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SURFACE FAUNA IN RECLAIMED FLY ASH DYKES AT KORBA

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ABSTRACT

Fly ash, the by-product of thermal power plants, is stored in specially prepared ash dykes. Being totally inorganic material, it is unsupportive for any living forms. These dykes are a major source of pollution, and plantations can reclaim these. This study deals with the presence of fauna on the surface of the ash dykes in 1. raw ash dykes of different ages and, 2. reclaimed ash dykes through different methods of plantations. The surface fauna of all these types of fly ash dykes was studied and recorded in relation to soil changes due to reclamation.

INTRODUCTION

Fly ash is a waste material produced by thermal power plants, coal washeries and steel plants etc. These units use pulverized coal as fuel which is introduced into the furnace in a stream of air, and 75-80% of ash resulting from combustion of this coal is carried out of furnace with the flue gases and extracted by mechanical/electrostatic precipitator in the form of a gray powder called fly ash. Fly ash is initially collected in hoppers and/or transported to the silos from where it can be supplied directly; otherwise a measured and controlled quantity of water is added to convert it into slurry form to improve its transportation. In case of wet transport, ash is transported through pipelines hydraulically into lagoons or artificial ponds known as ash dykes. This occupies huge areas around power stations. 1 MW generating capacity of coal based power station requires 1-10 acres of land for ash disposal for 30 years of operation. The characteristics of fly ash depend primarily on coal and its pulverization, burning rate, temperature and method of collection. Generally fly ash is composed of SiO_2 and Al_2O_3 etc. The properties of fly ash show variation due to mineral matters in coal, which varies from coal to coal.

The fly ash dykes only aggravate the pollution situation, mainly because of fly ash dispersal. Whole vegetation in the area surrounding dykes is always covered with ash. Traces of fly ash in air have been seen even above Indian Ocean. As we see ash is a necessary evil to be dealt with; this can be done as follows:

1. By maximizing usage of existing fly ash supply to stop its impregnation in environment.
2. To reclaim the area polluted by fly ash dumping by plantation.

By dumping of fly ash, the fertile land changes its biodiversity and gets converted into barren land. It takes up to 10 to 20 years to weather the ash in rich soil. The new colonizing plants comprise mainly of *Parthenium*, *Calotropis*, long grasses and prickly poppy etc., while the animals found are restricted to some microorganisms such as *Euglena* and *Paramecium* etc. with some visiting animals like mosquitoes, frogs and birds. Thus, a fertile area rich in biodiversity changes into a very thinly populated area where only hardy animals and plants are able to survive. The paper deals with the surface fauna of some reclaimed fly ash dykes.

MATERIALS AND METHODS

The areas of the fly ash dykes in Korba where the plantations are being done have been selected for the study. One fly ash dyke may extend up to the area of 50 acres. Sections of these are given for plantations to reclaim the ash dykes. This study was done in the area of plantation being carried out by TERI. The study was mainly to study the surface fauna, macroscopic animals, day creatures on surface and night creatures on surface.

For the surface fauna study, sections were marked and studied by simple quadrat method. As this was only the study of presence of biodiversity so only the creatures seen in this area were collected and identified.

The toughest part was to identify the ants, as much less literature is available on Indian ants, so they were not identified up to species level.

Charpara dyke-Mycorrhiza method: The surface fauna of the dyke, which was abandoned for many years and then taken for reclamation, by plantation through micorrhiza method by the power plant Organization, was taken in this study. To study the surface fauna most easy and accessible methods were used.

1. **Wait and watch method**: Look for the animal dwellings or some traces of animals and wait and watch for it to return to the site.
2. **Sweet method**: Put some honey drops on the desired surface and many insects will come on their own.
3. **Lights on method**: Best for the study of night fauna.

Torch lights, table lamps and other sources of light on the poles can be used. In this study, torch lights were used.

RESULTS AND DISCUSSION

The plants used for plantation in these area to reclaim the fly ash dykes were:

1. *Dalbergia sisoo,* 2. *Albizzia odoratism,* 3. *Trewia nudofolia,* 4. *Bambusa bambose,* 5. *Phyllanthus emblica,* 6. *Pongamia pinnata,* 7. *Tectona grandis,* 8. *Pithocolobium inermii,* 9. *Albizzia procera,* 10. *Azadirachta indica,* 11. *Terminalia arjun,* 12. *Cassia siema,* 13. *Alostonia inermii,* 14. *Engenia jambolana,* 15. China rose; **Grasses:**1. *Cynodon dactylon,* 2. *Saccharum* sp.

Plantations with Mycorrhiza: Around ten acres of dyke land has been used by TERI for plantation. In Charpara ash dyke 38,000 trees were planted in 2003-04. Micorrhiza and vermicompost were used for amending the soil.

The colour of soil was gray as that of the raw fly ash. Texture was hard where there was mycorhiza; the fungus has binded the ash perfectly. Otherwise it was still powdery but at places the green patches on the soil were clearly seen. The study was done on the advent of rainy season in the area.

The occurrence of animals is shown in Table 1. Surface animal fauna was mainly comprised of the following: 1. Lady bird - 2 species, 2. Grass hopper - 2 species, 3. Cockroaches - 2 species, 4. Termites -1 species, 5. Ants - 3 species, 6. Spiders - 2 species, 7. Housefly, 8. Butterfly, 9. Catterpillar - 1, 10. Egg case - 2, 11.Chamelion - 1, 12. Uromatrix - 1 species, 13. Snake - 3 species, 14. Skink -1 species, 15. Rat -1 species

The termites have started to build the termatorium on the dried bamboo shoots. They were the new arrivals in this plantation site as their tiny termatorium was built without any alignment to the

ground but only on dead and dry bamboo shoots. Korba is a favourite area for termites, and they are found in the residential areas and outskirts of the city and even in jungles.

The area of plantation was cleaned regularly and seemed to be managed better. If we compare these faunal species with the surface fauna present at the nascent dykes, we see a clear change in faunal diversity with an increase in species. Nascent dyke has *Euglena* and *Paramecium*, 2 year old dyke has insects and frogs, 10-year old dyke has ants and beetle and plantation dyke has insects (13 species), reptile (6 species), Aves (1 species), mammals (1 species) and egg cases of praying mantis in abundance. The nascent dyke was pool like structure with fresh slurry in it, so some population of *Euglena* and *Paramecium* were seen on the edges of the pool. In the two-year old dyke along with previous species, insects and frogs were seen, but again in and near the edges of the pond. The oldest dyke was kept abundant without any use and it was causing major pollution though spraying of the ash in air, thus plantation was started here to reclaim the land. This study was undertaken after 4 years of tree plantation. The substratum was searched nicely to look for any animal home, holes and termatorium etc.

Ants and spiders have made their dwelling in the mounds build for bamboos. The smaller ants were in the bamboo mounds, where small holes for the entry was clearly seen. But the larger bull ants had made their dwellings near the teak wood trees and sal trees. Their nest could not be found but large number of the bull ants was seen on the tees and on the ground. Here two spiders *Hasrius* and *Neoscona rumfi* were found wandering on the bamboo mounds. They were very conspicuous because of their special marks on their backs. The webs found were very far away from these two and were necessarily not of them The study of formation of webs was also necessary because it has been seen that some chemicals affect the formation pattern of the webs. Here two types of webs were found

1. The sheet web, which was on the fallen leaves on the grass.
2. The orb web along the pathway near the roots of teak wood tree.

Both seemed to be in perfect alignment showing that no chemical of fly ash is harming senses of spiders. In the nearby forest areas the funnel type of web is very common but none of that web was seen here.

The field cricket was seen once in the area of dyke where plantation at the grass levels had started, but now on full plantation area there were uncountable crickets and they made such a deafening noise together on the onset of evening that it was almost impossible to sleep.

Both the species of cockroaches were found under the debris and foliages. No rat hole or snake dwelling was found in the area. But our study shows that snakes and rats are seen here, even the *Varanus* and *Mobuia* were found. *Varanus* is commonly found in Korba area but in the dykes it was seen occasionally. As for snakes, all the three species found here are common in the residential as well as forest areas of Korba. Rat holes were seen only outside the dyke premise, that is below the dyke level. It has to be remembered that dykes are embankments which are continuously being increased in height, so this one was almost 150 meters above ground level where the plantation is being made. Thus, these animals do not have their residence at the dyke but wander frequently in the area of food availability. They must be disliking the course texture of the fly ash to build their homes.

Peacock is seen very rarely in the jungles of nearby area, but it was seen occasionally in the dyke area in search of food. These birds are always found in groups of four to six but here they were seen always alone wandering on the dyke.

Table 1: Surface fauna on ash dykes of Korba.

	10-yr old dyke (abandoned)	Dyke after plantation
1. Insects	Red ants, small beetles	**Ants**: 1. Small black *Indomyrmex* species, 2. Small black *Dolichoderus*, 3. Large black bull ants *Myrmecia* **Spider:** 1. *Hasarius adansoni*, *2. Neoscona rumpfi* **Cockroaches:** 1. *Periplanata austrelasiae*, *2. Blatta germanica*. **Termite:** One species **Grass hopper:** 1. *Poekilocerus pictus*, 2. Nymph of some other grasshoppers **Field Cricket** **Ladybird:** 1. *Anthea sexgateta*, **Housefly**: 1. *Musca domestica*
2. Reptiles	None	**Chamelion:** 1. species **Skinks**: 1. *Mobuia* **Snakes:** 1. *Viper, 2. Python*, 3. Rat snake **Varanus:** *Varanus bengalensis*
3. Aves	None	**Peacock:** *Pavo cristatus*
4. Mammals	None	**Rat:** 1. *Rattus rattus*

The food web in the area shows that reptiles are maximum here because of no other human intervention other than maintenance of the plantation. Therefore, a very healthy fauna and ecosystem is being developed here.

Ash amending has provided favourable conditions for growth of the trees but its affect on animal invasion has rarely been recorded. Mandal & Saxena (1999) have also recorded the improvements of physical property of black cotton soil by including fly ash. Banerjee & Kashyap (1999) have recorded the increase in microorganisms with the increase in age of dykes. The microorganisms along with trees also favour the animals. The plants and trees present in this area were healthy as no viral or other infection was seen on them, though viral infection on the plants of nearby area is very common.

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