

A study of the growth of lemon grass on the overburden of W.C.L. mines by using sludge from activated sludge process of Ballarpur Paper Mill, Ltd. Chandrapur (Maharashtra)

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(Received: July 10, 2009; Accepted: August 14, 2009)

ABSTRACT

Growth of lemon grass on overburden of W.C.L. Mines Chandrapur was studied from January 2006 to December 2007. Overburden samples were brought from heap of W.C.L. Mines Chandrapur. Experimental species of Lemon grass were procured from Anandwan Agriculture College, Warora, Chandrapur. A pilot plant was set up in college premises. Lemon grass was planted in 3 pots having different composition of activated sludge & overburden material. Physical chemical analysis of leachates from each pot were performed up to part per million level. Quality control procedure for collection and Physical – Chemical analysis of leachates including heavy, metals, sludge from ASP of BILT, were performed, the result of which showed high accuracy of the sampling. The recorded values of pH, alkalinity, chloride, sulphite, phosphate, silica were within permissible limit except Total Hardness (400 ppm). Heavy metal viz. Arsenic (2.083 ppm), Iron (0.764 ppm), Lead (0.235 ppm) and zinc (0.983 ppm) concentration were found above the permissible limit.

Key words: Lemon grass, overburden, leachates, activated sludge, process, heavy metals, coal mining.

INTRODUCTION

Mining industry in developing countries plays a vital role in the overall economy and industrial development. Most valuable minerals, metals, chemicals, fuel and energy, rocks and stones (Including the precious ones) are obtained by mining operation. Coal mining operation are specific and the requirement of land are very large. The mining activities results in large quantities of wastes resulting from various operations and processing technologies. The land which is exploited by the human being to their industrial benefit

activities and it becomes infertile in course is termed as spoiled or degraded.

The wastes include soil overburden, mine drainage etc. The present study aims to regain these degraded lands. The methods used are reclamation, when new use of land is involved or rehabilitation, when improvement of visual nature are evident, Restoration is another way to create the original topography and restoring the previous and use (Dhar 1990).

Reclamation takes place in two phases viz.

Technical and biological, The technical phase facilities succession by way of selected plants species (Khoshoo, 1984). Grass can play vital role in fruit fulutilization of waste lands, grasses by virtue of their high soil ramification value, fibrous root system and soil forming capacity are popular for their introduction into areas where soil erosion has caused serious problems.

Growing of such legumes and grasses not only stabilizers the soil structure and fertility but also provides extra production. The grasses intercept the precipitation and protect the soil from beating impacts of rain drops. Grasses also improve infiltration rate of soil by breaking up the soil aggregates and increase in soil water holding capacity. Grasses also incorporate heavy amount of organic matter and humus to the soil. On the other hand grasses which are economically important, if grows over the waste lands, it will create the employment for the people and also generate revenue for the nation.

Present study is undertaken to study the growth of lemon grass on overburden of W.C.L. mines Chandrapur

Methodology

The present study was conducted using three pots having different composition of activated sludge and overburden materials as shown in Table 1. 1.1 Litre distilled water was spread for leachate collection. Leachates from each of the pots were collected. Composited and analysed for chemical characteristics such as pH, Alkalinity, hardness, Chlorides, Sulphate, Phosphate, Silica, N, P, K and Heavy metal such as Arsenic, Iron, Lead, zinc as per standard methods for examination of water and waste water methods.

Lemon grass was rooted in each of the

pot. chemical characteristics of activated sludge form BILT, Ballarpur were analysed separately before mixing with overburden material. The growth of lemon grass was studied in each pot during January 2006 to December 2007.

RESULTS AND DISCUSSION

Chemical characteristics of the overburden material, activated sludge is presented in Table 2. Overburden dump site, activated sludge sample and growth of lemon grass are shown photographs 1, 2, 3 and 4 respectively.

The results of leachates showed that pH is within the prescribed limit. Alkalinity values of overburden material and activated sludge were 350 and 300 ppm. Higher alkalinity concentration will not interfere with the growth of the lemon grass on overburden soil. Higher alkalinity concentration are sometime required for buffer action. Presence of some chemical substances, mainly calcium carbonates, magnesium carbonate, bicarbonates, chlorides imports hardness to water. Concentration of hardness for overburden soil and activated sludge were 400 and 250 ppm respectively.

Sulphite concentration in overburden material and activated sludge process were 100 ppm and 190 ppm respectively. Both the sample showed sulphite below the prescribed limit.

Phosphate concentration for overburden and paper mill sample were 50 ppm and 42 ppm respectively subsoil often show phosphate higher than prescribed limit. Phosphate is needed for the optimum growth of lemon grass.

Total nitrogen was below detectable limit in overburden sample. Subsoil material is associated with inorganic material rather than organic material.

Table 1:

S. No.	Pot	Activated Sludge %	Overburden Material
1	1	25%	75%
2	2	100%	Nil
3	3	Nil	100%

Potassium were 3% and 6% in overburden and activated sludge sample.

Heavy metals such as Arsenic, Iron, Lead and Zinc were 2.083, 0.764, 0.235 and 0.983 respectively. Sub soil sample often shows higher concentration of heavy metals. Heavy metals interfere with the healthy growth of plant. Some heavy metals are accumulated various parts of plants such as stem, branches and roots.

It was observed that out of 3 pots one of the pot (No. 1) shows healthy growth which contains 25% of activated sludge and 75% of overburden material. Pot No. 2 shows optimum growth (100% activated sludge), it is due to the organic matter available to the grass, it does not show the growth as much as the first one which had 25% of activated sludge and 75% of O.B. material Pot No. 3, shows stunted growth as it contain 100% overburden material, which is devoid of organic material.

Expected benefits

The overburden is left barren or planted by some other non economic plants. Cultivation of lemon grass on this overburden provides strong economic condition and may solve the problem of disposal of waste water form coal mine. Application of the sludge as manure may solve the sludge disposal problem of Ballarpur Paper Mill.

Limitations of the study

The overburden dumped by coalmines are very large. Some times the percentage of heavy metals are more than the required does. It may affect nutrient uptake by plants. Heavy metals may impart toxic effect to various plant processes, it becomes difficult to carry water to certain heights.

The mixing of soil would require more time on large area of O.B. Material. If aromatic grasses are cultivated then distillation plants should be setup for the extraction of lemon grass oil. Installation of distillation plant require huge capital.



Photograph 1:



Photograph 2:



Pot - 1 Pot - 2 Pot - 3

Photograph 3:



Pot - 1 Pot - 2 Pot - 3

Photograph 4:

Table 2:

S. No.	Parameter	Over Burden	Paper Mill	USPH Std	ISD Std
1	pH	8.2 – 7.8	6.0-8.5	6.0-8.5	6.0-9.0
2	Alkalinity	350 ppm	300ppm	-	-
3	Hardness	400 ppm	252ppm	-	-
4	Chloride	220 ppm	240ppm	250	600
5	Sulfate	100 ppm	190ppm	250	1000
6	Phosphate	50 ppm	8ppm	0.1	-
7	Silica	150 ppm	20ppm	-	-
8	N	Bal	6%	6%	-
9	P	4%	4%	12%	-
10	K	3%	6%	8%	-
11	Arsenic	2.083	-	0.05%	0.055
12	Iron	0.764	-	20.3	-
13	Lead	0.235	-	<0.05	0.01
14	Zinc	0.983	-	5.5	-

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