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Studies on phytodiversity of Seethal Bani Sacred grove in Jhunjhunu, Rajasthan.

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Abstract:

Seethal bani sacred grove located in Jhunjhunu district of Rajasthan was explored and surveyed to identify plant species available in this sacred grove. In study area 31 plant species were identified belonging to 15 different families. Out of 31 different species 7 species were trees, 3 species were shrubs and remaining 21 species were herbaceous. In study area invasive species 'Gajar Ghas' *Parthenium hysterophorus &* 'Vilayati babool' *Prosopis juliflora* were also observed. Plant species such as *Withania somnifera & Indigofera linnaei* were also recorded. In study area Shannon-Weiner diversity index H' lies between 0.868 for shrubs and 2.539 for herbs. Simpson Dominance index D lies between 0.110-0.472 and Gini-Simpson's Index of diversity (1-D) lies between 0.528-0.890. Bray-Curtis cluster analysis method similarity varies from 4.76% (between sample 4 and 5) to 48.69% (between sample 3 and 4).

Key words : Invasive, Phytodiversity indices, Sacred groves

Abbreviations: SG: Sacred grove.

Introduction:

Sacred groves are forest patches generally associated with some deity and are conserved because of some sacred belief. Sacred groves are storehouses of endemic and endangered species. Rare species like Gugal, Kadam, Dhak are generally found in sacred groves located at foothills of Aravali mountain range. Local communities have been conserving these since times immemorial as a religious ritual from generation to generation. Size of sacred groves may vary from a small patch of few acres to a large forest and are more prevalent in Himalayan states, North-eastern Indian states, Bihar, Orissa, Madhya Pradesh, Andhra Pradesh, Karnataka, Tamil Nadu, Kerala, Maharashtra, Karnataka and Rajasthan particularly where the indigenous communities live. The total area under sacred groves in India has been estimated to be 33,000 hectares which comes to 0.01 percent of the total area of the country. However, the actual area could be as high as 42,000 hectares taking into account the 4,415 sacred groves reported so far **(Gokhale *et al.*, 1998).** Conservation methods vary from place to place. Sacred groves help in *in-situ* conservation leading to better phytodiversity in area compared to its surroundings. The analysis of phytodiversity in sacred groves helps in knowing habitat conditions in these groves and also helps in identifying level of disturbance in these groves.

Material and methods:

Survey was conducted in sacred grove in different seasons to ensure inclusion of seasonal species and identification of maximum possible plants species. The phytodiversity of study area was analysed using quadrate method for trees, shrubs and herbs species as per Kent and Coker (1992). The density, frequency and basal area were calculated using randomly placed quadrats (10 x 10 m^2) for trees, shrubs (5 x 5 m^2) and herbs (1 x 1 m^2) at present sacred grove. Information was also collected from locals by questionnaire method. Also had fruitful discussion with locals on conservation and protection strategies of sacred grove and exchanged lot of information on this and made them aware about importance of sacred groves and suggested some pragmatic solutions. Also interacted with Temple *pujari* , *Ayurvedic* Doctor and a specialist in traditional medicine to know more about local name and uses of plant species found in and around sacred grove. Photographs of sacred grove area and plant species were also taken. Geographic coordinates of the sacred grove were recorded and with the help of recorded coordinates "Google Earth" website was used to calculate area of sacred grove. 'BioDiversity Pro' and 'Microsoft Excel 2007' software packages were used to calculate Diversity indices and to plot graphs.

Results:

Seethal bani sacred grove is located in Seethal village, Jhunjhunu district, Rajasthan, India. Total area under this sacred grove is 187 Acres and it is a community owned land. Geographic coordinates of study area are 28°009302' North, 75°527244' East.

Distribution Pattern:

The A/F (Abundance/Frequency) ratio was used to interpret the distribution pattern of the species. A/F ratio indicates regular (<0.025), random (0.025-0.05), and contagious (>0.05) distribution patterns (Whitford, 1949). It is also known as Whitford's index. In present study area most of tree and herb species had contagious distribution pattern whereas shrub species mostly had random distribution pattern.

Table 1: Habit-wise percentage of species showing different distribution patterns (Whitford's index)

	Distribution pattern		
Habit	Regular	Random	Contagious
Tree	14.29	28.57	57.14
Shrubs	0	66.67	33.33
Herbs	0	4.76	95.24

Raunkier's frequency classes:

It represents 5 different frequency classes as shown in Table 2 below. More than half of the tree and herb species fall under Raunkier's frequency class A (having frequency value 0%-20%), i.e. 57.14% tree species and 66.67% herb species.

Table 2: Habit-wise percentage of species distributed according to Raunkier's frequency classes. These frequency classes are A (0%-20%), B (21%-40%), C (41%-60%), D (61%-80%), E (81%-100%).

Habit	A	B	C	D	E
Tree	57.14	14.29	28.57	0	0
Shrubs	33.33	0	33.33	33.33	0
Herbs	66.67	14.29	19.05	0	0

Individual species distribution:

The figures 1 to 3 represent the individual species distribution in the seethal bani SG for tree, shrub and herb species respectively. The tree species *Acacia nilotica, Prosopis cineraria, Dalbergia sissoo, Zizyphus mauritiana, Prosopis juliflora, Ficus religiosa* showed random aggregation whereas *Acacia catechu* showed aggregated aggregation. The Shrub species *Calotropis procera, Zizyphus nummularia* showed random aggregation whereas *Lycium barbarum* showed aggregated aggregation. Among herb species *Leptadenia pyrotechnica, Digitaria ciliaris, Tribulus terrestris, Indigofera linnaei, Parthenium hysterophorus, Cynodon dactylon, Amaranthus viridis* showed aggregated aggregation whereas remaining 14 herb species (Table 4) showed random aggregation.

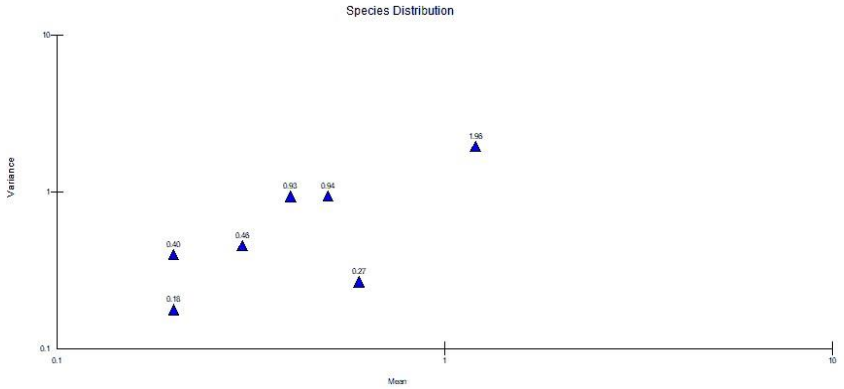

Figure 1: Species distribution pattern of tree species. On X-axis is mean and on Y-axis is Variance of the tree species.

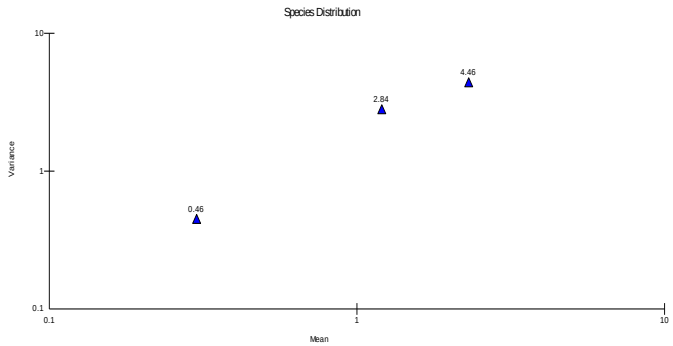

Figure 2: Species distribution pattern of shrub species. On X-axis is mean and on Y-axis is Variance of the shrub species.

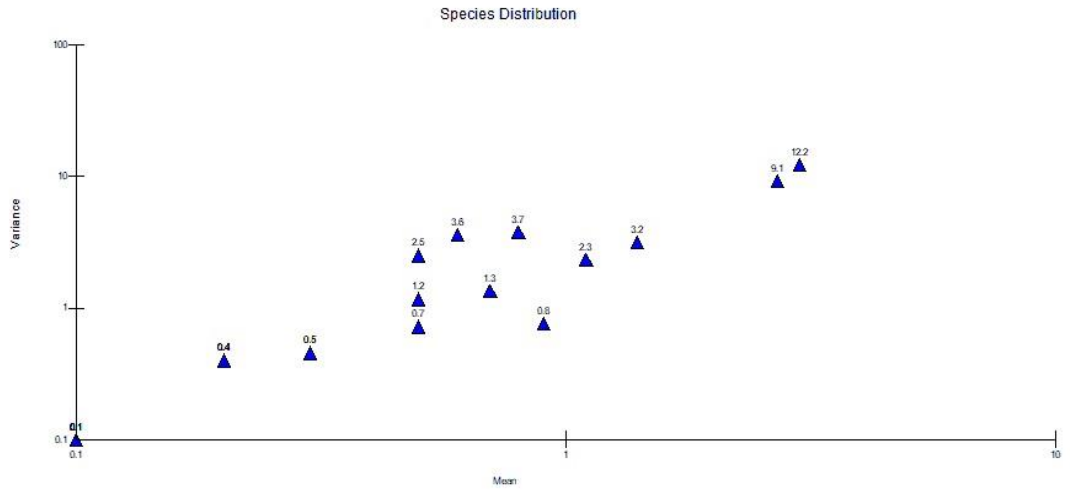

Figure 3: Species distribution pattern of Herb species. On X-axis is mean and on Y-axis is Variance of the herb species.

Abundance Rank plot:

Abundance rank plot shows relation between rank and abundance of species in each sample. The (Figure 4) shows that highest abundance in rank 1 is in sample 5 as 9 individuals of *Digitaria ciliaris* were recorded in said sample whereas samples 1 & 2 show lowest abundance in rank 1 as only 3 individuals of *Digitaria ciliaris & Acacia catechu* respectively were recorded in these samples. Samples 9 & 10 are only samples to have species up to rank 11 whereas, sample 7 has species only up to rank 6 hence has lowest species richness.

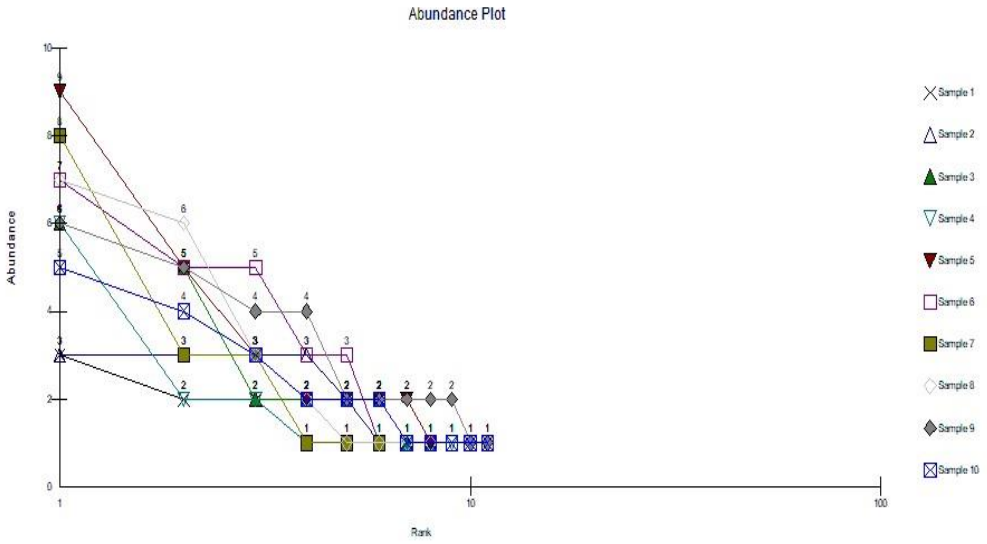

Figure 4: Abundance rank plot. X-axis represents rank and Y-axis represents Abundance of the species.

Species Richness:

Species richness is number of different species present in a habitat or study area. At present study area 31 different species were recorded. Line chart in Figure 5 shows the pattern of accumulation of

new species as new samples are explored. Species richness graph generally inclines steeply between first few samples as probability of recording new species is high and then gradually it flattens as sampling progresses due to decreasing probability of recording new species.

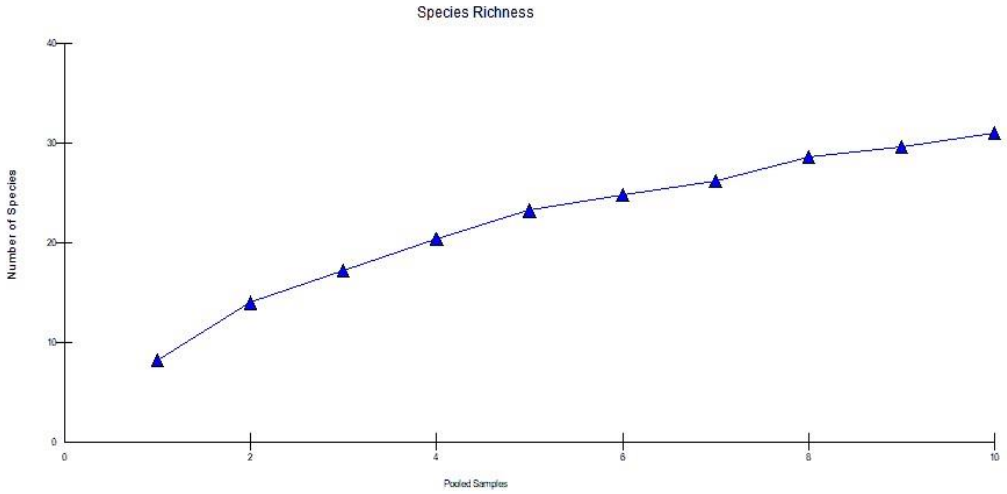

Figure 5: Species richness. X-axis shows pooled number of samples and Y-axis shows number of the species.

Bray-Curtis cluster analysis:

It is method to do comparative analysis between samples/sites. Samples having similar species will show highest similarity. In Bray-Curtis cluster analysis method (Figure 6) similarity varies between (0% to 100%) Where 0% depicts lowest similarity and 100% depicts highest similarity. In present study area samples 3 and 4 show highest similarity i.e. 48.69%, followed by sample 3 and 7 that has similarity of 48.48%. Whereas, lowest similarity is found between sample 4 and 5 i.e. 4.76%.

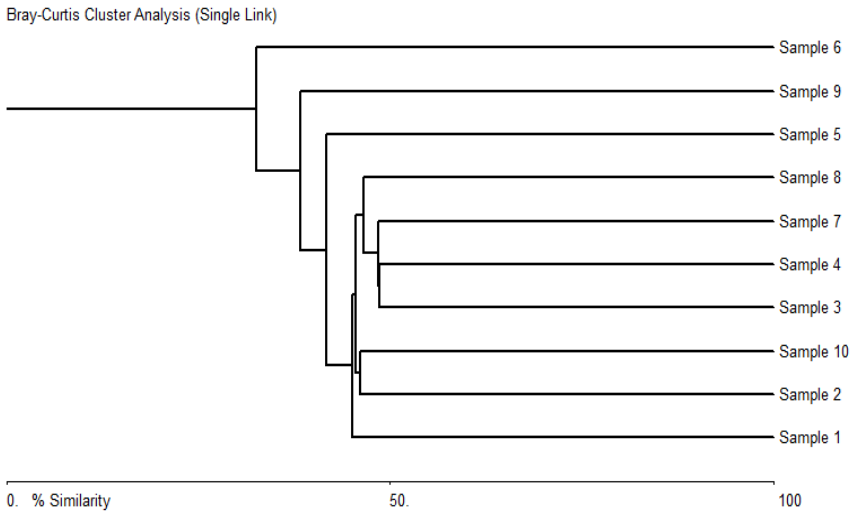

Figure 6: Bray-Curtis cluster analysis (Single Link) representing similarity percentage between samples.

Phyto-diversity indices of plant species in Seethal bani SG:

Most commonly used diversity indices i.e. Shannon-Weiner diversity index H', Simpson Dominance index D, Gini-Simpson's Index of diversity (1-D) were used to analyse phyto-diversity in present study area. Among these 3 indices Shannon-Weiner diversity index H' is most widely used diversity index. H' is directly proportional to diversity. Simpson Dominance index D is also largely used but it is inversely proportional to diversity. Hence, Gini-Simpson's Index of diversity (1-D) also came in use to overcome this limitation. Gini-Simpson's Index of diversity is calculated by subtracting simpson index (D) from 1. So, the result is directly proportional to diversity hence more logical.

Both Shannon-Weiner diversity index H' and Gini-Simpson's Index of diversity (1-D) are highest for herbs and lowest for shrubs in present study area. Values in Table 3 show clear relation between 3 indices as Simpson's index is inversely proportional to diversity whereas other 2 indices are directly proportional to diversity.

Table 3: Phytodiversity indices

Indices/Habit	Tree	Shrubs	Herbs
Shannon-Weiner diversity index H'	1.755	0.868	2.539
Simpson Dominance index D	0.206	0.472	0.11
Gini-Simpson's Index of diversity (1-D)	0.794	0.528	0.89

Discussion:

Local community uses these sacred groves in a limited way hence giving enough time to maintain sustainability. Sacred groves are indicator of natural productivity of the region. Several festivals and fairs/*melas* are hosted around sacred groves. Sacred groves also help in Soil and water conservation and also stop desertification of lands. Sacred groves also provide fuel wood, fodder, food and livelihood to humans.

Despite so many uses Sacred groves are facing existential threat in post modernist society because of loss of faith in traditional beliefs. In ancient times nature was worshipped but now temples are being worshipped. Industrialization has also wiped away sacred groves from many places.

Biggest threat in present study area i.e. Seethal Bani is encroachment. Locals who were once protectors of sacred groves are now encroaching them and bigger threat is legalisation of these encroachments by government. Another problem that facilitates encroachment is that Area, boundaries and legal status of sacred groves are not clearly defined. Seethal bani is almost in destroyed form as it is being encroached from all sides and also a big playground and running track has been made by locals after clearing trees from the area. Hence very less number of species survive

in Seethal bani Sacred Grove. Introduction of invasive species like ‘Gajar Ghas’ *Parthenium hysterophorus &* ‘Vilayati babool’ *Prosopis juliflora* is also responsible for loss of ecological balance in Seethal Bani sacred grove.

A. *Withania somnifera*

B. *Indigofera linnaei*

C. *Calotropis procera*

D. Echinops echinatus

E. *Heliotropium strigosum*

F. Nathji worship place in Seethal bani SG

Table 4: List of plant species that were identified in Seethal Bani SG:

S.No.	Botanical name	Vernacular name	Family	Habit
1	*Acacia nilotica*	Babool	Fabaceae	Tree
2	*Prosopis cineraria*	Khejri	Fabaceae	Tree
3	*Dalbergia sissoo*	Sheesam	Fabaceae	Tree
4	*Zizyphus mauritiana*	Ber	Rhamnaceae	Tree
5	*Prosopis juliflora*	Vilayati babool	Fabaceae	Tree
6	*Acacia catechu*	Kheri	Fabaceae	Tree
7	*Ficus religiosa*	Peepal	Moraceae	Tree
8	*Lycium barbarum*	Murali	Solanaceae	Shrub
9	*Calotropis procera*	Aak	Asclepiadaceae	Shrub
10	*Zizyphus nummularia*	Ber	Rhamnaceae	Shrub
11	*Withania somnifera*	Aswagandha	Solanaceae	Herbaceous
12	*Leptadenia pyrotechnica*	Kheenp	Asclepiadaceae	Herbaceous
13	*Digitaria ciliaris*	Jherni	Poaceae	Herbaceous
14	*Echinops echinatus*	Oont kateli	Asteraceae	Herbaceous
15	*Tribulus terrestris*	Chota Gokharu	Zygophyllaceae	Herbaceous
16	*Boerhavia diffusa*	Santhi	Nyctaginaceae	Herbaceous
17	*Achyranthes aspera*	Latjeera	Amaranthaceae	Herbaceous
18	*Indigofera linnaei*	Bekaria	Fabaceae	Herbaceous
19	*Gisekia pharnaceoides*	Sureli	Molluginaceae	Herbaceous
20	*Parthenium hysterophorus*	Gajar Ghas	Asteraceae	Herbaceous
21	*Citrullus colocynthis*	Gad tumba	Cucurbitaceae	Herbaceous
22	*Aerva pseudotomentosa*	Bui	Amaranthaceae	Herbaceous
23	*Malvastrum coromandelianum*	Jangli Khariti	Malvaceae	Herbaceous
24	Verbesina encelioides	Jangli Surajmukhi	Asteraceae	Herbaceous
25	*Argemone Mexicana*	Satyanashi	Papaveraceae	Herbaceous
26	*Cynodon dactylon*	Doob	Poaceae	Herbaceous
27	*Amaranthus viridis*	Cholai	Amaranthaceae	Herbaceous
28	*Saccharum munja*	Kuncha	Poaceae	Herbaceous
29	*Desmostachya bipinnata*	Dab	Poaceae	Herbaceous
30	*Crotalaria burhia*	Jhunda	Fabaceae	Herbaceous
31	*Heliotropium strigosum*	Chiti ka fool	Boraginaceae	Herbaceous

References:

1. Chaudhary, M. and Shringi, S.K. (2017). Floristic Composition of Beer Jhunjhunu Conservation Reserve of Rajasthan, India, http://www.thebiobrio.in/content.aspx?id=57 , The Biobrio 4(1 & 2), 2017, 244-258
2. Gadgil, M. and Vartak, V.D. (1976). Sacred groves of western ghats in India, Eco. Bot. 30: 152-160.
3. Gokhale V., Pala N.A., Negi A.K., Bhat J.A., Todaria N.P. (2011). Sacred Landscapes As Repositories Of Biodiversity A Case Study From The Hariyali Devi Sacred Landscape, Uttarakhand. International Journal of Conservation Science, 2(1):37-44.
4. Jatav, D.C. and Gupta, P. (2017). Traditional Uses of Medicinal Plants in Sacred Groves of Alwar District in Rajasthan, International Journal of Science and Research (IJSR), Volume 6 Issue 11, November 2017, 1847 – 1850
5. Katewa, S.S. and Guria, B.D. (1997). Ethnomedicinal observations on certain wild plants from southern Aravali hills of Rajasthan. Vasundhara : 85-88.
6. Katewa, S.S., Nag, A. and Guria, B.D. (1999). Ethnobotanical studies on wild plants for food from the Aravalli hills of South-east Rajasthan. Jour. Econ. Taxon. Bot. 23(1-2): 259-264.
7. Kumar, V. and Sharma, B. (2018). Gupteshwar Mahadev: A Valuable Sacred Grove For Conservation Of Medicinal Flora In Parthapgah District, Rajasthan, India, JETIR April 2018, Volume 5, Issue 4, 94-100
8. Singh, V. and Pandey, R.P. (1998). Ethnobotany of Rajasthan, India. Scientific Publishers, Jodhpur.
9. Vartak V.D., Kumbhojkar M.S., Nipuge D.S. (1987). Sacred groves in tribal areas of Western Ghats: treasure trove of medicinal plants. B Medi Ethno Bot Res., 8:77–78.
10. Zitzmann F. and Rode M. (2021). Short-Rotation Coppice Managed According to Ecological Guidelines—What Are the Benefits for Phytodiversity?. Forests, 12:646.