

Floristic Studies of Lajkura Coal Mines Area Jharsuguda, Odisha: An Overview

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Abstract- The opencast mining has resulted to destruction of habitats which is essential for maintaining ecological balance. In the present study, attempts have been made to assess the floristic composition and biomass accumulation of ground flora. The study revealed that the number of tree species was low in all the mining sites. The present study designed to explore the floristic composition of the Lajkura coal mining area, Jharsuguda and to analyze the impact of coal mining on plant diversity. The record of plant species was organized on the source of field trips conducted in winter, summer and monsoon during the year 2013-14. A total of 144 plant species (36 tree, 36 herbs, 34 shrubs, 17 small tree, 11 climber, 8 grasses and 2 rhizomes) were documented. Dominant families were Apocynaceae, Fabaceae, Moraceae, Poaceae, Euphorbiaceae, Asteraceae and Lamiaceae.

I. INTRODUCTION

India has abundance of coal resources and is the 3rd largest coal producing country after China and USA. It spreads over eight States in India (Jharkhand, West Bengal, Orissa, Chhattisgarh, M.P, U.P, Maharashtra and Assam) and operates in 473 Mines (Under Ground: 283, Open Cast: 155, Mixed: 35). Orissa's resource of Coal is formidable constituting approximately 25% of the total resources of the country (Noronha et al., 2009; Dash, 2005). More than 65% of electricity generation units are coal based. The mining industry accounts for a major percentage of the gross national product of many countries. But the removal of vegetation, top soil, overburden/waste and ore brings about the inevitable natural consequences, which manifest in many ways, deforestation, climatic change, erosion, and air and water pollution leading to serious health hazards. Ecosystem disturbance caused due to mining is an evitable fall out of industrialization and modern civilization. Forest ecosystems have important functions from an ecological perspective and provide services that are essential to maintain the life-support system on a local and global scale (Rao & Pant, 2001). Mining of coal both surface and subsurface causes enormous damage to the flora, fauna, hydrological relations and soil biological properties of the systems. Destruction of forests during mining operation is invariably accompanied by an extensive damage and loss to the system. Unscientific mining of minerals poses a serious threat to the environment, resulting in reduction of forest cover, erosion of soil at a greater scale, pollution of air, water and land and reduction in biodiversity (UNESCO, 1985). Mining operations, which involve minerals extraction from the earth's crust tends to,

make a notable impact on the environment, landscape and biological communities of the earth (Down & Stocks, 1997 and Bell *et al.* 2001). Open cast mining of coal deposits involves removal of overlying soil and rock debris. This debris is heaped in the form of dumps and is called mine spoil. These dumps change the natural land topography and affect the drainage system of the mining area (Chaulya *et al.* 2000). Lack of vegetation cover on such dumps often leads to acute problem of soil erosion and environmental pollution (Singh *et al.* 1996). Therefore, development of vegetation on the dumps is essential for the conservation of biodiversity and stable environment in the coalfield area (Singh *et al.* 2002). Besides, specific use of native and indigenous species for revegetation of mine spoil has also been suggested (Banerjee *et al.* 1996; Jha & Singh 1993). Hence an attempt was made for the floristic study in and around the mining area of the Lajkura coal mine of Jharsuguda, Odisha.

II. MATERIALS AND METHODS

Nationalisation of coal industry was done in 1973, which is now a part of western coals limited (WCL) having head quarters at Nagpur. In 1986 it came under South Eastern Coalfields Limited (SECL) having HQ at Bilaspur. In 1992, it came under Mahanadi Coalfield Limited (MCL) having HQ at Jagriti Vihar, Burla, Dist. Sambalpur (Odisha). Prior to nationalization, three underground mines were operational. Post nationalization, the IB valley Opencast Mines were opened from 1984 onwards. At present IB Valley Area consists of three Opencast Mines namely Lajkura Opencast mine, Samleswari Opencast mine and Lilari Opencast mine. The IB valley coalfield is located in south-eastern part of NW-SE trending Mahanadi basin belt between 21°30' to 83°37'N and 83°37' to 84°10'E. It touches the Himgir sub-basin in the north and the Rampur sub-basin in the south. The Ib-river is tributary of the Mahanadi. It lies entirely within the state of Orissa and covers parts of Sundargarh, Jharsuguda and Sambalpur district. The present study area is mainly confined to the Lajkura mining area which is situated between latitudes 21° 48' 39" & 21° 49' 55" N and longitudes 83° 53' 15" and 83° 54' 50" E as shown in figure1. Survey of composition of naturally occurring plant species and planted species was conducted during 2013-14.

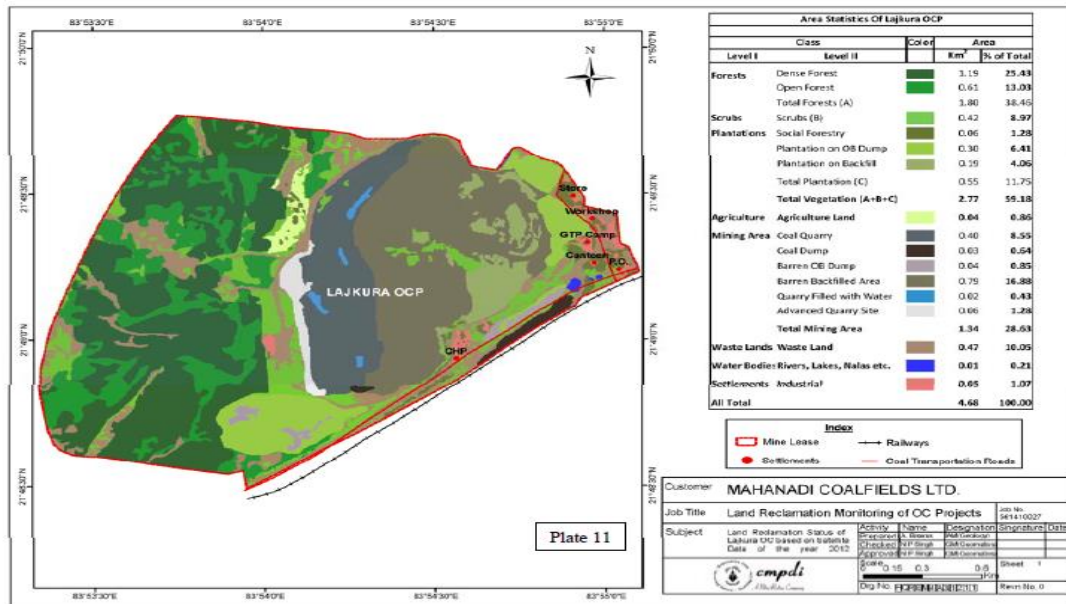


Fig 1: Study area

Plant specimens were collected in the sets of four preferably in flowering stage or at least in fruiting stage inside polythene bags. On spot floristic information on phenology, habit, habitat, vernacular names, local use were documented. Then the plant samples were dried and stored for further requirement as and when necessary. The voucher specimens were brought to the laboratory and processed for herbarium specimen [7-8] and identified with the help of available floras and literatures [9]. The

specimens were deposited in the Herbarium (RRL-B), Environment and Sustainability, Department of CSIR-Institute of Minerals & Materials Technology, Bhubaneswar for future references. The data were spread on an excel sheet to summarize and to identify various proportions like plant families, habit as presented in the table 1.

Table 1: List of plants collected and its data

SL NO.	BOTANICAL NAME	FAMILY	HABIT
1	<i>Adhatoda zeylanica</i> Medic.	Acanthaceae	Shrub
2	<i>Artocarpus heterophyllus</i> L.	Moraceae	Tree
3	<i>Anthocephalus cadamba</i> (Roxb.)Miq.	Rubiaceae	Tree
4	<i>Argemone mexicana</i> L.	Papaveraceae	Herb
5	<i>Azadirachta indica</i> A.Juss.	Meliaceae	Tree
6	<i>Aegle marmelos</i> (L.) Corr.	Rutaceae	Tree
7	<i>Annona squamosa</i> L.	Annonaceae	Shrub
8	<i>Ailanthus excelsa</i> Roxb.	Simaroubaceae	Tree

9	<i>Abrus precatorius</i> L.	Fabaceae	Climber
10	<i>Anacardium occidentale</i> L.	Anacardiaceae	Small Tree
11	<i>Aristolochia indica</i> L.	Aristolochiaceae	Climber
12	<i>Achyranthes aspera</i> L.	Amaranthaceae	Herb
13	<i>Acacia mangium</i>	Fabaceae	Tree
14	<i>Atylosia scarabaeoides</i> (L.) Benth	Fabaceae	Climber
15	<i>Agave sisalana</i> ex Engelm.	Agavaceae	Rhizome
16	<i>Asparagus racemosus</i> Willd.	Liliaceae	Climber
17	<i>Acorus calamus</i> L.	Araceae	Herb
18	<i>Andrographis paniculata</i> (Burm.f.)Wall.ex Nees	Acanthaceae	Herb
19	<i>Adina cordifolia</i> Hook.F.ex brandis	Rubiaceae	Tree
20	<i>Anogeissus latifolia</i> Wall.ex Guill.& Perr.	Combretaceae	Tree
21	<i>Acacia auriculiformis</i> (Roxb.ex.DC) A.Cunn.ex Benth.	Fabaceae	Small Tree
22	<i>Blumea lacera</i> (Burm.f.) DC.	Asteraceae	Herb
23	<i>Bougainvillea spectabilis</i> willd.	Nyctaginaceae	shrubs
24	<i>Bauhinia purpurea</i> L.	Caesalpinlaceae	Small Tree
25	<i>Butea monosperma</i> (Lam.) Taub.	Fabaceae	Small Tree
26	<i>Borassus flabellifer</i> L.	Arecaceae	Tree
27	<i>Barleria cristata</i> L.	Acanthaceae	Shrub
28	<i>Bulbostylis barbata</i> (Rottb.) C..B.cl	Cyperaceae	Climber
29	<i>Canthium glabrum</i> Blume.	Rubiaceae	Small Tree

30	<i>Croton sparsiflorus</i> Morong.	Euphorbiaceae	Herb
31	<i>Carica papaya</i> L.	Caricaceae	Small Tree
32	<i>Calotropis procera</i> (Ait.)R.Br	Asclepiadaceae	Shrub
33	<i>Citrus aurantifolia</i> (Christm.& Panz.)Swingle	Rutaceae	Shrub
34	<i>Cassia occidentalis</i> L.	Caesalpinlaceae	Erect Herb
35	<i>Careya arborea</i> Roxb.	Lecythidaceae	Small Tree
36	<i>Cassia fistula</i> L.	Caesalpinlaceae	Small Tree
37	<i>Cucurbita pepo</i> L.	Cucurbitaceae	Climber
38	<i>Costus speciosus</i> (Koeng) Sm.	Zingiberaceae	Herb
39	<i>Cajanus cajan</i> (L.)Huth	Fabaceae	Erect Shrub
40	<i>Cassia tora</i> auct.non L.	Caesalpinlaceae	Herb
41	<i>Cuscuta reflexa</i> Roxb.	Cuscutaceae	Creeper
42	<i>Cleistanthus collinus</i> (Roxb.) Benth.ex Hook.f.	Euphorbiaceae	Tree
43	<i>Curculigo orchioides</i> Gaertn.	Hypoxidaceae	Herb
44	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Grass
45	<i>Catharanthus roseus</i> (L.) G.Don	Apocynaceae	Herb
46	<i>Celastrus paniculata</i> Willd.	Celastraceae	Shrub
47	<i>Centella asiatica</i> (L.) Urban	Apiaceae	Herb
48	<i>Clerodendrum inerme</i> (L.) Gaertn.	Verbenaceae	Shrub
49	<i>Curcuma longa</i> L.	Zingiberaceae	Rhizome
50	<i>Cascabela thevetia</i> (L.) Lippoid	Apocynaceae	Small tree
51	<i>Cyperus squarrosus</i> L.	Cyperceae	Grass

52	<i>Cleome monophylla</i> L.	Cleomaceae	Herb
53	<i>Dendrocalamus strictus</i> (Roxb.)Nees	Poaceae	Grass
54	<i>Dalbergia sissoo</i> Roxb.	Fabaceae	Tree
55	<i>Diospyros melanoxylon</i> Roxb.	Ebenaceae	Tree
56	<i>Evolvulus alsinoides</i> (L.) L.	Convolvulaceae	Herb
57	<i>Emblica officinalis</i> Gaertn.	Euphorbiaceae	Tree
58	<i>Eucalyptus tereticornis</i> Sm.	Myrtaceae	Tree
59	<i>Eragrostis coarctata</i> Stapf	Poaceae	Grass
60	<i>Evolvulus nummularius</i> (L.)L.	Convolvulaceae	Herb
61	<i>Eupatorium odoratum</i> L.	Asteraceae	Herb
62	<i>Urena lobata</i>	Malvaceae	Herb
63	<i>Euphorbia hirta</i> L.	Euphorbiaceae	Herb
64	<i>Eugenia jambolana</i> Lam	Myrtaceae	Small Tree
65	<i>Erioglossum rubiginosum</i> (Roxb.)Bl.	Sapindaceae	Small Tree
66	<i>Ficus benghalensis</i> L.	Moraceae	Tree
67	<i>Ficus racemosa</i> L.	Moraceae	Tree
68	<i>Ficus hispida</i> L.f.	Moraceae	Tree
69	<i>Ficus religiosa</i> L.	Moraceae	Tree
70	<i>Glochidion lanceolarium</i> (Roxb.)Dalz.	Euphorbiaceae	Small Tree
71	<i>Hibiscus rosa- sinensis</i> L.	Malvaceae	Shrub
72	<i>Holarrhena bubescens</i> (Buch.Ham.) Wall.ex G.Don	Apocynaceae	Tree
73	<i>Hemidesmus indicus</i> (L.)R.Br	Apocynaceae	Climber

74	<i>Heliotropium indicum</i> L.	Boraginaceae	Herb
75	<i>Homonoia riparia</i> Lour.	Euphorbiaceae	Shrub
76	<i>Helicteres isora</i> L.	Malvaceae	Shrub
77	<i>Ixora pavetta</i> andr.	Rubiaceae	Shrub
78	<i>Ipomoea carnea</i> Jacq.	Convolvulaceae	Shrub
79	<i>Jatropha gossypifolia</i> L.	Euphorbiaceae	Shrub
80	<i>Ludwigia adscendens</i> (L.) Hara	Onagraceae	Herb
81	<i>Lantana camara</i> var. <i>acullata</i> (L.) Mold	Verbenaceae	Shrub
82	<i>Leucas mollissima</i> Wall.ex Benth.	Labiatae	Herb
83	<i>Lagerstroemia parviflora</i> Roxb.	Lythraceae	Shrub
84	<i>Lawsonia inermis</i> L.	Lythraceae	Shrub
85	<i>Lygodium flexuosum</i> (L.) Sw.	Lygodiaceae	Fern
86	<i>Lagerstroemia indica</i> L.	Lythraceae	Tree
87	<i>Madhuca indica</i> Gmel.	Sapotaceae	Tree
88	<i>Murraya Koenigii</i> (L.) Spreng.	Rutaceae	Shrub
89	<i>Mangifera indica</i> L.	Anacardiaceae	Tree
90	<i>Moringa oleifera</i> Lam.	Moringaceae	Small Tree
91	<i>Mimosa pudica</i> L.	Fabaceae	Herb
92	<i>Musa paradisiacal</i> L.	Musaceae	Shrub
93	<i>Manihot esculenta</i> Crantz	Euphorbiaceae	Shrub
94	<i>Microstegium ciliatum</i> (Trin.) A.camus	Poaceae	Grass

95	<i>Mimosa himalayana</i> Gamble	Mimosaceae	Shrub
96	<i>Mitragyna parvifolia</i> (Roxb.)Korth.	Rubiaceae	Tree
97	<i>Mimusops elengi</i> L.	Sapotaceae	Tree
98	<i>Merremia tridentata</i> (L.)Hall.f.	Convolvulaceae	Creepers
99	<i>Mentha piperita</i> L.	Lamiaceae	Herb
100	<i>Nerium oleander</i> L.	Apocynaceae	Shrub
101	<i>Nouchali stellata</i> Willd	Nymphaeaceae	Herb
102	<i>Oxalis corniculata</i> L.	Oxalidaceae	Herb
103	<i>Oxal scandens</i> Roxb.	Oxalaceae	Shrub
104	<i>Osbeckia chinensis</i> L.	Melastomataceae	Herb
105	<i>Ocimum basilicum</i> L.	Lamiaceae	Shrub
106	<i>Phoenix sylvestris</i> (L.)Roxb	Arecaceae	Tree
107	<i>Psidium guajava</i> L.	Myrtaceae	Small Tree
108	<i>Polyalthia longifolia</i> (Sonn.) Thw.	Annonaceae	Tree
109	<i>Pithecellobium saman</i> (Jacq.)Benth.	Fabaceae	Small Tree
110	<i>Pergularia daemia</i> (Forssk.)Chiov.	Apocynaceae	Climber
111	<i>Peltophorum pterocarpum</i> (DC.)Baker ex. K.Heyne	Caesalpinaceae	Tree
112	<i>Polygonum barbatum</i> L.	Polygonaceae	Herb
113	<i>Parthenium hysterophorus</i> L.	Asteraceae	Herb
114	<i>Phyllanthus emblica</i> L.	Euphorbiaceae	Tree
115	<i>Quisqualis indica</i> L.	Combretaceae	Shrub

116	<i>Rouvolfia tetraphylla</i> L.	Apocynaceae	Shrub
117	<i>Richardia scabra</i> L.	Rubiaceae	Herb
118	<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	Tree
119	<i>Sesamum indicum</i> L.	Pedaliaceae	Herb
120	<i>Schleichera oleosa</i> (Lour.)Oken	Sapindaceae	Tree
121	<i>Solanum lycopersicum</i> L.	Solanaceae	Herb
122	<i>Smilax macrophylla</i> Roxb.	Smilacaceae	Shrub
123	<i>Streblus asper</i> Lour.	Moraceae	Tree
124	<i>Scoparia dulcis</i> L.	Scrophulariaceae	Herb
125	<i>Shorea robusta</i> Gaertn.f.	Dipteraocarpaceae	Tree
126	<i>Solanum torvum</i> Sw.	Solanaceae	Shrub
127	<i>Tamarindus indica</i> L.	Fabaceae	Tree
128	<i>Terminalia tomentosa</i> (Roxb.ex DC.)Wight & Arn.	Combretaceae	Tree
129	<i>Tectona grandis</i> L.f.	Verbenaceae	Tree
130	<i>Terminalia bellirica</i> (Gaertn.)Roxb.	Combretaceae	Tree
131	<i>Tridax procumbens</i> L.	Asteraceae	Herb
132	<i>Thysanolaena maxima</i> (Roxb.)Kuntze	Poaceae	Grass
133	<i>Typha angustata</i> Bory & Chaub.	Typhaceae	Herb
134	<i>Tephrosia purpurea</i> (L.)Pers.	Fabaceae	Grass
135	<i>Thuja orientalis</i> L.	Cupressaceae	Small Tree
136	<i>Crotolaria juncea</i> L.	Fabaceae	Shrub

137	<i>Trichosanthes tricuspidata</i> Lour.	Cucurbitaceae	Climber
138	<i>Tripogon bromoides</i> R & S	Poaceae	Grass
139	<i>Toddalia asiatica</i> (L.)Lam.	Rutaceae	Shrub
140	<i>Vitex negundo</i> L.	Lamiaceae	Shrub
141	<i>Valeriana chinensis</i> L.	Hydrocharitaceae	Herb
142	<i>Wendlandia heynei</i> (Roem. & Schult.) Sant. & Merch.	Rubiaceae	Small Tree
143	<i>Woodfordia fruticosa</i> (L.)Kurz	Lythraceae	Shrub
144	<i>Ziziphus oenoplia</i> (L.) Mill	Rhamnaceae	Shrub

III. RESULTS AND DISCUSSION

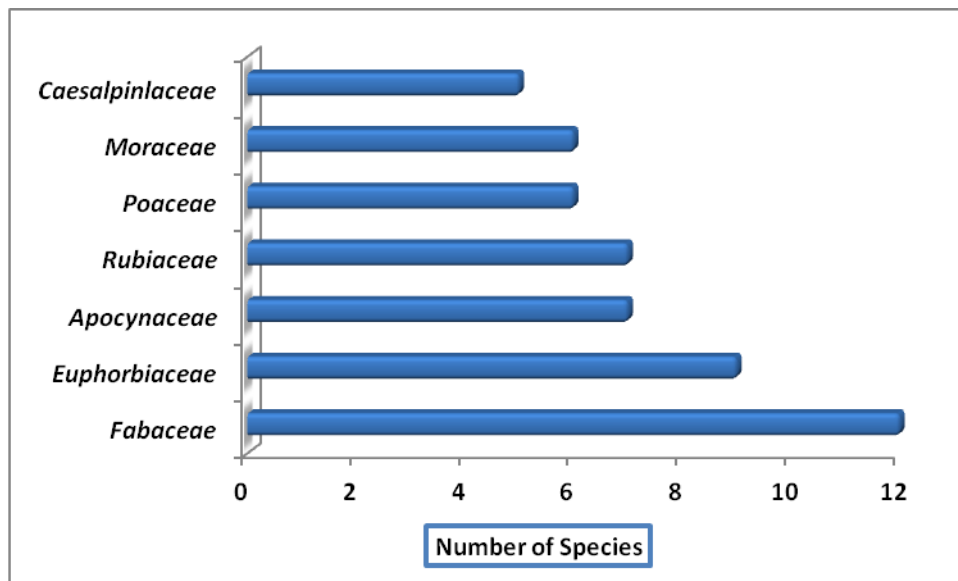


Figure 2: Graph showing number of species in families

Despite of harsh climate a total of 144 plant species (36 tree, 36 herbs, 34 shrubs, 17 small tree, 11 climber, 8 grasses and 2 rhizomes) were documented from the nearby areas of Lajkura coal mine. Dominant families were Apocynaceae, Fabaceae, Moraceae, Poaceae, Euphorbiaceae, Asteraceae and Lamiaceae as shown in figure 2. The grasslands of the area comprise the grasses like *Cynodon dactylon*, *Eragrostis coarctata*, *Bulbostylis neglecta*, *Microstegium ciliatum*, *Thysanolaena maxima*,

Tehrosia purpurea and *Tripogon bromoides*. Tree species like *Cassia fistula*, *Eucalyptus tereticornis*, *Ficus carica*, *Ficus religiosa*, *Mangifera indica*, *Madhuka indica*, *Phyllanthus emblica*, *Solanus crispum*, *Tectona grandis* and *Tamarindus indica* are the keystone species in that area. Plant species like *Cynodon dactylon*, *Cyperus rotundus*, *Heliotropium strigosum* and *Parthenium hysterophorus* were exotic in nature.

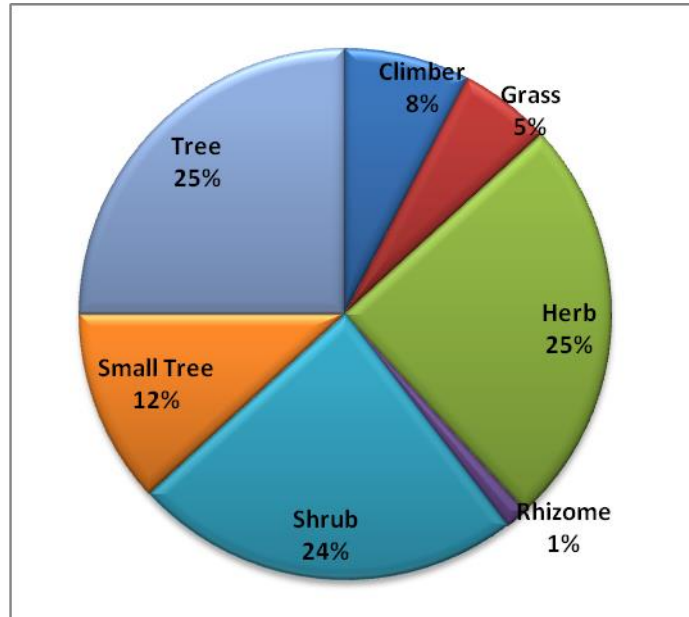


Figure 3: Graph showing the plant type

This study will be of great help to the state government, particularly the forest department in developing a strategy and action plan for the management of this biodiversity rich forest area. Rare, Endangered, and Threatened plants obtained from the present investigation may help the scientists, conversationalists and environmentalists for conserving and protecting the natural resources. It would be the moral and ethical duty of the local people and government organization to protect the plant resources.

IV. CONCLUSION

Extensive coal mining in the study area has led to shrinkage of land use/land cover and created a landscape dotted with mine spoils. The study reveals that the natural floristic composition of the mine area is dominated by the tree species followed by shrub and herb. It is evident from the study that the mining activities are detrimental to the plant diversity. Thus it is advisable that such activities have to be strictly regulated to avoid further damage to the species and scientific mining has to be taken up in a proper manner to minimize further damage to the vegetation. Hence appropriate and proper management plan was necessary for the reclamation of mined affected areas.

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