

STUDY OF FAUNA DIVERSITY (MICRO AND MACRO) IN FLY ASH DISCHARGE POND IN RELATION TO IT'S PHYSIO-CHEMICAL PROPERTIES

¹Vandana Singh, ²Dr.Shweta Sao

¹M.Phill. Research Scholars, ²H.O.D.Of Life science

Dr.C.V.Raman University, Kota,Bilaspur (C.G.)

Abstract: Fly ash refers to grey coloured post high temperature combustion residues particles of coal. We can say that the fly ash constituent is the main abiotic portion of the pond, which directly affects the biodiversity of pond. The biological characteristics (present fauna) depend on the physio-chemical properties of water body, so they also show differences in their existence, community structure, in diversity and density.

Keywords: fly ash, Fauna, pozzolonic, Biodiversity, Micro and Macro Fauna.

I. INTRODUCTION

Background:

During past several decades Urbanization and industrialization of human society the generation of electricity through various coal combustion process has grown to accommodate increased populations and associated industrial and commercial development all over the world. Thus increasing the production of fly ash, making its disposal a major problem. Ultimately being disposed off outside the power plants in fly ash dykes.

The Fly Ash:

The fine particles of fly ash have property to escape with the flue gases and fly into the atmosphere thus named as fly ash(Joshi R.C.,2010) the word 'Fly ash' was coined in 1937, during the proceeding by American Concrete Institution.(Tharaniyil M.P. and Ramme B.W., 2013).

Fly-ash particles are defined as solidified droplets, (COWI Report) and a fine powder of mainly spherical, glassy particles, derived from burning of pulveriseies coal, with or without co-combustion materials, which has pozzolonic properties and consists essentially of SiO₂ and Al₂O₃.In our study area class C type fly ash is collected in fly ash dykes situated at Dhanras village of district Korba. Class C type fly-ash is mainly associated with SiO₂, Al₂O₃, Fe₂O₃, and TiO₂ with other constituent.

Chemical composition of fly ash:

During the combustion process at high temperature radioactive element presented in coal released from the original coal in gaseous form or may present in solid form in solid combustion products. Fly ash also contains As, Cd, Ca, Cr, Co, Cu, Pb, Mn, Hg, Ni, F, Zn, Al, B, Ba, Be, Mo and some trace metals along with the basic elements. Some of these elements were showed leaching property at different quantity (Praharaj T. et al., 2002 and Piekos R. et al.,1998)

Chemically fly ash composed of SiO_2 , Al_2O_3 , Fe_2O_3 , CaO , MgO , LiO in different compositions. Depending on the source of fly ash, pozzolanic and cementation characteristics and other mechanical properties of produced fly ash narrates its further usages in different industries (Gonzalez A.*et al.*, 2009(1)).

Biodiversity:

Study and identification of fauna inhabiting in fly ash discharge pond became an interesting study because of the absence of fauna in hot slurry and due to its different water quality in comparison to another nearby natural water bodies as river and pond.

Fauna which are found in aquatic ecosystem is an important biotic component and is controlled by the temperature and other hydrological factors, (Jiang H.G. and Shen Y.F., 2003 and Jogi S., 2003) (25,31) they were affected not only by the climatic changes but also from the anthropogenic activities.

II. METHODS AND METHODOLOGY

Study area:

The Fly ash discharge pond is located in Dhanras village in Korba district of Chhattisgarh state. This pond is a small shallow pond situated at downhill position near the ash dyke having depth of around 10 to 15 meters receives water from ash dyke. During monsoon season runoff water from nearby fields are also with the rain water in this pond.

Water of this pond seems very clear, though it appears milky white and gray during the discharge from dyke, but then it is metallic green after some time, especially when it is not receiving water from the dyke. Some large weeds, fishes and frogs were found in that pond during our pilot survey (2007-2008).

Stations for sample collections:

This pond has an area of 6.1856 hectare situated at $22^{\circ} 28' 55.00''$ latitude and $82^{\circ} 38' 29.55''$ longitude. Elevation (high from earth.) To decide the sampling stations, whole pond was divided in sections of 5^2 meters. Station of 30^2 meter on each side, and the center of pond were decided as stations A, B, C, D, E depending on the presence and absence of vegetation, which could give us a clear picture of fauna present in this water. All stations were equidistant from the pond bank i.e. till 10 meter inside the pond. Except station E which was in the center of the pond.

III. METHODOLOGY FOLLOWED

I. Physio-chemical parameters

A. Physical parameters:

- Colour – By Visual comparison method,
- Odor- By Threshold test,
- Turbidity-By Nephelometric method,
- pH- By pH meter and Litmus paper test,
- Temperature- By Centigrade thermometer,
- Conductivity- By Laboratory method (Conductivity meter),
- Total solids- By Laboratory method (Titration method).

B. Chemical parameters:

- Hardness- By EDTA Titration method
- Sulphate- By Ion Chromatographic Method,
- Aluminum- By AAS method
- Iron- By AAS method
- Silica- By AAS method
- Potassium-By Flame Emission Photometric method
- Sodium- By Flame Emission Photometric method
- TiO_2 - By AAS method-

- Dissolved oxygen- By 5 day BOD test,
- Biological oxygen demand- Winkler method,
- Chemical oxygen demand- Titrimetric method.
- Alkalinity-By Titration method.

The method used for the analysis of above stated physio-chemical parameters followed as given in APHA, AWWA and WPCF [1989]: Standard Method for The Examination Of Water. 17th edition, APHA and Workbook on Limnology By Adoni et al.

II. Biological assessment

Identification of Micro and Macro Fauna-

Macro and micro fauna were collected by filtering large amount of water with help of plankton net made up from blotting silk of different mesh sizes. Sieves were also used for macro fauna collection. Samples were studied from every station of fly ash discharge pond. Formalin and Lugol solution with glycerin was used for their preservation.

Identification - Identification of micro and macro fauna done on the basis of their morphological characteristics, with the help of many senior scientists with experience in identification of fauna.

- Fresh Water Biology By W.T. Endmson,
- Workbook on Limnology By Adoni et al.
- APHA (1989).
- Fishes of U.P. And Bihar By Gopalji Shrivra

C. Seasonal variation of faun

D. Diurnal variation of fauna - By Tow method (Wieve 1992)

IV. RESULT

Physiochemical characteristics of Fly Ash Discharge Pond (2014-2015)

S.No.	Physiochemical parameters	Unit	Value
1	Colour	Hazels	>5
2	Odor		Pungent
3	Turbidity	NTU	107.75
4	pH		9.01
5	Temperature	⁰ C	29.25
6	Hardness	mg/l	117.89
7	Sulphate	mg/l	11.15
8	Dissolved Oxygen	mg/l	4.91
9	BOD	mg/l	4.36
10	Mercury	ppb	BDL
11	Carbonate	ppb	Absent
12	Conductivity	umho	334.5
13	Total solids	Mg/l	97.5
14	Alkalinity	Mg/l	29.9
15	Potassium	ppb	BDL
16	Aluminum	ppb	Not detected
17	Iron	ppb	Not detected
18	Mercury	ppb	BDL
19	Selenium	ppb	34.3
20	Sodium	ppb	BDL
21	Arsenic	ppb	7.4
22	Carbonate	ppb	Absent
23	Silicate	ppb	Not detected
24	Lead	ppb	8.6

BDL –Below the detectable limit

Observe after study about Fauna: In Our Study period only 14 species of protozoans, 1 species of rotifer, 1 species of arthropod, 2 species of ichthyofauna and only 1 species of frog are found in our study period. Only 19 species of fauna found in our study period.

Station wise distribution of Fauna in fly ash discharge pond: *Amoeba protious*, *Chilodonella*, *Frontoria leucaus*, *Philodena recelli* (micro fauna) and *Puntious phutionia* and *Puntious ticto* were found in all stations (A, B, C, D, E) in FADP while *paramecium caudatum* and *stylonchia mytilus* were not found in station A. *Clatrulina elegance*, *Paramecium multimicronucleatum* and *Euphyctis cynophlyctis* were found in station A, B, C, D and not found in station E. *Bodopsis godboldi*, *Bodocaudatus*, *Urotrica*, *Spirostomum minus*, *Nauplius larvae* were found in station B, C, D. *Arcella Vulgaris*, *Didinum nasutum*, *Dogiella minuta* were found in station B and C. If we assess the presence of fauna, species wise maximum species of protozoans and rotifers were found in station C followed by B and D, while in station A and E shows similar no. of species. Pattern of localization of Arthropoda was station C > station B > station D. Fishes were found in all stations they localized in maximum in station C followed by station D and E while minimum localization was found in station A and station B. Only one species of frog was found in FADP, which was localized in every station. Station B and C showed highest localization of fauna during our study period.

Diurnal variation of fauna in fly ash discharge pond:

In our diurnal study which was random and for three days at a stretch we did not see any of the changes or variation in size of the animal. Thus we have to accept the fact that. According to some scientists lunar rhythm act on the ecophysiology of the plankton in fresh water ecosystem which ultimately might be governed by hormones (genetically based) and accordingly followed by the internal clock; biological clock.

Seasonal assessment of fauna:

During our study period organisms present in FADP were belonging from 5 groups of fauna. Seasonal study of these groups shows that the protozoans, rotifers, arthropods, Ichthyofauna, amphibia. maximum organism is well developed during winter season comparison of summer season

REFERENCES

- [1] P. K. Rohatgi "Morphology and selected properties of fly ash"; Fly Ash, Silica Fume, Slag, and Natural Pozzolans in Concrete, Vol. 1, Pages: 459-478 (1995)
- [2] Praharaj T. and Piekos R. "Leachability of elements from sub-bituminous coal fly ash from India"; Environ Int.; a27(8):609-15(2002,1998)
- [3] S. Shrivastava, "Surface fauna at reclaimed ash dykes in Korba"; Nature environment and pollution technology ; 6:677-680,2012.
- [4] Shrivastava S. "Biodiversity in fly ash dykes". Nature environment and pollution technology. 2006-07 ref no.-65,66)
- [5] H.G. Jiang & Y.F. Shen; "Development of a biotic index using the correlation of protozoan communities with chemical water quality"; New Zealand journal of marine and fresh water research; 37: 777-792, (2003).