	<i>Rasna</i>	C	P	Apr.-Jan.	NE	M:La,Le, Ro
143. <i>Vanda tessellata</i> (Roxb.) Hook. ex G.Don	Orchidaceae	<i>Raktapita</i>	H	P	Apr.-Jul.	LC	M:W; Or:Fl,W
144. <i>Ventilago denticulata</i> Willd.	Rhamnaceae	<i>Raktapita</i>	C	P	Sep.-Jun.	NE	D:Rb;Sb;M:Fr, Rb;Sb;Ti:St
145. <i>Viscum cruciatum</i> Sieber ex Boiss.	Santalaceae	<i>Banda</i>	S	P	Jan.-Jun.	NE	I:W;M:W
146. <i>Vitex negundo</i> L.	Lamiaceae	<i>Nisinda</i>	T	P	Mar.-Jun.	NE	I:Le,St;M:Fl,Fr,Le, Rb, Ro,Sb,Se
147. <i>Wattakaka volubilis</i> (L.f.) Stapf	Apocynaceae	<i>Jukti</i>	C	P	Jun.-Sep.	NE	M:Fl,Fr,La,Le, Ro
148. <i>Xanthium strumarium</i> L.	Asteraceae	<i>Okra</i>	H	A	Sep.-Apr.	NE	M:Fr,Le, Ro,Se
149. <i>Zeuxine strateumatica</i> (L.) Schltr.	Orchidaceae	<i>Shwethuli</i>	H	P	Dec.-Mar.	LC	M:Fl,Le;Or:Fl,W
150. <i>Zingiber capitatum</i> Roxb.	Zingiberaceae	<i>Jangli Ada</i>	H	P	Jul.-Aug.	NE	M:Rh

Abbreviation:

Habit: C-Climber, H-Herb, S-Shrub, T-Tree

Life-Span: A- Annual, P-Perennial

Flowering and Fruiting time: Jan.-January, Feb.-February, Mar.-March, Apr.-April, Jun.-June, Jul.-July, Aug.-August, Sep.-September, Oct.-October, Nov.-

November, Dec.-December, All- All season

IUCN Status: DD-Data Deficient, LC- Least Concern, LR/LC-Lower Risk/ Least Concerned, NE -Not Evaluated, VU-Vulnerable

Purpose and Plant part(s) used: Bu- Bulb, D- Dye, E- Edible, Fi- Fiber, Fl- Flower, Fo- Fodder, Fr- Fruit, G-Gum, I-Insecticidal, La- Latex, Le- Leaf, M- Medicinal, Or- Oil, Or- Ornamental, Rb- Root bark, Rh- Rhizome, Ro- Root, Sa- Sacred, Sb- Stem bark, Se-Seed, St- Stem, Ta- Tannin, Ti- Timber, Tu- Tuber, W- Whole

plant

Among these, 67 (44.67%) of the reported species were herbs. Other reported species included 26 shrubs (17.33%), 24 trees (16%) and 22 climbers (22%). Amongst the total 123 dicots (82%) and 27 monocots (18%), herbs, shrubs, trees and climbers represented 48, 25, 23, 27 and 19, 1, 1, 6 species, respectively, representing 32.0 percent, 16.67 percent, 15.33 percent, 18.0 percent and 12.67 percent, 0.67 percent, 0.67 percent and 4.0 percent of the total species (Table 1).

Major six herbaceous families (≥ 4 species) were Asteraceae (7 or 10.45%), Poaceae (6 or 8.96%), Amaranthaceae (4 or 5.97%), Cyperaceae (4 or 5.97%), Orobanchaceae (4 or 5.97%) and Rubiaceae (4 or 5.97%) held above 43.0 percent of the total herb population. The five major less-woody shrub families (≥ 2 species) were Malvaceae (5 or 19.23%), Loranthaceae (3 or 11.54%), Apocynaceae (2 or 7.69%), Cactaceae (2 or 7.69%) and Solanaceae (2 or 7.69%) represented above 53.0 percent of the total shrubs population. Apocynaceae, Ebenaceae, Malvaceae, Phyllanthaceae and Rutaceae were the four diversified families (≥ 2 species, 8.33%), which contained above 33.0 percent of the total tree population. Another 14 families contained single-tree species. The eight most speciose families (≥ 2 species) in descending manner included Apocynaceae (4 or 12.12%), Convolvulaceae (3 or 9.09%), Menispermaceae (3 or 9.09%), Cucurbitaceae (2 or 6.06%), Dioscoreaceae (2 or 6.06%), Fabaceae (2 or 6.06%), Rubiaceae (2 or 6.06%) and Sapindaceae (2 or 6.06%) and showed above 60.0 of the total liana population (Table 1).

Life-span

In the sacred grove, 58 (38.66%) annual plants would go through their life cycle in one growing season. There were 92 (61.34%) perennial plants that could survive most unfavourable conditions and would stay alive for more than two years (Table 1).

IUCN Categories

Among these 150 plants, 128 plants have not been evaluated until now. There were 19 Least Concerned (LC), 1 Vulnerable (VU), 1 Lower Risk or Least Concerned (LR/LC) and 1 Data Defi-

cient (DD) species. *Cayratia pedata* was the vulnerable liana species according to the IUCN (2020) (Table 1).

The above phyto-sociological analysis with ecological information about IUCN Red Listed plants reveals that the plants were still present and regenerate in the sacred grove but locally vanishing in nearby forests. This research will highlight the status and distribution of the species in the study area, the ecological characteristics required for their survival and the threats to some of the species (IUCN 2020). Various factors caused the increase in numbers of threatened species in the area. Overgrazing was a major cause, which led to the destruction of seedlings. In contrast, restricted population and low natural reproduction were the major factors for the vulnerability of *Cayratia pedata*.

Plant Part(s) Used for NTFPs and Ethnomedicine

This grove supports 19 timber-yielding plant species and a good number of NTFPs (Non-Timber Forest Products), of which, 19 species bear edible parts, 5 species produce fibre, 19 species have fodder value, 2 species yield gum, 5 species produce dye, 7 species have insecticidal properties, 150 species have medicinal properties, 6 species yield oil, 9 species have ornamental value, 8 species are tannin-yielding and 19 species have sacred value (Table 1).

A total of 150 ethnomedicinally important plants were collected and identified belonging to 59 families and 141 genera, of which 123 are dicots and the remaining 27 species are monocots. In the grove, herbs are represented by 67 species and are found to be a more prominent growth-form for treatment of various ailments followed by shrubs (26 species), climbers (33 species) and trees (24 species). The local people of the groves recognised the plant species by their different vernacular names and suggested the medicinal part(s) of those plant(s). Of the various plant part(s) used for the treatment of ailments, the leaves were being used maximum represented by 68.0 percent, followed by whole plant (52%), root (32.67%), fruit (32%), stem (25.33%), seed (23.33%), stem bark (20.67%), flower (16%), rhizome (8%), ornamental (6.67%), root bark (6%), latex (4%), tuber (2%) and bulb

(0.67%), respectively (Table 1). Most of the ethnomedicinal plants are common among the different sacred groves and the way of using the medicinal plants is quite similar among the different local communities of the sacred groves with several taboos (Bhakat and Sen 2008). All over the world, tribal communities, utilised leaves for the preparation of herbal medicine (Prabhu et al. 2014; Yabesh et al. 2014). The reason the leaves were mostly used is that they are more easily collected than underground parts, flowers and fruits and that leaves are active in photosynthesis and metabolite production from a scientific point of view (Ghorbani 2005; Giday et al. 2009).

Common Taboos and Beliefs Associated with the Grove

Those taboos need to be followed by all, according to villagers. These comprise the following:

1. The felling of the tree and uprooting any plant is strictly prohibited.
2. Footwear is to be removed at the entrance of the path leading to the deity.
3. Women are not allowed to enter the sacred groves during a specific period.
4. Collection of plant or plant part(s) has been strictly prohibited.
5. One day before worshipping, the devotees stop eating onion, garlic, egg and meat.
6. Anything that is made of leather is prohibited in the grove.
7. It is believed that any disturbance to the sacred grove causes failure of agricultural crop and disease to livestock.

Conservation Status

The *KST* sacred grove, although fairly well protected, is facing minor threats due to biotic pressure in the form of grazing, exotic weed invasion and erosion of ethical attachments with plants of the present generation. Therefore, there is a need to convince the local people about the value of sacred groves.

CONCLUSION

The religious beliefs and myths are generally attributed to the deities to preserve a large

number of forest patches. The *in situ* conservation practice of tribal communities is the traditional ecological heritage, which conserves the population of various species in its habitat, known as the best method of conservation. Conserving and promoting the heritage is of vital importance to protect many endemic, endangered and keystone species for future generations. There is a need to launch a sacred grove conservation programme under the Protected Area Network through the tribal-dominated institution. People's attitudes have changed nowadays and this along with the mistrust of traditional beliefs has caused the degradation of sacred groves throughout India. For improving their degraded condition, it is suggested that the local people living inside and around the sacred groves need to be taken into confidence so that long-term conservation goals can be achieved.

RECOMMENDATIONS

The researchers have the following recommendations based on primary and secondary data:

1. There is a need for a separate law to protect sacred groves throughout the country.
2. To care for sacred groves only, a separate branch must be started within the forest department.
3. A joint sacred grove management program, involving the forest department and key stakeholders in the sacred groves, should be developed. This will not only motivate the preservation of sacred groves but forests in general.
4. Educational institutions should be entrenched in the conservation of sacred groves.
5. Reforestation of sacred groves is urgently needed in several areas. There is a special need to initiate tree planting at a rapid pace in places where sacred groves are endangered or depleting.
6. Education programs, particularly for the youth, should be organised for the people. Such programs can assist in understanding the value of sacred groves. The youth should start engaging in the recycling and education projects themselves.

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