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A TAXONOMIC CENSUS OF MAGNOLIOPHYTES IN AN ABANDONED MINE TAILING SITE OF BURDWAN DISTRICT, WEST BENGAL

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ABSTRACT

An unreclaimed coalmine overburden site at Belbaid patch, Raniganj, West Bengal was investigated for the documentation of its floristic database. The enumeration of Magnoliophyta (angiosperms) in the study site showed the plant community to be composed of 57 species, of which 82% are dicots and 18% are monocots. The dicots dominated over monocots in terms of their contribution to flora. The ratio of tree, herb and shrub were found to be 4, 44 and 9 respectively. Value of Generic Coefficient of the vegetation in study was 84.21% which speaks of an appreciable taxonomic potential to render stability to the ecosystem. This value is expected in course of time to be progressively escalated to 1. Since the difference between the observed and expected values of generic coefficients is low (15.79), there is a possibility of successful revegetation and restoration of the area studied.

KEYWORDS : Overburden (OB), vegetation, magnoliophyta, census, restoration

Environmental degradation by open cast coal mining has been an alarming issue for years. This type of mining proceeds with the excavation of topsoil and large amount of spoil (overburden) material overlying coal layers. These overburdens are deficient in organic matter and nutrients and comprised of abnormal soil structure. Disposal of overburdens in the surrounding aboveground areas turn fertile soil into wastelands that remain unvegetated for years. Inspite of such stressed conditions, natural ecological successions have been observed (Ekka and Behera, 2011, Borpujari, 2008; Hazarika et al., 2006) but the entire process is time consuming affair (Bradshaw and Chadwick, 1980; Dobson et al., 1997) that cannot keep pace with the amount of deterioration caused by mining activities. However, revegetation is the only effective process to restore and maintain the stability of the degraded landscapes. A taxonomic census of the existing natural colonizers or an in situ floristic study on overburdened spoils or simply OBs should be taken in to consideration since it is the index of the autophytoremediation in progress. It can help in understanding the direction of the ongoing plant succession when compared with the flora of the forest in the vicinity and guide augmentation of ecorestoration.

In view of the foregoing, the present work was undertaken in the Belbaid Patch of Kunustoria area in Raniganj coalfield, Burdwan district, West Bengal. The primary objective of the present work is thus stocktaking of plant diversity on the over-burden (OB) lying in the selected mining area which is highly ecologically hostile.

Study Site

For the present study, we selected an abandoned overburden (OB) of Belbaid Patch in Kunustoria area of Raniganj coalfield within the latitudes 23°22 N and 23°52 N and longitudes 86°38 E and 87°25 E. It is located in Burdwan district of West Bengal. Qualitative vegetation surveys were carried out to understand the natural succession process.

MATERIALS AND METHODS

Field work was performed during 2010-2011 in different seasons, viz. pre-monsoon, monsoon and post-monsoon in an overburden of Belbaid patch, Kunustoria area OCP in Burdwan district of West Bengal State. Specimens of the constituent species were collected some of which were processed for herbarium preservation (Jain and Rao, 1977) and the rest were dissected, described and identified with the help of pertinent taxonomic literature (Prain, 1903; Guha Bakshi, 1984; Bennet, 1987; Murti and Panigrahi, 1999) and authentic specimens. After identification, the plant species were enumerated under respective families arranged according to Cronquist's system of classification (1988). Generic Coefficient (Jacard, 1901) which gives an indication of trend of the microclimatic status of a floristic organization was determined by the following formula:

Generic Coefficient= No. of genera/No. of species x 100.

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RESULTS

As many as 57 species of Magnoliophyta (Angiosperms) could be identified of which 47 (82%) were Magnoliopsids (dicot) and 10 (18%) Liliopsids (monocots). The number of species of trees, shrubs and herbs were 4, 9 and 44 respectively. These species were incorporated in to their respective systematic positions according to Cronquist's system of classification (1988) (Table 1).

Table 1: An Enumeration of the Angiospermic Plants (Magnoliophyta) Thriving in Mine Tailing

Class MAGNOLIOPSIDA

Subclass 1. Magnoliidae

Order. Papaverales

Family. Papaveraceae

1. *Argemone mexicana* L.

Subclass 3. Caryophyllidae

Order. Caryophyllales

Family. Nyctaginaceae

2. *Boerhaavia repens* L.

Amaranthaceae

3. *Achyranthes aspera* L.

Subclass 4. Dilleniidae

Order. Malvales

Family. Malvaceae

4. *Sida acuta Burm.*f.
5. *Abutilon indicum* L.
6. *Malachra capitata* L.
7. *Sida chordifolia* L.
8. *Sida rhombifolia* L.

Order. Capparales

Family. Cleomaceae

9. *Cleome chilosis* DC.

Subclass 5. Rosidae

Order. Fabales

Family. Mimosaceae

10. **Mimosa pudica** L.
11. *Albizia lebbeck* (L.) Benth.

Caesalpiniaceae

12. *Senna alata* (L.) Roxb.

Fabaceae

13. *Crotalaria saltiana Andrews*
14. *Desmodium gangeticum* DC.
15. *Alysicarpus monilifer* (L.) DC.
16. *Butea monosperma* (Lam.) Taub.
17. *Cajanus scarabaeoides* (L.) Thou.
18. *Dalbergia sisso Roxb.*
19. *Tephrosia purpurea* (L.) Pers.
20. *Indigofera linifolia* (L.f.) Retz.
21. *Alysicarpus bupleurifolius* (L.) DC.
22. *Indigofera tinctoria* L.
23. *Alysicarpus vaginalis* (L.) DC.
24. *Desmodium triflorum* (L.) DC.

Order. Euphorbiales

Family. Euphorbiaceae

25. *Phyllanthus simplex* Retz.
26. *Euphorbia hirta* L.
27. *Croton bonplandianum Baill.*

Order. Rhamnales

Family. Rhamnaceae

28. *Zizyphus oenoplea* (L.) Mill.

Order. Sapindales

Family. Sapindaceae

29. *Cardiospermum halicacabum* L.

Order. Geraniales

Family. Oxalidaceae

30. *Biophytum sensitivum* L.
31. *Oxalis corniculata* L.

Subclass 6. Asteridae

Order. Gentianales

Family. Asclepiadaceae

32. *Calotropis gigantia* R. Br.

Order. Solanales

Family. Convolvulaceae

33. *Evolvulus nummularius* (L.) L.
34. *Merremia gangetica* L.
35. *Merremia emerginata Hallier* f.
36. Ipomoea carnia Jacq. Sub sp. fistulosa (Mart. Ex Chiosy) D. Austin

Table 2: Taxonomic analysis of plants found in the Belbaid patch overburden

	Subclass	Order	Family	Genera	Species
Magnoliopsids (Dicots)	5	14	18	40	47
Liliopsids (Monocots)	1	1	2	8	10
Magnoliopsids: Liliopsids	5:1	14:1	9:1	5:1	4.7:1

Order. Lamiales

Family Verbenaceae

37. *Lantana camara* L.

Lamiaceae

38. *Anisomeles indica* (L.) Kuntze
39. Clerodendrum viscosum Vent.
40. *Hyptis suaviolens* (L.) Poit.

Order. Scrophulariales

Family. Scrophulariaceae

41. *Lindernia crustacean* (L.) F. Muell.

Order. Asterales

Family. Asteraceae

42. *Eupatorium sp.* L.
43. *Blumea sp.* DC.
44. *Vernonia sp.* Schreb.
45. *Tridax procumbens* L.
46. *Parthenium hysterophorus* L.
47. *Centranthera indica* (L.) Gamble

Class. Liliopsida

Subclass 3. Commelinidae

Order. Cyperales

Family. Cyperaceae

48. *Dactyloctenium aegyptium* (L.) Willd.
49. *Cyperus rotundus* L.

Poaceae

50. *Saccharum spontaeneum* L.
51. *Cynodon dactylon* (L.) Pers.
52. *Eragrostis tenella* L.
53. *Digitaria bicornis* (Lam.) Roem. & Schult.
54. *Digitaria ciliaris* (Retz.) Koel.
55. *Brachiaria* sp. (Trin.) Griseb.
56. *Paspellum conjugatum* Berg.
57. *Brachiaria ramosa* (L.) Stapf.

DISCUSSION

A taxonomic analysis of the floristic diversity thus recorded (table 2) showed 57 species representing 48 genera of 20 families of Magnoliophyta (angiosperms). The dicots had dominance over monocots when compared at all levels of taxonomic hierarchy as recognized by Cronquist, 1988. At the levels of subclass, order, family, genera and species the Magnoliopsida (dicot): Liliopsida (monocot) ratios appear as 5:1; 14:1; 9:1; 5:1 and 4.7:1 respectively. Fabaceae is the most dominating family in the floristic scenario of the overburden which is successively followed by Poaceae, Asteraceae, Malvaceae, Convolvulaceae, Euphorbiaceae and Lamiaceae; whereas rest of the families encompassed of only 1 or 2 representing species (figure 1).

The Generic Coefficient which serves as an index of floristic diversification was found to be 84.21% and hence appreciable. In the existing condition, where more than one species shared single genus, the value is expected in course of time to be reduced to 1. Since the difference between the observed and expected values of generic coefficient was low (15.79), there is a possibility of successful revegetation and restoration of the study site, provided the existing environmental conditions. From the ratio of tree, shrub and herb (4:9:44) the dominance of non-ligneous species over ligneous species (3.38:1) was clearly revealed, which however is likely to change in future initially towards parity and eventually towards a reversal with concomitant establishment of a vegetation dominated by woody species characteristic of indigenous vegetation of the same climatic domain.

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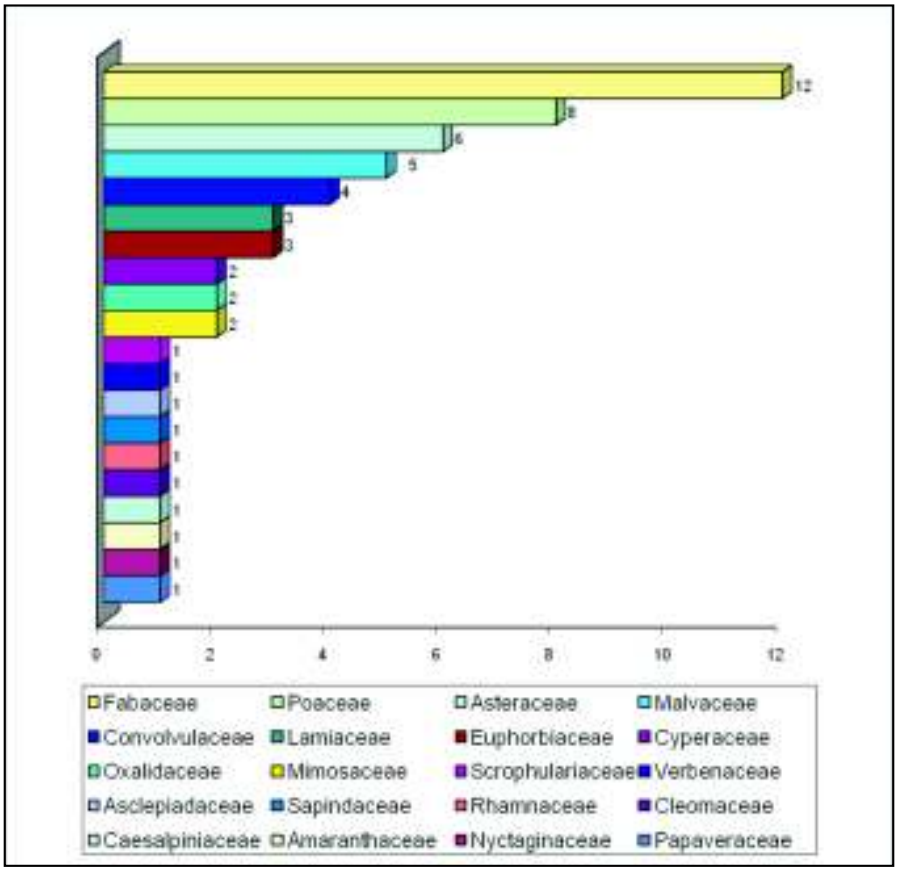

Figure 1: A Glimpse of the Families of Angiosperms in the Study Site. Numbers at the Top of Each Bar Were Represented by the Number of Included Species in the Family

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