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RESEARCH NOTE

A brief comparative study of soil conserving efficiency of three pioneer plant species of tikak opencast mine with their economic importance

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SUMMARY

The unplanned and unscientific opencast coal mining in Tikak area have caused large scale damage to the environment.The most important impact of opencast coal mining is soil erosion. The present study strengthens the point about soil conserving efficiency of two soft herbaceous species and one woody herbaceous species or small shrub along with their economic importance.

Key Words : Opencast mine, Overburden spoil, Conserving efficiency

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The present centuries have been concerned much with the environmental economics. Restoration of damaged ecosystems is given priority in environmental science and technology. Several environmental issues are of prime concern for human welfare. Sustainable ecosystem is essentially an important issue. It has been estimated that over 40% of earth's productivity has been modified and harnessed for human ends. In many cases, the most productive ecosystems that have been most impacted. Restoration requires recreating of both structural and functional attributes of damaged ecosystems. If we are to achieve sustainable use of the planet, at some point, the rate of ecological repair must equal to the rate of ecological destruction, so that no net loss situation can be achieved. Ecological restoration is a positive statement of co-operation with natural systems. The National Research Council (1992) recommends that ecological restoration be carried out at a landscape level wherever possible.

A devastation process of vegetation and fertile soil in the Patkai Range of Eastern Himalaya was started two decades back in the name of Opencast mining of coal under Coal India Limited (CIL) (1990). These mining systems entirely alter the mining patches into desertic condition with the mixture of broken rock and mind spoil (Michel, 1959). On the spoil, even up to one year of dumping, there was no sign of green plant at all; probably due to lack of essential requirements for plant growth (Wimbush, 1963; Alexander, 1989).As a conservance of the loss of vegetational cover the spoil is subjected to severe teaching and erosion. Erosion by rain and wind takes place on the barren dumps, as a result of which the surrounding ecosystem is badly effected (Cairns, 1995; Klemow, 1999; Kloor; 2000; Davis, 2000) .The badly effected ecosystem of the present study site are the Buridihing river system (source of drinking water for a section of neighboring inhabitance), agriculture field, human habitats and forest (Borpujari and Saikia, 2002).

As soil conservation is a set of management strategies for preservation of soil being eroded from the earth's surface, so present communication attempts to focus on soil conservation study using herbaceous plant species in the open cast coal mining area.

Study area :

The study site is located in the hills of Patkai in Tinsukia District of Assam which is about 150 km South-East direction from Dibrugarh University. The area lies 27.20°N latitude and

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95.41°E to 95.51°E longitude. It occupies a foot-hill area of the Eastern Himalaya above 150m and 300m sea level.

Tikak open cast mine located at 8 km North-East direction from Margherita. In the northern side of the mine goes the National highway No – 38. The southern side is covered by Patkai range.

The climate of the area is divided into two broad seasons. The warm humid summer from April to October and the cold dry winter from November to March. Average rainfall during summer of 2000 to 2002 through 2001 was 514.3 mm. The winter was practically rainless throughout the study period. The maximum temperature during summer of 2000 to 2002 through 2001 was average 32.2°C and during winter it was 9.3°C. Relative humidity occur maximum (Av. 98%) in the month of November and December throughout the study period.

Soil conservation study using herbaceous species has been attempted to find out the importance of soil conserving capacity of certain species which are common in the opencast mining area. These species selected to know their soil conserving efficiency were :

– *Borreria hispida* (L.) K, Schum.

– *Melastoma malabathricum* Linn.

– *Imperata Cylindrica* (L.) Beauv.

Separate patches of these species were found out in the OB area (except 1< year old) and the associated species were removed manually. Three metallic trays (for one replicate) of 20 cm length, 16 cm breadth and 2 cm depth (20 x 16 x 2) cm^3 were placed at down ward margins of the test species patches in such a manner that eroded soil due to rain may be deposited in the trays. The trays were kept for 35 days (11.6.2001 to 15.7.2001; rainfall 2200 mm). Collected spoil from the recovered trays were first air dried separately then allowed to dry in hot air over at 105°C ± 2°C for constant weight. A set was run simultaneously in the bare patches of the same OB dump. The experiment was conducted in triplicate. The soil conservation value of each species was determined using the formula given by Ambasnt (1963) as follows :

$$\mathbf{CV = 100 - (\frac{Swp}{Swo} * 100)}$$

where,

CV = Conservation value of a species;

Swp = Weight of the dry soil washed from the plot under cover by the species;

Swo = Weight of the soil washed from an identical but bare plot under identical erosive factor.

The soil conserving value of tested species is given in the Table 1. Soil conserving value of *B. hispida* was maximum (97.83%) followed by *M. malabathricum* (87.83%) and *I. cylindrica* (39.83%) . It is observed from the experiment that *B. hispida* was the most efficient soil conserving species in the coal mine spoil followed by *M. malabathricum* and *I. cylindrica*. In a previous study (Borpujari and Saikia, 2002) it was noted that *B. hispida* and *M. malabathricum* were grown comparatively well in the spoil. Therefore, these species could be recommended as a good spoil conservator species in coal mine spoil at Tikak. Since these species grow comparatively well and produce a considerable amount of biomass, a portion of the biomass would definitely contribute to the soil regeneration process by adding organic matter to spoil. Although *I. cylindrica* showed comparatively less conserving efficiency to *B. hispida* and *M. malabathricum*, the former is an economically important grass species (used as thatching grass) could also be recommended for growing in the spoil area. *B. hispida* is also important as a good forage crop while the stem of *M. malabathricum* is sold in the market as a poor man's tooth brash (datoon). *I. cylindrica* had lower soil conservation value probably due to its thin population in the spoil. Moreover, this is a narrow leaved species. On the other hand *B. hispida* makes a cushion like cover on the spoil by its clumped habit and *M. malabathricum* is a broad leaved species with profuse branching that makes a fairly cover on the spoil.

Table 1: Soil conservation efficiency of certain dominant species at Tikak coal mine spoil (± mean deviation error)

Species	Conservation efficiency (%)
Borreria hispida	97.83 ± .0012
Melastoma malabathricum	87.83 ± .07
Imperata cylindrica	39.83 ± 1.1

A good vegetation cover effect climate, topography and on soil erosion. The knitting and binding affect of root system in the surface layer of soil aggregates the soil in to granules and increase its resistance, the soil fertility and building of soil structure.

The dead materials cannot as such be utilized but they are acted upon a series of micro organisms which convert them into humus and ultimately back to minerals. Actually this process is essentially important in soil regeneration process of coal mine spoil. More number of herbaceous species could be exercised in the soil conservation process at the mining areas. Protection of bare slopes through plantation with fast-growing species has been recommended for large scale landslide areas in the Himalayas (Vishwanathan and Sastry, 1986).

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