ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 8, Issue, 05, pp.30306-30309, May, 2016

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

SOIL PHYSICO- CHEMICAL CHARACTERISTICS NEAR THE MINING AREAS OF KEONJHAR DISTRICT, ODISHA, INDIA

***Aditya Kishore Dash, Abanti Pradhan and HimanshuSekhar Patra**

[1]Department of Environmental Engineering, Sikshya O Anusandhan University, Bhubaneswar
[2]Department of Environmental Sciences, Jyotivihar, Burla

ARTICLE INFO

Article History:
Received 19th February, 2016
Received in revised form
16th March, 2016
Accepted 09th April, 2016
Published online 10th May, 2016

Key words:

Soil Pollution, Mining Activities, Conductivity, NPK, Micro Nutrient.

ABSTRACT

Soil pollution is mostlyrelated to human activities such as industry, agriculture, burning of fossil fuels, mining and metallurgical processes and their waste disposal. A work was undertaken to study the physico- chemical characteristics of soil at three villages like Raika, Bansapani and Kalinga near the mining area of Keonjhar District, Odisha. The physico- chemical parameters like pH, conductivity, organic carbon, and organic matter, N, P, K, Zn, Fe and Mn were analyzed following the standard methods. It was observed that, parameters like pH, conductivity, organic carbon and organic matter content did not show any significant difference between the three sampling stations. The minimum and maximum values for different parameters at all the three stations are; pH 6.43-6.7, conductivity 75.6–96.6, OC (%) 0.32-0.53 and OM (%) 0.82-0.98. However, the major soil nutrient like Nitrogen, Phosphorous and Potassium content of soil in the three stations showed significant difference. Further, the micro- nutrient like Zn, Fe and Mn content of soil were also analyzed in the above three stations. There was no significant difference of Zn and Fe concentration between the stations however the manganese content of soil showed a significant difference. Abanti Pradhan and HimanshuSekhar Patra

Citation: Aditya Kishore Dash, Abanti Pradhan and HimanshuSekhar Patra, 2016. "Soil physico- chemical characteristics near the mining areas of Keonjhar District, Odisha, India", *International Journal of Current Research*, 8, (04), 30306-30309.

INTRODUCTION

Soil is a dynamic, natural body that occurs on the earth's surface which supports the growth of plants. Soils are formed by the decomposition of rock and organic matter over many years (Zaware, 2014). Mining causes negative environmental effects such as degradation of water quality, loss of forest and wildlife, landscape deterioration, spreading of spoils creating wasteland, noise pollution and degradation of agricultural lands (Lamare and Singh, 2014). Mining of minerals is very location specific and often a onetime exploitative activity which adversely affects the environment. Mining industry affects the agricultural land area and induces human settlement pattern thereby causing disruption of social relations (Debasis, 2014). Open cast quarrying is responsible for several negative environmental and socio-economic impacts, particularly when the quarrying is carried out haphazardly and not as per prescribed norms and regulations (Lad and Samant, 2014). Mining and metallurgical activities causes' greater perturbation and devastation of both terrestrial and aquatic environments which has large scale ramifications (Ahanger et al., 2014).

****Corresponding author: Aditya Kishore Dash,***
Department of Environmental Engineering, Sikshya O Anusandhan University, Bhubaneswar, India.

Rapid degradation of disturbed soil with substantial macro-nutrient losses were recorded from bauxite mine in Jamaica (Harris and Samson, 2008). Mining activities in the Western Ghats of Maharashtra has disturbed the habitat of various species which is affecting the diversity of Pteridophytic species in the area (Shaikh and Dongare, 2010). Bauxite mining activity, legal and illegal, in the Western Ghats of south Maharashtra has caused environmental degradation due to various factors such as dust pollution, noise pollution, loss of biodiversity, vegetation loss and pressure on local resources (Lad and Samant, 2013).

MATERIALS AND METHODS

In the present research, a work was undertaken to study the physico- chemical characteristics of soil at three villages near the mining area of Keonjhar District, Odisha.The villages were Raika (Station-1), Bansapani (Station -2) and Kalinga (Station-3). Four random soil samples from each villages were collected at 0-10 cm depth for physico- chemical analysis. The physico-chemical parameters like pH, conductivity, organic carbon, and organic matter, N, P, K, Zn, Fe and Mn were analyzed following the standard methods.

Soil Physico- chemical Analysis

pH: pH of the soil suspension was measured by a digital pH meter (Systronics make -335 model).

Electrical conductivity: Electrical conductivity was measured by a conductivity meter (Systronics make -304 model). The electrical conductivity was expressed in terms of m mho/cm at 25^0C.

Organic matter and Organic carbon: Walkley and Black's (1934) rapid titration method was followed to determine the organic carbon content of the soil. Percent organic matter (OM) was calculated as % OM = 1.724 X % C.

Nitrogen: Nitrogen content of soil was estimated by per sulphate oxidation method of Raveh and Avnimlech (1979) and the value was expressed in g %.

Sulphate: Soil suspension (1:5) was prepared and filtered for spectrophotometric estimation of sulphate.

Phosphate: Available phosphorous of soil was determined by using ammonium molybdate solution and was measured in a spectrophotometer at 690 nm. The value was expressed as mg /Kg. soil.

Heavy metals: Heavy metals like Zn, Fe and Mn were analyzed following the standard methods of Atomic Absorption Spectrophotometer.

RESULTS AND DISCUSSION

pH which determines the basic and acidic properties of soil, plays a significant role as nutrients namely Nitrogen (N), Potassium (K) and Phosphorus (P) are carried by soil which are needed by plants in varying amounts for their growth (Biswal and Mukherjee, 1994). The electrical conductivity is directly related to the cations present in the soil solution. The more is the absorption of cation in the soil fraction, the more will be their availability in the soil solution (Brady, 1990). The result shows that, the minimum and maximum values for pH varied between 6.43-6.7 and conductivity between (µmho/cm) 75.6 – 96.6. Organic carbon and organic matter are the important parameters of any soil, which improves both the physical and chemical properties of soil and has several favorable effects on soil quality. In the present study, OC (%) varied between 0.32-0.53 and OM (%) between 0.82- 0.98.

NPK as a fertilizer plays an important role for plant growth. Nitrogen is the chief growth promoting nutrient element which influences soil productivity and is an important element for plant development. Phosphorus is an essential element classified as macro- nutrient. It is required in relatively large amounts by the plants. Potassium as a key nutrient plays a vital role in the building of protein and reduction of diseases in plants. In the present work Nitrogen (kg/hec), Phosphorous (kg/ hec) and Potassium (kg /hec) content of soil in the three stations showed significant difference. Nitrogen content was found to be maximum at S3 (1583.33 kg/hec) and minimum at S2 (410.5 kg/hec). Similarly the potassium and phosphorous content varied between 980 and 54 (kg/hec) at S1 and 327.5 - 7.6 (kg/ hec) in S3 respectively. Iron is abundantly present in the rocks in ferrous and ferric states. It plays an important role in human metabolism and its deficiency can lead to health disorders. Zn in soil remains strongly absorbed and in aquatic environments it predominantly binds to suspended material before finally accumulating in the sediment. Manganese is one of the abundant metals in soil which occurs as oxides and hydroxides. Fe, Zn and Mn content of soil were also analyzed in the above three station.

Table 1: Soil Physico- chemical characteristics near three sampling stations

Parameters	S_1	S_2	S_3
pH	6.43	6.5	6.7
Conductivity (µmho/cm)	94	75.6	96.6
OC (%)	0.32	0.46	0.53
OM (%)	0.82	0.96	0.98
N (kg/Hec)	898	410.5	1583.33
P (Kg/Hec)	54	15.4	7.6
K (Kg/Hec)	980	363	327.5
Zn (mg/Kg)	5	5.3	5.6
Fe (mg/ Kg)	5.9	4.5	4.8
Mn (mg/ Kg)	7.53	64.3	45.7

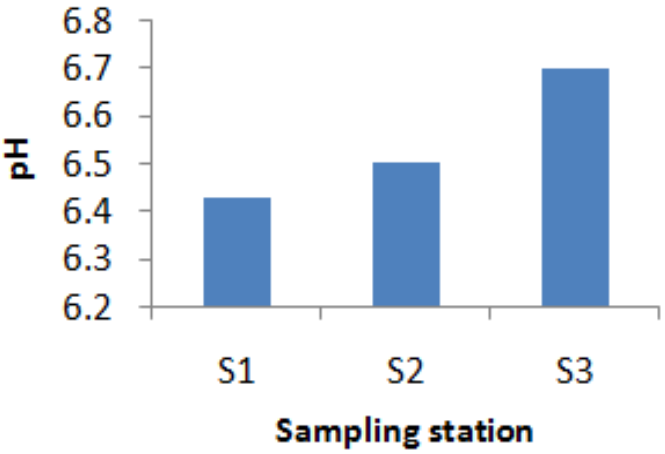

Figure 1a. pH at the three sampling stations

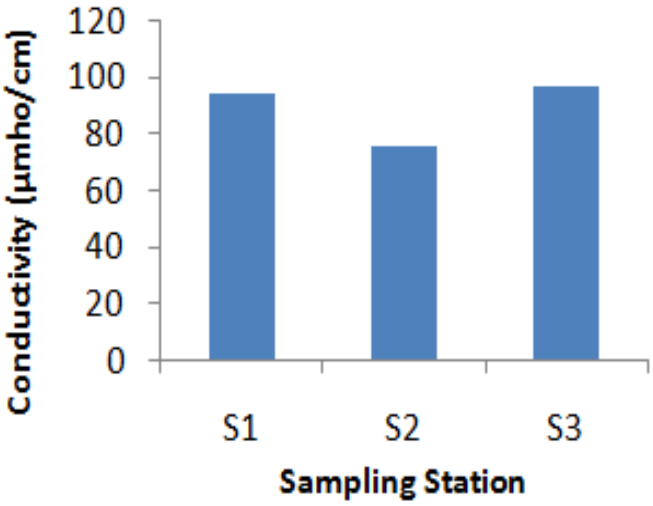

Figure 1b. Conductivity at the three sampling stations

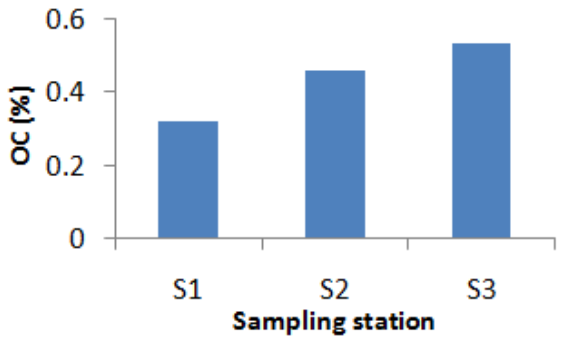

Figure 1c. Organic carbon (%) content at the three sampling stations

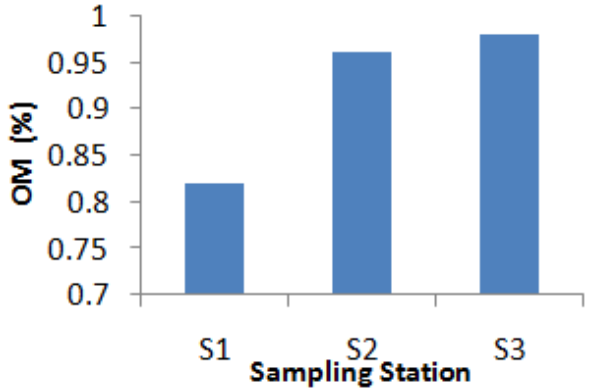

Figure 1d. Organic matter (%) content at the three sampling stations

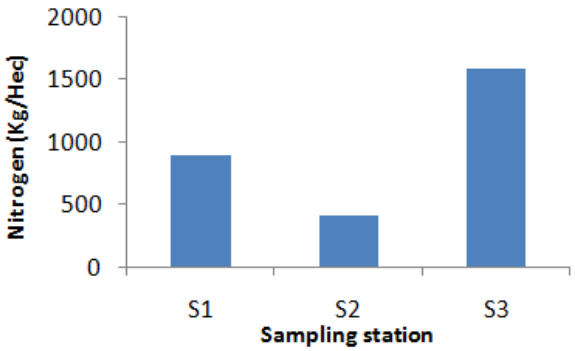

Figure 1e. Nitrogen (Kg/Hect.) content at the three sampling stations

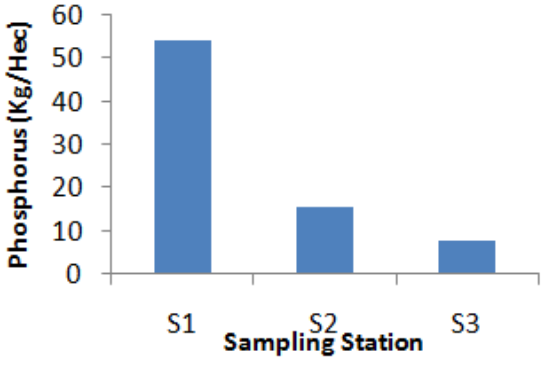

Figure 1f. Phosphorus (Kg/Hect.) content at the three sampling stations

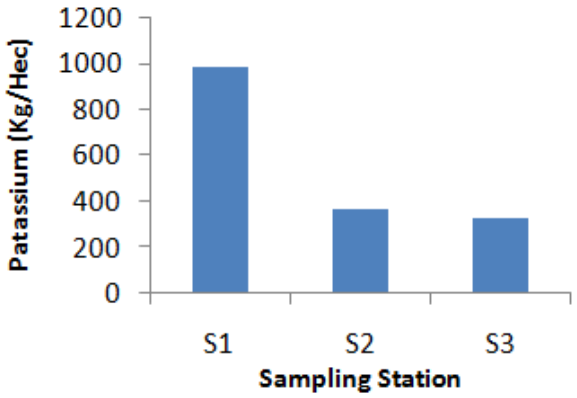

Figure 1g. Potassium (Kg/Hect.) content at the three sampling stations

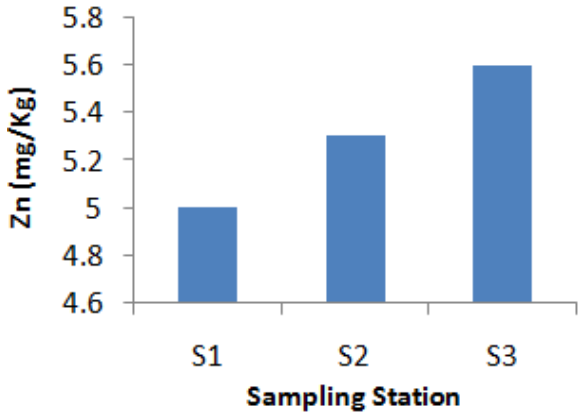

Figure 1h. Zinc (mg/Kg) content at the three sampling stations

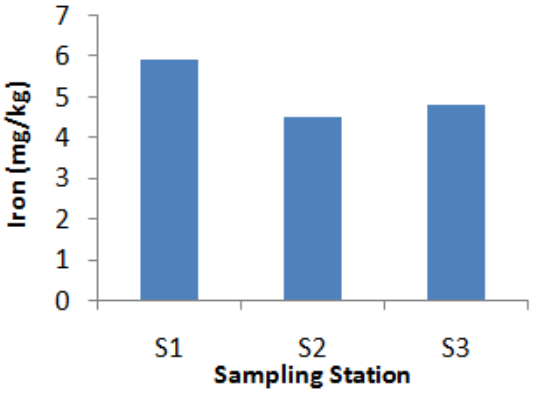

Figure 1i. Iron (mg/Kg) content at the three sampling stations

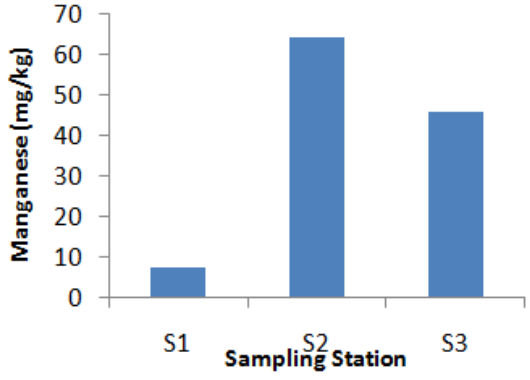

Figure 1j. Manganese (mg/Kg) content at the three sampling stations

The result showed no significant difference between the station S1, S2 and S3 with respect to Fe and Zn however the Mn content of soil showed significant difference (7.53-64.3 mg/Kg). Table 1 shows the soil physico- chemical characteristics near three sampling stations. Figure 1 a-j shows the results of different soil physic- chemical parameters like pH, conductivity, OC, OM, N, P, K, Zn, Fe and Mn respectively.

Conclusion

Soil pollution is mostly related to human activities, out of which mining plays an important role. Changes in soil physico-chemical properties affect the growth and development of flora and fauna of the area which ultimately affects the ecosystem of the area. In the present study, it was observed that, variation in soil characteristic was mostly due to the mining and allied activities taking place in the area.

REFERENCES

Ahanger, F.A., Sharma, H.K., Rather, M.A. and Rao, R.J. 2014. Impact of Mining Activities on Various Environmental Attributes with Special Reference to Health Impacts in Shatabdipuram, Gwalior, India. *International Research Journal of Environment Sciences,* 3(6), 81–87.

Biswas, T.D. and Mukherjee, S.K. 1994. Textbook of Soil Science, (2nd Edition, Tata McGraw- Hill Publishing Company Limited, New Delhi), 8-12.

Brady, N.C. 1990. The nature and properties of Soils.Xth ed. Macmillan Publ. Company, USA.

Guha, D. 2014. A case study on the effects of coal mining in the environment particularly in relation to Soil, Water and Air causing a Socio-economic Hazard in Asansol- Raniganj Area, India. *International Research Journal of Social Sciences*, 3(8), 39-42.

Harris, A.M. and Samson, O.N. 2008. Post-mining deterioration of bauxite overburdens in Jamaica: storage methods or subsoil dilution?,*Environ Geol,* 54, 111–115.

Lad, R.J. and Samant, J.S. 2013.Environmental impact of bauxite mining in the Western Ghats in south Maharashtra, India.*International Journal of Recent Scientific Research*, 4(8), 1275-1281.

Lad, R.J. and Samant, J.S. 2014.Environmental and Social Impacts of Stone Quarrying- A Case Study of Kolhapur District.*International Journal of Current Research*, 3(8), 39-42.

Lamare, R. and Singh, O.P. 2014. Degradation in water quality due to limestone mining in east Jaintia Hills, Meghalaya, India.*International Research Journal of Environment Sciences,* 3(5), 13-20.

Reveh, A. and Avnimlech, Y. 1979. Total nitrogen analysis in water, soil and plant material with persulphate oxidation. *Plant Res*., 13, 911-912.

Shaikh, S.D. and Dongare, M. 2010.Effects of Mining on the Diversity of the Pteridophytes from the Western Ghats of Maharashtra (India).*World Applied Sciences Journal*, 11(12), 1547-1551.

Walkley, A. and Black, I.A. 1934. An examination of theDegtiareffmethod for determining soil organic matter and a proposed modification of the chromic acid titration method.*Soil Sci*., 37, 29-38.

Zaware, S.G. 2014. Environmental Impact Assessment on Soil Pollution Issue about Human Health.*International Research Journal of Environment Sciences,* 3(11), 78- 81.

****