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Documentation and Density of native plants from Eastern Coal fields areas, Rajmahal, Lalmatia, Jharkhand.

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Abstracts

Due to mining activities a great loss of vegetation is inevitable. Eastern coal field areas, Rajmahal coal block of ECL has been selected for the present investigation. The selected site divided into two zones i.e. core zone (mining lease area) and buffer zone (10km radius from mining lease area). Altogether,102 angiospermic plants of diverse nature were found to grow in core and peripheral zone. Out of 102, only 6 plant viz. Croton bonplandianum, Melia azedarach, Phoenix sylvestris, Cassia occidentalis, Calotropis gigantea and Vitex negundo were recorded in both core and peripheral zone. Herbaceous plants were more in the core zone than peripheral zone due to settlement of new soil with changed microbial niche.

Key words: ECL, Native plants

INTRODUCTION:

Lalmatia coal field area under board domain of Rajmahal hills is situated in Santhal paragana division of Jharkhand, which covers about 122km in the North South direction at 150-250 m above mean sea level. The Eastern Coal Field limited (ECL), Lalmatia covers the whole coal field stretches of Jharkhand and Bengal including Jharia, around 860 20'' East longitude and 250 14'' North Latitude with approximately 7854ha as the core zone. Lalmatia under Godda district of Jharkhand state is also an active coal mine area of ECL (MAP-1) Ground surface elevation varies from 70 m to 100m above mean sea level.

Mining tends to make a notable impact on the environment, varying in severity depending on whether the mine is working or abandoned, the mining methods used, and the geological conditions (Bell et al., 2001). Open cast excavation of coal deposits involves the removal of overlying soil and rock debris and their storage in overburden dumps (OBD). The OBD contents normally soil particles, pebbles, stones, boulders, rocks, coaly matter etc and so forth and are devoid of true soil character (Raju and Hassan 2003; Deka Boruah 2006; Gogoi et al., 2007).Thus, the admixture of OBD soil nutritional poor biologically stressed and

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physically degraded. It also modified the natural vegetation and land topography affecting the drainage system and natural succession of plant growth as such creating quite problems of soil erosion and environmental pollution (Singh et al., 1994; Singh et al., 1996) Mining spoil represent very rigorous condition for plant and microbial growth because of low organic matter content, low organic carbon, unfavorable pH, either coarse texture or compacted structure (Meyer, 1973, Harthill and Mckell, 1979). Mining degraded land is devoid of fertile soil, fauna and loss of flora including plant wealth with some endemic flora and subsequently favors invasion of exotic species.

A limiting knowledge with regard to diversity of flora in stressed ecosystem is a major impediment in developing predictive understanding required for reclamation of plant communities on mined land. Thus, there is great need to find ways in which either the native or substitute flora can be re- established quickly and economically. As per the laws of ecological succession, the new ecological links will be established by nature itself. However, the natural process of establishment of vegetation is very slow.

Materials and Methods:

1. Identification and documentation of native flora- In order to get more clear picture of diversification of native flora of coal mine areas were divided into two zone i) core zone, where actual mining is under operation and ii) Periphery (Buffer) zone, the surrounding area of core zone within 5 kms radius. In Lalmatia coal area open cast mining is operative, due to which several OBD are generated time to time. In due course of time the OBDs soil is settled and become available as a barren land for pioneer vegetation. Keeping this fact in consideration OBDs of different age group i.e. 5yrs, 10 yrs, and 15 yrs. old were surveyed at regular interval of 3 months for a year in such a way that all seasons may be covered to study the diversification of growing plants on OBDs soil. The surrounding mining areas were also surveyed for native vegetation. Plant samples were identified and documented. Correct botanical names were ascertained to each of them in accordance with the rules of International Code of Botanical Nomenclature (ICBN). Vegetation appearing on different aged OBD (5, 10 and 15 years old) in the core zone was particularly taken into consideration.

2. Quantitative structures of plant community in core zone:

In the plant community different species was represented by few or large number of individuals aggregating in different vegetation units. It was essential to know the quantitative structure of the community specially the numerical distribution and the space occupied by the individuals of different species. After recording the essential data density of the individual plant species were determined. The nested quadrate method (1m x 1m) and line transact (10 meter rope) methods were used to sample the native vegetation of the mined overburden dumps. Fifty quadrates were taken

as randomly as possible from base, mid slope and crest position of different aged OB dumps to minimize the errors.

Density: The density of a species is its individuals in a unit area or volume. The density of a species refers to the adequacy of its different requirements and the availability of space.

Results:

Flora distribution:

The results are depicted in tables 1 and 2 clearly revealed that 102 angiospermic plants of diverse nature were found to grow in core and peripheral zone. Out of 102, only 6 plant viz. Croton bonplandianum, Melia azedarach, Phoenix sylvestris, Cassia occidentalis, Calotropis gigantea and Vitex negundo were recorded in both core and peripheral zone. Herbaceous plants were more in the core zone due to settlement of new soil with changed microbial niche. However density of flora varied with different aged OBDs sectors. 10 and 15 years old OBD showed highest number of plant, whereas 5 years old heap was found to cover only with few plant species mostly of herbaceous habitat viz, Saccharum spontaneum, Croton bonplandianum, Xanthium strumarium, Launeae nudicaulis, Cynodon dactylon, Chrysopogon aciculatus, Phyllanthus niruri, Madhuca latifolia, Mangifera indica, Shorea robusta, Tectona grandis etc. plants were observed details are depicted in Table 1.

However, density of flora varied with the different aged OBDs sectors. 10 and 15 years old OBD showed highest number of plants, whereas 5 years old heap was found to cover only with few plant species mostly of herbaceous habitat viz. Saccharum spontaneum, Croton bonplandianum, Xanthium strumarium, Launeae nudicaulis.

Density of common plants:

Density of common plants was also determined by the standard formula on the basis of observation made in five quadrates (30 x 30 m2). The number of plants species though were almost same but the number of each individual was found to higher on 15 years old OBD which clearly indicates the changing in soil condition in favor of propagation of the plants.

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Table 1: Showing diversity of the plants growing on OBD of different ages (5, 10, 15 years) in core zone and buffer zone.

Sl. No.	Name of Plants	Habit	Family	Core Zone (Age of OBD)			Buffer Zone
				5 Yrs	10 Yrs	15 Yrs	
1.	*Saccharum spontaneum* L.	Herb	Poaceae (Monocot)	+	+	+	_
2.	*Croton bonplandianum* Baill.	Herb	Euphorbiaceae (Dicot)	+	+	+	+
3.	*Sida cordifolia* L.	Herb	Malvaceae (Dicot)	`_	+	+	_
4.	*Tridax procumbens* L.	Herb	Asteraceae (Dicot)	_	+	+	_
5.	*Vinca rosea* L.	Herb	Asteraceae (Dicot)	_	+	+	_
6.	*Chromolaena odorata* L.	Herb	Asteraceae (Dicot)`	_	+	+	_
7.	*Indigofera linifolia* L.	Herb	Papilionaceae (Dicot)	_	+	+	_
8.	*Xanthium strumarium* L.	Herb	Asteraceae (Dicot)	+	+	+	_
9.	*Alternanthera sessilis* L.	Herb	Amaranthaceae (Dicot)	_	+	+	_
10	*Eragrostis coarceata*	Herb	Poaceae (Monocot)	_	+	+	_
11.	*Desmodium triflorum* DC.	Herb	Oxalidaceae (Dicot)	_	+	+	_
12.	*Launeae nudicaulis* Les.	Herb	Asteraceae (Dicot).	+	+	+	_
13.	*Cynodon dactylon* Pers.	Herb	Poaceae (Monocot)	+	+	+	_
14.	*Cassia cordata* L.	Shrub	Caesalpiniaceae (Dicot)	_	+	+	_
15.	*Leucas aspera* Willd.	Herb	Labiatae (Dicot)	_	+		_
16.	*Clerodendron petasites* Lour.	Shrub	Verbenaceae (Dicot)	_	+	+	_
17.	*Eclipta alba* Hassk.	Herb	Asteraceae (Dicot)	_	+	+	_
18.	*Acacia Arabica* Willd.	Shrub	Leguminaceae (Dicot)	_	+	+	_
19.	*Hygrophila auriculata* Schumach.	Herb	Acanthaceae (Dicot)	_	+	+	_
20.	*Rungia pactinata* L.	Herb	Acanthaceae(Dicot)	_	+	+	_
21.	*Crotalaria juncea* L.	Herb	Fabaceae (Dicot)	_	+	+	_
22.	*Cyperus rotundus* L.	Herb	Cyperaceae (Monocot)	_	+	+	_
23.	*Scripus arteculatus* L.	Herb	Cyperaceae (Monocot)	_	+	+	_
24.	*Melia azedarach* L.	Tree	Meliaceae (Dicot)	`_	+	+	+
25.	*Phoenix sylvestris* Roxb.	Tree	Arecaceae (Monocot)	_	+	+	+
26.	*Boerhavia diffusa* L.	Herb	Nyctaginaceae(Dicot)	_	+	+	_
27.	*Solanum xanthocarpum* Schrad & Wendl.	Herb	Solanaceae (Dicot)	_	+	+	_

28.	*Argemone Mexicana* L.	Herb	Papaveraceae (Dicot)	_	+	+	_
29.	*Cassia occidentalis* L.	Shrub	Caesalpiniaceae(Dicot)	_	+	+	+
30.	*Calotropis gigantea* L.	Shrub	Asclepiadaceae (Dicot)`	_	+	+	+
31.	*Andropogon pumilus* Roxb.	Herb	Poaceae (Monocot)	_	+	+	_
32.	*Sporobolus diander* Beauv.	Herb	Poaceae (Monocot)	_	+	+	_
33.	*Tephrosia purpurea* L.	Herb	Papilionaceae (Dicot)	_	+	+	_
34.	*Convolvulus alsinoides* L.	Herb	Convolvulaceae(Dicot)	_	+	+	_
35.	*Evolvulus alsinoides* L.	Herb	Convolvulaceae (Dicot)	_	+	+	_
36.	*Blumea lacera* Dc.	Herb	Asteraceae (Dicot)	_	+	+	_
37.	*Aerva sanguinolenta* L.	Herb	Amaranthaceae(Dicot)	_	+	+	_
38.	*Phyla nodiflora* L.	Herb	Verbenaceae (Dicot)	_	+	+	_
39.	*Justicia diffusa* Willd.	Herb	Acanthaceae (Dicot)	_	+	+	_
40.	*Blumca mollis* (D.Don) Merr.	Herb	Asteraceae (Dicot)	_	+	+	_
41.	*Chrysopogon aciculatus* Trin.	Herb	Poaceae(Monocot)	+	+	+	_
42.	*Phyllanthus simplex* Retz.	Herb	Euphorbiaceae (Dicot)	_	+	+	_
43.	*Phyllanthus urinaria* L.	Herb	Euphorbiaceae (Dicot)	_	+	+	_
44.	*Scorparia dulcis* L.	Herb	Scrophulariaceae (Dicot)	_	+	+	_
45.	*Ipomoea cairica* L.	Herb	Convolvulaceae (Dicot)	_	+	+	_
46.	*Mecardonia procumbens* (Miller.) Small.`	Herb	Scrophulariaceae(Dicot)	_	+	+	_
47.	*Mollugo pentaphylla* L.	Herb	Verbenaceae (Dicot)	_	+	+	_
48.	*Alternanthera paronychiodes* St. Hill.	Herb	Amaranthaceae(Dicot)	_	+	+	_
49.	*Lantana camara* L.	Shrub	Verbenaceae (Dicot)	+	+	+	_
50.	*Vitex negundo* L.	Shrub	Verbenaceae (Dicot)	+	+	+	+
51.	*Amaranthus spinosus* L.	Herb	Amaranthaceae(Dicot)	_	+	+	_
52.	*Euphorbia hirta* L.	Herb	Euphorbiaceae (Dicot)`	_	+	+	_
53.	*Euphorbia prostrate* Ait.	Herb	Euphorbiaceae (Dicot)	_	+	+	_
54.	*Jatropha curcas* L.	Herb	Euphorbiaceae (Dicot)	_	+	+	_
55.	*Acacia farnesiana* (Linn.) Willd.	Tree	Mimosaceae (Dicot)	+	+	+	_
56.	*Vernonia cinerea* L.	Herb	Asteraceae (Dicot)	_	+	+	_
57.	*Phyllanthus niruri* L.	Herb	Euphorbiacae(Dicot)	+	+	+	_
58.	*Leucas cephalotes* Spreng.	Herb	Labiatae (Dicot)	_	+	+	_
59.	*Jatropha gossypifolia* L.	Herb	Euphorbiaceae(Dicot)	_	+	+	_
60.	*Atylosia scarabaeoides* Benth.	Herb	Asteraceae(Dicot)	_	+	+	_
61.	*Tragia involucrate* L.	Harb	Euphorbiaceae(Dicot)	_	+		_
62.	*Pentanema indicum* L.	Herb	Asteraceae (Dicot)	_	+	+	_
63.	*Acacia nilotica* (Linn.) Del.	Tree	Mimosaceae (Dicot)	_	_	_	+

64.	*Acacia augustifolia* Lodd.	Tree	Mimosaceae (Dicot)	_	_	_	+
65.	*Aegle marmelos* (Linn.) Correa.	Tree	Rutaceae (Dicot)	_	_	_	+
66.	*Alstonia scholaris* (Linn.) R. Br.	Tree	Apocynaceae (Dicot)	_	_	_	+
67.	*Annona squamosa* L.	Shrub	Annonaceae (Dicot)	_	_	_	+
68.	*Annona reticulate* L.	Shrub	Annonaceae (Dicot)	_	_	_	+
69.	*Artocarpus lakoocha Roxb.*	Tree	Moraceae (Dicot)	_	_	_	+
70.	*Artocarpus heterophyllus Lam.*	Tree	Moraceae (Dicot)	_	_	_	+
71.	*Atalantia monophylla* Correa.	Tree	Rutaceae (Dicot)	_	_	_	+
72.	*Azadirachta indica* L.	Tree	Melsiaceae (Dicot)	_	_		+
73.	*Bombax ceiba* L.	Tree	Bombaceae (Dicot)	_	_	_	+
74.	*Bauhinia variegate* L.	Tree	Caesalpiniaceae (Dicot)	_	_	_	+
75.	*Borassus flabellifer* L.	Tree	Arecaceae (Monocot)	_	_	_	+
76.	*Butea monosperma* Lamk.	Tree	Fabaceae (Dicot)	_	_	_	+
77.	*Cassia fistula* L.	Shrub	Caesalpiniaceae (Dicot)	_	_	_	+
78.	*Cassia siamea* Lamk..	Tree `	Caesalpiniaceae (Dicot)	_	_	_	+
79.	*Cassia sophera* L.	Shrub	Caesalpiniaceae (Dicot)	_	_	_	+
80.	*Calotropis procera Br*.	Shrub	Asclepiadaceae (Dicot)	_	_	_	+
81.	*Costus speciosus* Smith.	Herb	Zingiberaceae (Dicot)	_	_	_	+
82.	*Dalbergia sissoo* Roxb.	Tree	Popilionaceae (Dicot)	_	_	_	+
83.	*Entada pursaetha* DC.	Tree	Leguminaceae (Docot)	_	_	_	+
84.	*Ficus bengalensis* L.	Tree	Moraceae (Dicot)	_	_	_	+
85.	*Ficus glomerata* Roxb.	Tree	Moraceae (Dicot)	_	_	_	+
86.	*Ficus religiosa* L.	Tree	Moraceae(Dicot)	_	_	_	+
87.	*Holarrhena pubescens* Wall.ex G.Don.	Tree	Apocynaceae (Dicot)	_	_	_	+
88.	*Madhuca latifolia* (Roxb.) J. F. Macbr.	Tree`	Sapotaceae(Dicot)	_	_	_	+
89.	*Mangifera indica* L.	Tree	Anacardiaceae (Dicot)	_	_	_	+
90.	*Pithecellobium dulce* (Roxb.) Benth.	Tree	Mimosaceae (Dicot)	_	_	_	+
91.	*Pongamia pinnata* L.	Tree	Fabaceae (Dicot)	_	_	_	+
92.	*Semecarpus anacardium* L.	Tree	Anacardiaceae (Dicot)	_	_	_	+
93.	*Sterculia urens* Roxb.	Tree	Sterculiaceae (Dicot)	_	_	_	+
94.	*Shorea robusta* Gaertn.	Tree	Dipterocarpaceae (Dicot)	_	_	_	+
95.	*Streblus asper* Lour.	Tree	Moraceae (Dicot)	_	_	_	+
96.	*Siphonodon celastrineus* Griff.	Tree	Celastraceae (Dicot)	_	_	_	+
97.	*Tacca leontopetaloides*	Tree	Taccaceae (Dicot)	_	_	_	+
98.	*Terminalia arjuna* W.& A.	Tree	Combretaceae (Dicot)	_	_	_	+
99.	*Terminalia belerica* Roxb.	Tree	Combretaceae (Dicot)	_	_	_	+
100	*Terminalia alata* Heyne ex Roth	Tree	Combretaceae (Dicot)	_	_	_	+
101	*Tectona grandis* L.	Tree	Verbenaceae (Dicot)	_	_	_	+
102	*Zizyphus mauritiana* Lam.	Tree	Rhamnaceae (Dicot)	_	_	_	+

(+) sign indicates the presence and (–) sign indicates the absence

Table 2: Showing density of plants in 5, 10 & 15 years old OBD site of core zone.

Sl. No	Name of the Plants	Density		
		5 yrs.	10 yrs.	15 yrs.
1.	*Saccharum spontaneum*	0.08	1.48	3.26
2.	*Eragrostis coarceata*	0.06	1.90	4.28
3.	*Cassia occidentalis*	0.03	2.38	6.39
4.	*Clerodendron petasites*	0.05	2.88	6.48
5.	*Croton bonplandianum*	2.08	4.66	7.02
6.	*Launeae nudicaulis*	0.08	2.90	5.26
7.	*Agremone xicana*	0.04	1.99	4.26
8.	*Andropogon pumilus*	0.03	3.28	7.26
9.	*Xanthium strumarium*	1.82	4.70	7.50
10.	*Desmodium triflorum*	1.08	4.4	7.27
11.	*Acacia farnesiana*	1.47	4.6	7.6
12.	*Euphorbia prostrata*	0.02	2.9	7.22
13.	*Convolvulus alsenoides*	0.09	3.65	7.02
14.	*Phyllanthus niruri*	0.05	4.68	6.24
15.	*Vernonia cinerea*	0.3	3.79	5.28
16.	*Euphorbia hirta*	0.02	4.25	4.59
17.	*Alternanthera sessilis*	1.47	6.8	7.01
18.	*Lantana camara*	0.82	3.79	8.26
19.	*Vitex negundo*	1.02	4.69	8.23
20.	*Leucas cephalotes*	0.07	4.23	8.02

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