

Status study of medicinal plants at Purnapani forest of Jhargram in West Bengal

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Sal based vegetation of Purnapani is under Binpur-I community Development Block in the newly formed district Jhargram of West Bengal. It is important because it is an associated corridor of Jhitka-Lalgarh forest under Jhargram Forest Division (Formerly Medinipur Forest Division) which is open corridor for Dalma Elephant (including residential kind). It was famous because of recorded 'The Royal Bengal Tiger', reported first time. Now it is a forest filled with coppice sal (*Shorea robusta*) along with many valuable medicinal plants, timber yielding crops, mushrooms. The forest includes a variety of birds, butterflies including insects round the year. The forest comprised of a large number of insects, mushrooms, many ferns, mosses and woody lianas. The so called forest have been studied ecologically which reflects highest diversity index of shrubs (1.15) followed by herbs (1.14) and lowest diversity index of trees (0.15). The said research reflects evenness index and species richness index also. Here, highest evenness index was observed in case of herbs (1.16) followed by shrubs (0.08) while lowest was observed in case of tree species (0.16). Similarly, species richness of shrubs showed highest value (7.69) and lowest value of richness found in case of tree species (2.84). In case of studied medicinal plants, status of abstract community was *Shorea-Spatholobus-Cyperus* during monsoon. Here, all the plants observed were medicinal which have significant ecological role to develop better plant community.

Keywords: Purnapani, Coppice sal forest, medicinal plants, ecological status, conservation.

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I. Introduction

Medicinal plants are those plants which have potential chemical composition that act to cure ailments. Generally some plants are medicinal that are used by medicine men locally to protect disease or cure some problems on men and quadrupeds. But in contrary, most useful plants available locally in home gardens, or in forest or in open country yards applied day by day which have immense chemical properties to cure ailments or disease is so called medicinal plants. We see near our area, a large number of plants which protect some diseases or to stop the bleeding or used to cure appetite even constipation if used. Forest plants like *Terminalia bellerica*, *Terminalia chebula* and *Emblica officinalis* are used as 'triphala churna' to act as reliever against constipation since time immemorial. Similarly, aswagandha, ghritakumari, bel, satmuli, asoke, sarpagandha, belladonna, dhutara, kurchi, Kuchila, indrajab, helencha, kalmi, kotbel etc. are used locally to cure some problems faced by local people. In local ayurvedic preparation and even direct use purpose, local market is a common corridor where we can get these items in a large scale. Therefore, according to the use or pattern of use all plants may be regarded as medicinal plants. They have properties but the application or mode of action is under study regionally because of the lack of proper knowledge. Purnapani in Lalgarh is a dry deciduous sal dominated lateritic forest which boosts a large number of medicinal plants though it is adjacent to Lalgarh-Jhitka forest of Jhargram. The people and place is so tagged that people depend upon forest for their livelihood. They use fuel and some non-timber forest products (NTFPs) from forest floor. They dwell near the forest and for various purposes they use and collect medicinal plants from forest and nearby. Regionally all medicine men and local people use these plants for their common purpose even they practice on those elements as they depend upon traditional system of medicine. The high demand and low availability face them problems and that's why they consult doctors of allopathic and or homoeopathic even unani or ayurvedic including siddha system of medicine. Now, we see large habitats which are going to face a serious degradation problem. The soil erosion, forest fire, unwanted cutting of forest, sweeping the ground, construction of dam, highways, metallic roads and even construction of building, settlement of agricultural land, common plants are going to vanish from the locality. The fragmentations of habitat impose threats on local flora and fauna which is a burning problem. Every year our kitchen garden, home garden, home premises and open land losing vegetation and vanishing some flora and

fauna forever due to drought, flood and or indiscriminate use of these resources by unscientific means. So, people are going to forest where its beauty and natural resources attracts people. They always use the resource for their necessary purpose and so they engage there for collection of fuels, green leaves, mushrooms, medicinal herbs, shrubs, fruits, flowers and floral buds even raw resource round the year. Excessive pressure and huge collection even illicit felling make the forest degrade and natural forest becomes degraded even repeated forest fire make the forest barren. Flora, fauna and microorganisms are becoming less to lesser. The degree and concentration is therefore a parameter for present day research which makes it manage to restore the ecosystem more integral rather than degraded one. Keeping these view in mind, we have taken initiatives to study the status of medicinal plants available in sal dominated dry deciduous forest of Purnapani under Southwest Bengal. It is because the forest is a treasure of many medicinal plants as well as plants of economic kind. Study on the status of plants, their proper management and community based practice study is very much essential to restore it from degraded one. It is our focus theme which could be generated through group research in a lateritic southwest Bengal of West Bengal in the future.

II. Study Area

Study area is a forest which is 7 km away from Government General Degree College, Lalgargh, Jhargram, West Bengal. It is a coppice sal dominated dry deciduous forest with huge medicinal plants though facing degradation. It is a forest under Lalgargh Forest Range, Binpur-I CDB of Lalgargh, West Bengal. The site is famous as because it is surrounded by agricultural land and one side bounded by a canal. The site is dominated by tribal people like Lodha. The nearer forest aside the Jungle is Jhitka-Lalgargh forest. It is divided by two patches, one is dense and another is denser (more dense) as demarcated in the PRA map (Participatory Rural Appraisal Map 1).

III. Materials and Methods

A field study includes some aspects of study i.e. standardization of instruments, standardization of methodology associated with specific type of study have been made earlier in the workshop held at Lalgargh Govt. College on and from 26th July to 28th July. The study field and grid standardization was fixed by using statistical sampling. Random sampling was considered and plots were chosen and study was done with the fix up of seasons as per the guideline made earlier. Quadrats were drawn and study was done using 10 x 10 m², 5 x 5 m² and 1 x 1 m² for the study of trees, shrubs and herbs respectively. No change will takes place in case of trees as the data type is girth and height. So, in case of herbs and shrubs seasonal change is a general phenomenon so we have taken consecutive study started from monsoon in the coppice sal forest area (Fig. 3). Exotic like Lantana (Fig. 4) and Eupatorium are common species. Shrubby species show minute change in the forest where as in case of herbs, a great change has been observed in comparison to dry season when ground was almost barren. A GPS reading (latitude, longitude and altitude) was taken to know the global position. A local map has been drawn with the help of local people using participatory rural appraisal (PRA) technique. Study conducted to know the characters of vegetation, soil, flora, fauna, soil microbes, etc. to know the condition of ecosystem on a trial basis. Standard indices were prepared using different indices available in ecology work book. We consider study of frequency, density, abundance and importance value index (IVI) of species. These are required to qualify the goals and quantify the vegetation in terms of standard data. Diversity index, dominance index (concentration of dominance), evenness index and richness index were prepared for discussion till date. Frequency, Density, Abundance and IVI of species were studied using ecological standard. Frequency is the number of times a plant species occurs in a given number of quadrats. Frequency is usually expressed as a percentage and is sometimes called a frequency index. The concept of frequency indicates the probability of finding a species in a series of quadrats examined in an area of interest. It is denoted by 'f'. So, %f = Total number of quadrats in which species present / Total number of quadrats studied. An average number of individuals of a given species over the total number of samples studied in an area. Density therefore may be calculated by the formula given below: Density = Total number of individuals of a species present / Total number of quadrats studied. So,

Abundance of Species is another parameter. The number of individuals of a given species per unit area (quadrat) of occurrence is called abundance. Therefore, abundance = Total number of individuals of a species / total number of quadrats of occurrence.

Density gives us the numerical strength of a species in a plant community. Abundance on the other hand, gives the number of individuals of a species in a habitat. Generally, frequency and abundance are co-related to find out the distribution of species.

(a) High frequency x low abundance = Regular distribution.

(b) Low frequency x high abundance = Contagious distribution

Dominance indices are weighted towards the abundance of the commonest species. A widely used dominance index is Simpson's diversity index. It is used widely for all cases but need to study dominance as well as

diversity of species in a community. It takes into account both richness and evenness. It measures the probability that any two individuals drawn at random from an infinitely large community will belong to same species. There are two versions of the formulae for calculating Simpson's Index (D).

$$D = \sum (ni/N)^2 \quad \text{or, } D = \frac{n(n-1)}{N(N-1)}$$

The first one was taken into account. Where, n= the

total number of individuals of each species, N= the total number of organisms of all species. The value of D may be zero (0) or one (1). With this index zero represents infinite diversity and 1, no diversity. That is, the bigger the value of D, the lower the diversity. This does not sound logical, so to get over this problem, D is often used and subtracted from 1 or the reciprocal of the index is taken. People use **Simpson's Index of Diversity 1-D**. This index represents the probability that two individuals randomly selected from a community will belong to different species. The value of this index also ranges between 0 and 1, but here, the greater the value, the greater the diversity. Similarly **Simpson's Reciprocal Index 1/D** may be used to study the same vegetation. The value of this index starts with 1 as the lowest possible figure. This figure would represent a community containing only one species. The higher the value, the greater would be the diversity. The maximum value is the number of species in the sample. For example, if there are five species in the sample (data), the then maximum value is 5. The name Simpson's diversity index is often loosely applied and all three related indices described above (Simpson's Index, Simpson's Index of Diversity and Simpson's Reciprocal Index) have been quoted term, depending on author. All these three formulae used simultaneously but the first one was used for the study. The three values represent the same measurement value for biodiversity study. It is therefore, important to ascertain which index has actually been used in any comparative study of biodiversity. The disadvantage of Simpson's Index is that it is heavily weighted toward the most abundant species, as are in all dominance indices. The addition of rare species with one individual will fail to change the index. As a result, Simpson's Index is of limited value in conservation biology if an area has many rare species with just one individual. Importance Value Index was used to know the status of individual plants: It is totality of frequency, density and abundance of species i.e. a total value will be calculated on 300 only. Therefore, frequency, density and abundance values shall be calculated on 100 each basis. To make an IVI sum of RF+RD+RA (R stands for relative) was used, for diversity study use IVI value as 'ni' and sum of 'ni' as 'N' has been taken for consideration.

In study area i.e. Purnapani of Southwest Bengal, it is better to use the method for calculating the diversity index as Shannon and Wiener (1963). Similarly for dominance of concentration, Simpson's formula (1949) was used. To study the evenness of species, Pielou (1966) was used along with species richness by Margalef (1958). Similar in manner, indices of similarity in any community or simply community coefficient (IS) between any two sample sites were taken though now it has its no predictive value because of a single study area. Community study, the formula of Sorensen (1948) as described by Muller-Dombois and Ellenberg (1974) has been taken into account. All the references are mentioned below (1-22) in the form of Bibliography.

To study all, the individuals are given below:

$$(1) \quad \text{Diversity Index } (\bar{H}) = -\sum [(ni/N) \times \log (ni/N)].$$

Where, 'ni' is the value of IVI of individual species and 'N' is the total IVI of all the species.

$$(1) \quad \text{Dominance of Concentration } (Cd) = (ni/N)^2$$

Where 'ni' is the IVI of individual species and 'N' is the total IVI of all the species.

$$(2) \quad \text{Evenness Index } (e) = \text{Diversity Index} / \log S$$

Here, Diversity Index is Shannon Index and 'S' is the number of species.

$$(3) \quad \text{Species Richness Index } (d) = S - 1 / \log N$$

Where, S= Number of species and 'N' is the total Importance value and 'd' is species richness.

Abstract Community study: The degree of occurrence of a species in an ecosystem, in an abstract community, along the series of stand may be adjusted by species presence in sample plots of similar nature and size. The judgement for grouping of discrete plant communities into an abstract community may vary. However, based on common management status the classification of community has been done. This is indeed true to a natural forest where the elements are heterogeneous in comparison to the community in degraded land or plantation stand.

Several formulae used today to assess the diversity of species. But in general, Simpson's diversity index was popular. Zoologist and botanist use Shannon Index (1948) to determine the diversity of species. The formula is:

$$H = - \sum_{i=1}^r ni/N * \log ni/N$$

Where, 'N' is total number of 'ni' and 'ni' is the proportion of characters belonging to the ith type of letter in the string of interest. In ecology, ni is often the proportion of individuals belonging to the ith species in the dataset of interest. Then the Shannon entropy (degree of surprise) quantifies the uncertainty in predicting the species identity of an individual that is taken at random from the dataset. Although the equation is here written with natural logarithms, the base of the logarithm used when calculating the Shannon entropy can be chosen

freely. Shannon himself discussed logarithm base 2, 10, and e and these have since become the most popular bases in application that use the Shannon entropy. Each log base corresponds to a different measurement unit, which have been called binary digits (bits), decimal digits (decits), and natural digits (nats) for the base 2, 10 and e respectively. Comparing Shannon entropy values that were originally calculated with different log base requires converting them to the same log base: change from the base 'a' to base 'b' is obtained with multiplication by $\log_b a$. Evenness of Species: It takes natural logarithms of species richness ' $\ln(S)$ '. In this example, $\ln(3)$ equals 1.009. We can calculate the proportion of each species ' $p(i)$ ' by dividing the number of that species by the total number of all species.

IV. Result and Discussion

Present study revealed species composition and structure of abstract community in Purnapani forest of Lalgah, Jhargram. Here, herbaceous species encountered in quadrat was 16 while shrubs and tree species were 20 and 8 respectively. In this study, highest IVI value of herbaceous species was *Cyperus rotundus* (43.78) followed by *Curculigo orchioides* (38.75) (Fig. 9) and lowest IVI of species was recorded in case of *Crotalaria nana*, *Desmodium triflorum*, *Andrographis paniculata* and *Butea superba* (8.2) Table 1.

IVI of shrubby species showed interesting value i.e. *Spatholobus roxburghii* showed highest value (49.4) followed by *Holarrhena pubescens* (35.75) which are medicinal plants (Table 2). Lowest IVI was noticed in case of *Thespesia lampas*, *Syzygium cumuni*, *Flemingia chapper*, *Glochidion lanceolarium*, *Odina wodier* and *Flacourtia indica* (4.7).

Tree species showed lesser degree of variations, i.e. dominant species *Shorea robusta* showed highest IVI (186.7) followed by *Adina cordifolia* (35.34). Lowest IVI of tree species was found in case of *Gardenia latifolia*, *Terminalia bellerica*, *Mitragyna parviflora* and *Careya arborea* (9.18) Table 3.

Highest Diversity index was observed in case of shrubs (1.15) and lowest was observed in case of tree species (0.15) Table 4. Concentration of dominance of species was observed in case of shrubs (0.089) and lowest in case of trees (0.041). Highest Evenness of species was noticed in case of herbs (1.16) and lowest in case of trees (0.16). Similarly, highest richness of species was observed in case of shrubs (7.69) and lowest in case of tree species (2.84) Fig 8 in the said area.

V. Recommendation

In general the following points to be implemented to protect the forest and recover the flora and fauna in a regional basis but global in way:

- 1) Grazing should be checked.
- 2) Browsing and over loaded fuel wood collection should be checked.
- 3) Monsoon to post monsoon special attention should be paid to regenerate advant growth.
- 4) Illicit felling, lopping and climber cutting, should be banned so that spontaneous growth of natural members may get flowering and fruiting in due time.
- 5) Leaf and mushroom collection should be made on the basis of local management. During heavy rains do not allow or do not get permission to the forest even stop grazing.
- 6) Unscientific monitoring, litter collection, collection of mushroom, vegetables, leaf fuel, wood may enhance the productivity loss.
- 7) Study should be made repeatedly to monitor the vegetation as well as growing stock at regular interval basis.
- 8) Encourage the knowledge transfer about the forest and the long term benefit may be made at village with the help of local body of Schools, Clubs, and Colleges or even with the aid of forest officials.
- 9) Documentation on bio-resource may be arranged at School through active participation of all school going and club members.
- 10) Surface run-off should be checked to encourage the ground cover development and care should be taken to protect the ground cover from forest during post monsoon or in summer.
- 11) Wildlife should be protected by any way which automatically would amplify the medicinal herbs in woodland of lateritic forest.
- 12) Record board should be placed in front of forest and unwanted entry must be banned.
- 13) Display board must be placed at the entry point and People's Biodiversity Register (PBR) should be kept at School/Villager's House, Club House to record the entire flora/fauna available thereby.
- 14) Do and Don't glow sign board must be kept indicating pollution level, threats, measures taken or to be taken to aware people more in a scientific way for ecological sustenance of species.

VI. Conclusion

It is concluded that sal is dominant species in the forest which is common phenomenon. Here degree of biotic interference is higher that allows to overgrazing even over collection that is not fit to establish regeneration in the forest floor. Small plants like liverworts, mosses, ferns and small seedling face serious threat and repeated hammering may cause loss of species from the forest. Lopping and felling of illicit kind is a general phenomenon, which is observed inside the forest. Good growth seedlings, big mushrooms, small ferns and many insects have been observed in the forest which is a good sign for ecosystem development. Hope that researcher will work successively in the same site each season to establish a set of data to discuss on eco-degradation process that can triggers the path to make sustenance to develop vegetation through proper management.

VII. Conflicts of Interest

Conflict of interest of authors is none.

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Table 1 Ecological status of herbaceous medicinal plants in Purnapani of Lalgah, Jhargram, West Bengal, India

Name of Herbs	RF	RD	RA	IVI	ni/N	log ni/N	ni/N * log ni/N	(ni/N) * (ni/N)
(Col 1)	(Col 2)	(Col 3)	(Col 4)	(Col 5)	(Col 6)	(Col 7)	(Col 8)	(Col 9)
<i>Curculigo orchioides</i>	13.6	7.75	17.4	38.75	0.133162	-0.87577	-0.116618924	0.017731988
<i>Cyperus rotundus</i>	13.6	9.3	20.88	43.78	0.150447	-0.822766	-0.123782526	0.02263422
<i>Dicliptera bupleuroides</i>	6.8	3.1	3.48	13.38	0.045979	-1.337586	-0.061501381	0.002114104
<i>Hemidesmus indicus</i>	3.4	6.2	3.48	13.08	0.044948	-1.347434	-0.060565095	0.002020363
<i>Digitaria sanguinalis</i>	10.2	4.9	8.7	23.8	0.081787	-1.087465	-0.088940457	0.006689104
<i>Ichnocarpus frutescens</i>	3.4	15.5	8.7	27.6	0.094845	-1.023133	-0.09703943	0.008995642
<i>Botrychium daucifolium</i>	3.4	12.4	6.96	22.76	0.078213	-1.10687	-0.086571684	0.006117283
<i>Dioscorea bulbifera</i>	6.8	4.65	5.2	16.65	0.057216	-1.242628	-0.071098817	0.003273727
<i>Crotalaria nana</i>	3.4	3.1	1.7	8.2	0.028179	-1.550228	-0.043683411	0.000794039
<i>Desmodium triflorum</i>	3.4	3.1	1.7	8.2	0.028179	-1.550228	-0.043683411	0.000794039
<i>Andrographis paniculata</i>	3.4	3.1	1.7	8.2	0.028179	-1.550228	-0.043683411	0.000794039
<i>Lygodium japonicum</i>	6.8	4.65	5.2	16.65	0.057216	-1.242628	-0.071098817	0.003273727
<i>Murdania nudiflora</i>	6.8	4.65	5.2	16.65	0.057216	-1.242628	-0.071098817	0.003273727
<i>Butea superb</i>	3.4	3.1	1.7	8.2	0.028179	-1.550228	-0.043683411	0.000794039
<i>Commelina oblique</i>	3.4	6.2	3.4	13	0.044674	-1.350099	-0.060313694	0.001995725
<i>Bonnaya brachiata</i>	3.4	6.2	3.4	13	0.044674	-1.350099	-0.060313694	0.001995725
SUM	95.2	97.9	98.8	291.9			-1.14368	0.083291

Note: RF-Relative Frequency, RD-Relative Density and RA-Relative Abundance, IVI-Importance Value Index, Col-Column, Minus Sum of Col 8 is Diversity Index and Sum of Col 9 is Dominance Index. Hence, diversity Index of herbs is 1.14 and dominance index is 0.08 at Purnapani of Lalgah in Jhargram District.

Table 2 Ecological status of Shrubby medicinal plants in Purnapani of Lalgah, Jhargram, West Bengal, India

Name of Shrubs	RF	RD	RA	IVI	ni/N	log ni/N	ni/N * log ni/N	(ni/N) * (ni/N)
(Col 1)	(Col 2)	(Col 3)	(Col 4)	(Col 5)	(Col 6)	(Col 7)	(Col 8)	(Col 9)

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<i>Ampelocissus latifolia</i>	7.8	4.95	6	18.75	0.064655	-1.1894	-0.07690065	0.004180291
<i>Dioscorea bulbifera</i>	5.2	4.5	3.6	13.3	0.045862	-1.33855	-0.061388505	0.002103329
<i>Thespesia lampas</i>	2.6	1.5	0.6	4.7	0.016207	-1.7903	-0.029015209	0.000262663
<i>Spatholobus roxburghii</i>	10.4	15	24	49.4	0.170345	-0.76867	-0.130939137	0.02901736
<i>Holarrhena pubescens</i>	10.4	9.75	15.6	35.75	0.123276	-0.90912	-0.112072792	0.015196938
<i>Smilax perfoliata</i>	5.2	0.75	0.6	6.55	0.022586	-1.64616	-0.037180436	0.000510137
<i>Croton oblongifolia</i>	10.4	9.3	15	34.7	0.119655	-0.92207	-0.110330268	0.01431736
<i>Smilax zeylanica</i>	5.2	2.25	1.8	9.25	0.031897	-1.49626	-0.047725415	0.00101739
<i>Lygodium japonicum</i>	5.2	5.25	4.2	14.65	0.050517	-1.29656	-0.065498653	0.002551992
<i>Syzygium cumuni</i>	2.6	1.5	0.6	4.7	0.016207	-1.7903	-0.029015209	0.000262663
<i>Flemingia chapper</i>	2.6	1.5	0.6	4.7	0.016207	-1.7903	-0.029015209	0.000262663
<i>Glochidion lanceolarium</i>	2.6	1.5	0.6	4.7	0.016207	-1.7903	-0.029015209	0.000262663
<i>Gardenia arborea</i>	5.2	3	2.4	10.6	0.036552	-1.43709	-0.052528195	0.001336029
<i>Meyna spinosa</i>	5.2	15	12	32.2	0.111034	-0.95454	-0.105987091	0.012328656
<i>Flacourtia indica</i>	2.6	1.5	0.6	4.7	0.016207	-1.7903	-0.029015209	0.000262663
<i>Odina wodier</i>	2.6	1.5	0.6	4.7	0.016207	-1.7903	-0.029015209	0.000262663
<i>Cissus adnata</i>	2.6	10.5	4.2	17.3	0.059655	-1.22435	-0.073038923	0.00355874
<i>Atylosia indica</i>	2.6	3	2.4	8	0.027586	-1.55931	-0.043015393	0.000760999
<i>Ichnocarpus frutescens</i>	2.6	2.25	1.8	6.65	0.022931	-1.63958	-0.037597182	0.000525832
<i>Antidesma diandrum</i>	2.6	1.5	0.6	4.7	0.016207	-1.7903	-0.029015209	0.000262663
SUM	96.2	96	97.8	290			-1.15731	0.089244

Note: RF-Relative Frequency, RD-Relative Density and RA-Relative Abundance, IVI-Importance Value Index, Col-Column, Minus Sum of Col 8 is Diversity Index and Sum of Col 9 is Dominance Index. Hence, diversity Index is 1.15 and dominance index is 0.08 for shrubs at Purnapani of Lalgah in Jhargram District.

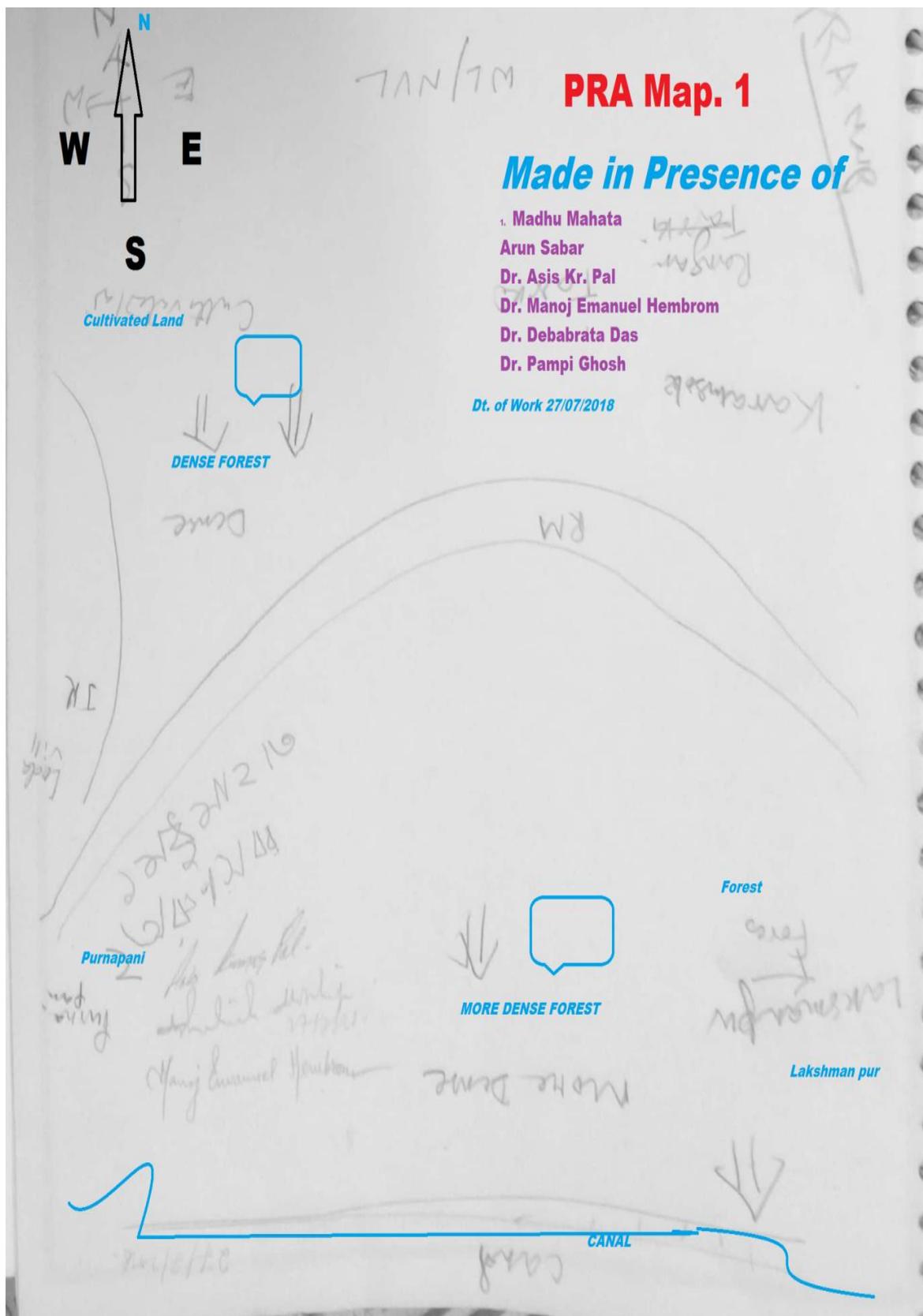
Table 3 Ecological Status of medicinal trees in Purnapani of Lalgah, Jhargram, West Bengal, India

Name of tree species	RF	RD	RA	IVI	ni/N	log ni/N	ni/N * log ni/N	(ni/N) * (ni/N)
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9
<i>Shorea robusta</i>	35	88.8	62.9	186.7	0.6365	-0.19616	-0.12485584	0.40513225
<i>Gardenia latifolia</i>	7	0.48	1.7	9.18	0.0313	-1.50447	-0.04708988	0.00097969
<i>Terminalia bellerica</i>	7	0.48	1.7	9.18	0.0313	-1.50447	-0.04708988	0.00097969
<i>Mitragyna parviflora</i>	7	0.48	1.7	9.18	0.0313	-1.50447	-0.04708988	0.00097969
<i>Careya arborea</i>	7	0.48	1.7	9.18	0.0313	-1.50447	-0.04708988	0.00097969
<i>Semecarpus anacardium</i>	14	0.48	3.4	17.88	0.0609	-1.21495	-0.073990151	0.00370881
<i>Adina cordifolia</i>	7	6.24	22.1	35.34	0.012049	-0.91905	-0.011073671	0.00014518
<i>Syzygium cumini</i>	14	0.96	1.7	16.66	0.0568	-1.24564	-0.070752182	0.00322624
SUM	98	98.4	96.9	293.3			-0.1574	0.416131

Note: RF-Relative Frequency, RD-Relative Density and RA-Relative Abundance, IVI-Importance Value Index, Col-Column, Minus Sum of Col 8 is Diversity Index and Sum of Col 9 is Dominance Index. Hence, diversity Index of tree species is 0.15 and dominance index is 0.41 for tree species at Purnapani of Lalgah in Jhargram District.

Table 4 Ecological Status of medicinal trees in Purnapani of Lalgah, Jhargram, West Bengal, India

	Types of Plants	Diversity Index	Dominance Index	Evenness Index	Species Richness Index
1.	Herbs	1.14	0.083	1.16	6.09
2.	Shrubs	1.15	0.089	0.88	7.69
3.	Trees	0.15	0.041	0.16	2.84
	Abstract Community is <i>Shorea-Spatholobus-Cyperus</i> in Purnapani Forest of Lalgah area in Jhargram District				



Map 1 PRA map showing dense and denser (more dense) forest at Purnapani of Lalgarh, Jhargram



Fig. 1 Study group during field at Purnapani forest of Lalgah, Jhargram, West Bengal, India



Fig. 2 Professors, Botanist, Scholars and students including local people in forest during field study at Purnapani forest of Lalgah, Jhargram



Fig. 3 Natural sal forest in front of School at Purnapani, Jhargram, W.B.



Fig. 4 *Lantana camara* an exotic weed attracts Butterfly at Purnapani forest of Lalgah, Jhargram, West Bengal, India during monsoon.

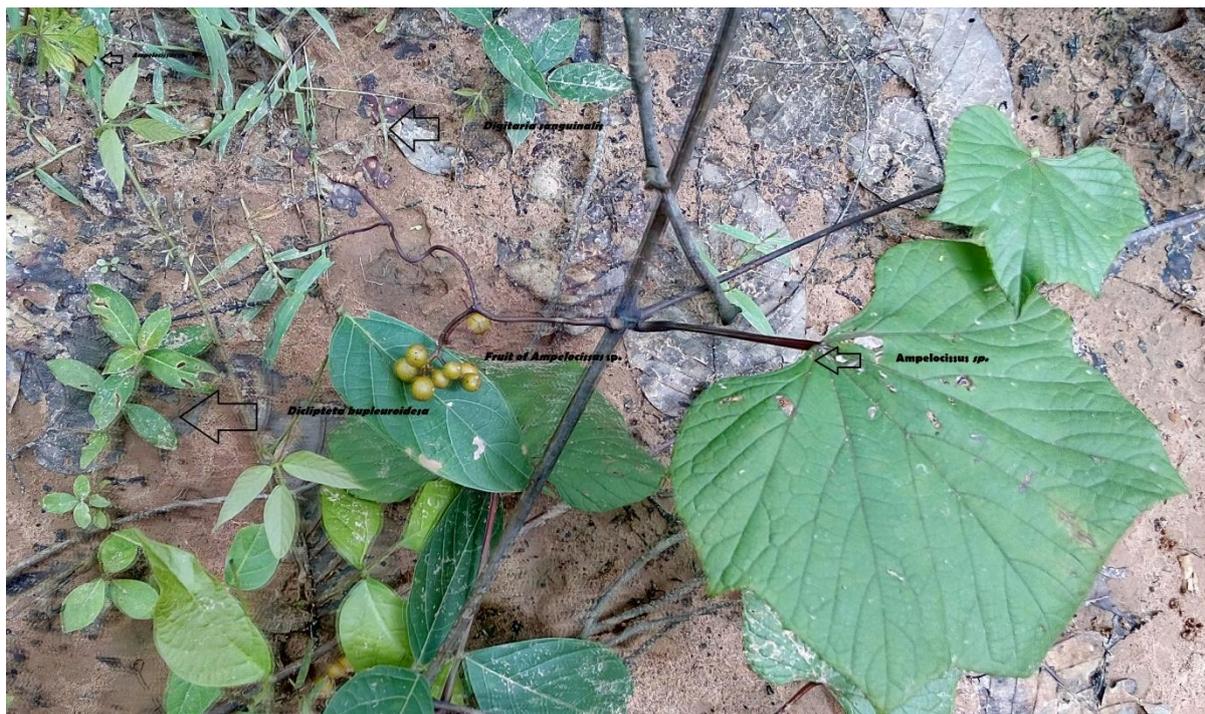


Fig. 5 Study Quadrat showed plant species inside the quadrat during field at Purnapani forest of Lalgarh, Jhargram, West Bengal, India



Fig. 6 Mushroom blooming at the centre of the quadrat along with other plants at Purnapani forest of Lalgarh, Jhargram, West Bengal



Fig. 7 Diverse fungi of Purnapani Forest (Un-identified) is a source of alkaloids: A bio-resource of forest of Jhargram, West Bengal in monsoon.

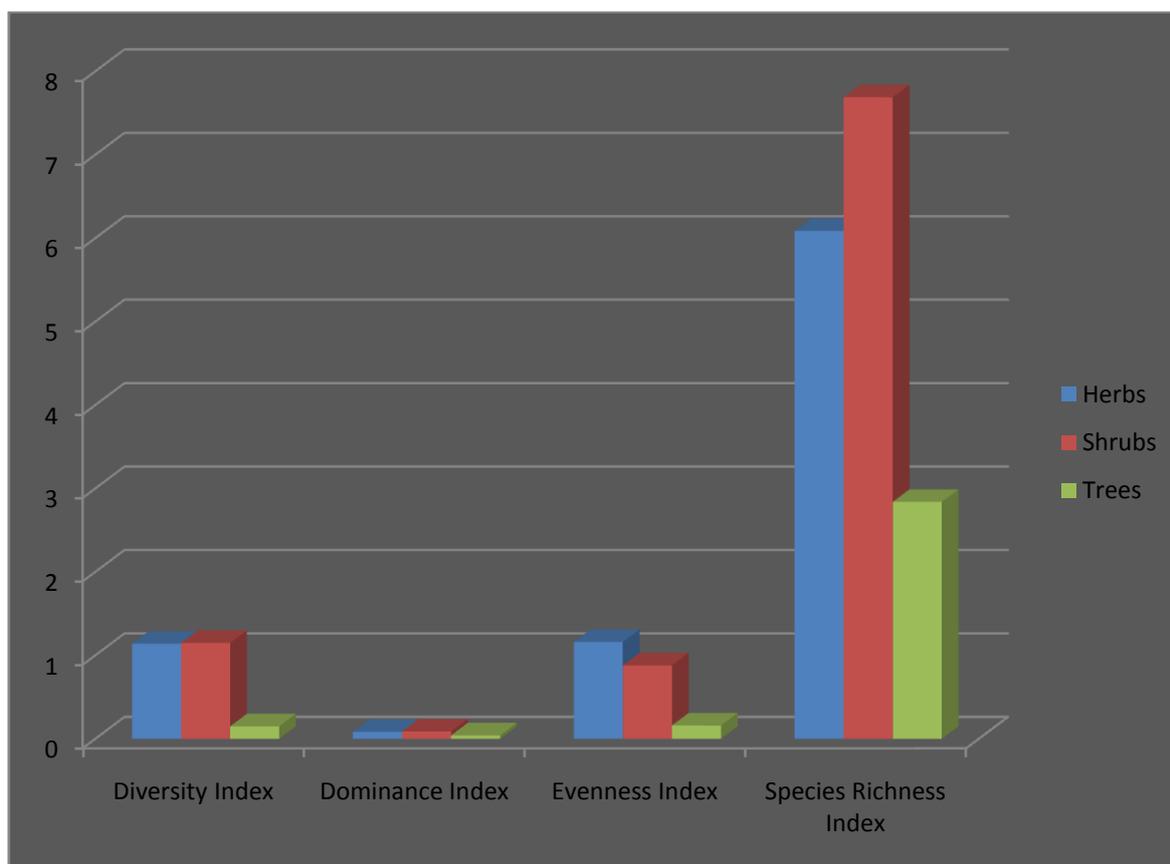


Fig. 8 Status of plants in forest of Purnapani, Lalgah, Jhargram District, West Bengal



Fig. 9 *Curculigo orchioides* in forest floor –an important medicinal herb locally called ‘Talamuli’

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