



## Pioneer Flora on Naturally Revegetated Coal Mine Spoil in a Dry Tropical Environment

Arvind Singh

Department of Botany, Banaras Hindu University, Varanasi-221 005, India

E-mail: arvindsingh\_bhu@yahoo.com;

Tel.+91 542 2316310; Fax : +91 542 2366708

### ABSTRACT

A field study was conducted to record the pioneer plant species on coal mine spoil in a dry tropical environment. A total of 17 plant species belonging to 7 families were recorded on a 19 months old spoil. Of the total plant species reported, only 3 were represented by the woody species. The Poaceae and Fabaceae were the dominant families of pioneer flora on coal mine spoil.

**Kew words:** Dry deciduous forest, mine spoils, Singrauli coalfields.

### INTRODUCTION

Opencast mining activities though inevitable for economic development, are environmentally hazardous and result in drastic disturbances of land. The disturbances include mining dumps, tailings and slimes, compaction, heavy metal toxicity and acidity. During coal mining operation overburden materials overlying a coal seam are removed and dumped in a haphazard manner without any consideration for the respective sequence of soil profile. These overburden dumps are known as mine spoil. Mine spoils are physically, chemically, nutritionally and microbiologically impoverished habitats [1] deterring the establishment and growth of plant species. Thus natural colonization of plant species is a slow process on mine spoils. The objective of the present investigation was to list the pioneer plant species on coal mine spoil in a dry tropical environment.

### MATERIAL AND METHODS

The study was conducted at Singrauli coalfields, India. The coalfields of Singrauli extend over 2,200 km<sup>2</sup> (latitude 23°47'-24°12' N; longitude 81°48' - 82° 52' E and elevation 280-519 m above mean sea level), of which 80 km<sup>2</sup> lie in the state of Uttar Pradesh and the remaining in the state of Madhya Pradesh. The climate is dry tropical with temperature reaching up to 48°C during June and lowering down to 5°C in January. Rainfall varies from 900 to 1000 mm during monsoon months of June to September. The potential natural vegetation is a tropical dry deciduous forest.

A 19 months old naturally revegetated coal mine spoil of about 4 hectares area was selected at the Jayant mine of Singrauli coalfields, India. An extensive survey was done in December 1997 to record the pioneer plant species colonizing the coal mine spoil. The species were collected from the field and pressed in brown paper, and brought to laboratory where they were identified with the help of flora [2].

### RESULTS AND DISCUSSION

List of pioneer flora on coal mine spoil is depicted in Table 1. A total of 17 plant species were observed on a naturally revegetated coal mine spoil represented by 16 genera and belonging to 7 families. Of the total observed plant species, 15 were represented by herbs, 2 by trees and only 1 species were represented by shrub. Thus herbs dominate as pioneer flora on coal mine spoils of Singrauli coalfields. The three woody flora namely *Acacia catechu*, *Butea monosperma* and *Ziziphus nummularia* appearing as pioneer plants on coal mine spoils are the component species of the tropical dry deciduous forest of the region [3]. Of the total pioneer flora reported on coal mine spoil, 7 belonged to Poaceae, 5 to Fabaceae and 1 each to Boraginaceae, Asteraceae, Euphorbiaceae, Convolvulaceae and Rhamnaceae families. Thus the study reveals that mostly the pioneer flora on coal mine spoils are dominated by the members of Poaceae and Fabaceae families. Several studies on coal mine spoils reveals the dominance

of Poaceae and Fabaceae families along with the Asteraceae family [4-7]. The Poaceae and Fabaceae dominate the younger spoils, while the Poaceae and Asteraceae dominate the older spoil [6]. The appearance of legumes (Fabaceae) as pioneer plants on nutrient deficient mine spoils is due to their autonomy of fixing atmospheric nitrogen, while the appearance of grasses (Poaceae) as pioneer plants may be due to C<sub>4</sub> pathway of photosynthesis which enable them to survive the harsh conditions offered by the mine spoils.

**Table 1** : Pioneer flora on 19 months old coal mine spoil in a dry tropical environment

S. No.	Plant species	Family	Habit
1.	<i>Acacia cathechu</i> Willd.	Fabaceae	Tree
2.	<i>Alysicarpus monilifer</i> DC.	Fabaceae	Herb
3.	<i>Borreria articularis</i> L.f.	Boraginaceae	Herb
4.	<i>Bothriochloa pertusa</i> (Willd.) A. Camus	Poaceae	Herb
5.	<i>Butea monosperma</i> (Lam.) Taub.	Fabaceae	Tree
6.	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Herb
7.	<i>Desmodium triflorum</i> DC.	Fabaceae	Herb
8.	<i>Dichanthium annulatum</i> (L.) Stapf	Poaceae	Herb
9.	<i>Eleusine indica</i> Gaertn.	Poaceae	Herb
10.	<i>Eragrostis tenella</i> (L.) P. Beauv.	Poaceae	Herb
11.	<i>Eragrostis unioides</i> Nees	Poaceae	Herb
12.	<i>Euphorbia hirta</i> L.	Euphorbiaceae	Herb
13.	<i>Evolvulus nummularius</i> L.	Convolvulaceae	Herb
14.	<i>Sporobolus diander</i> Beauv.	Poaceae	Herb
15.	<i>Tridax procumbens</i> L.	Asteraceae	Herb
16.	<i>Ziziphus nummularia</i> (Burm f.) Wt.&Arn.	Rhamnaceae	Shrub
17.	<i>Zornia diphylla</i> Pers.	Fabaceae	Herb

Thus it can be concluded from the study that members of Poaceae and Fabaceae represents the majority pioneer flora on coal mine spoils in a dry tropical environment, and the non-woody plants are the chief representatives of the pioneer flora on coal mine spoil.

## REFERENCES

- Singh, J. S. and Jha A. K. (1993). Restoration of degraded land : an overview. In : Singh, J. S. (ed.) *Restoration of Degraded Land : Concept and Strategies*, Rastogi Publications, Meerut, India, pp.1-9.
- Verma, D. M. Pant P. C. and Hanfi M. I (1985). *Flora of India. Series 3 Flora of Raipur, Durg and Rajnandgaon*. Botanical Survey of India. Government of India, New Delhi, India.
- Jha, A. K. and Singh J. S. (1992). Influence on microsites on redevelopment of vegetation on coalmine spoils in a dry tropical environment. *J. Environ. Manage.* **36** : 95-116.
- Glenn-Lewin, D. C. (1979). Natural revegetation of acid coal spoils in southeast Iowa. In : *Ecology and Resource Development* Vol. 2 Wali, M. K. (ed.) Pergamon Press, pp. 568-575.
- Jonescu, M. E. (1979). Natural revegetation of strip-mined land in the lignite coalfields of southeastern Saskatchewan. In : *Ecology and Coal Resource Development* Vol. 2 Wali, M. K. (ed.) Pergamon Press, pp. 592-608.
- Singh, A. (2006). Herbaceous species composition of an age series of naturally revegetated coal mine spoils on Singrauli coalfield, India. *J. Indian Insti. Sci.* **86** : 75-79.
- Singh, A. (2011). Vascular flora on coal mine spoils of Singrauli coalfields, India. *J. Ecol. Nat. Environ.* **3** (9) : 309-318.