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Monitoring of Alteration of pH of Soil in Itakpe Iron Ore Deposit Area of Kogi State, Nigeria

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Abstract: Mining has been reported to alter the pH of soil through its wastes. The effect of mining on pH of soil in the iron ore deposit area of Itakpe, Kogi state of Nigeria was investigated. The study involves the determination of degree of acizdity and alkanity of some soil in order to have a baseline for assessing the impact of iron ore mining in future. Soil samples at 0-15 cm depth were collected, predigested and analysed using pH meter. The results revealed that soil of the mined and unmined sites have favourable pH for agricultural activities. Likely consequences of this discovery on the residents of the area are discussed. Useful suggestions are made on continous monitoring of the soil pH in and around the mine area and regulation of pH of soil when necessary.

Key words: Alter, pH, soil, mined, unmined, monitoring, regulate

INTRODUCTION

Adverse environmental effects (of mining) have primarily been the result of contamination by acids and metals (Eric *et al*., 1992). Mine wastes develop hot spots of acidity and consequent revegetation failure (Down and Stocks, 1977). Metal mine wastes usually contain excessive hydrogen ion (Johnson *et al*., 1994).

Symbiotic bacteria associated with nitrogen fixing plants are pH sensitive. Azotobacter will not survive below pH of 6, while Rhizobium has a limit of pH 5-5.5 (Down and Stocks, 1977). Many mine wastes are acidic (Down and Stocks, 1977).

Itakpe is situated in Kogi state of Nigeria. It lies on longitude 6°16'E and between latitude 7°36'N and 7°39'. Soil of Itakpe iron ore area is heavy metal contaminated and it is not yet remediated (Olatunji, 2008).

The objective of this study, is to make available baseline data on the degree of alteration of pH of the soil in evaluating the impact of iron ore mining in the area. This is with the view of considering possible implications of pH alteration on the residents of the area especially those farming in the area and recommend appropriate meausures to regulate the effect of pH alteration of soil due to iron ore mining.

MATERIALS AND METHODS

Three replicates of composite samples of top soil (0-15 cm) were collected randomly from each site. Steel butch auger was used to collect the soil samples (FAO, 1992). The sites are West Mine, WM, East Mine, EM and Pilot Mine, PM. The control site used is an unmined site several kilometers away from the mines.

The pH of the soil samples were meausured with BS 1377-3:1990.5 g of powdered samples were weighed on an analytical balance, 5 mL of distilled water was added. The solution was then stirred for 1 min, the mud was filtered with a piece of Whatman paper no 1 filter paper. The pH meter was inserted into the filtrate and the readings were recorded.

RESULTS AND DISCUSSION

The mean pH of soil at 0-15 cm depths are shown in Table 1. The topsoil was used in this study because it has been shown that surface soils are better indicator of metallic burdens i.e., hydrogen (Nyagababo and Hamya, 1986). Mean pH of soil in East Mine (EM) is 7.05, in West Mine (WM), 7.04 and 7.06 at Pilot Mine (PM). The lowest was at Pilot mine indicating highest acidity and highest was at Pilot Mine, 7.64. These values show alkaline which characterize the nature of the soil in the area (Rahaman, 1973; Extension, 2008). This is in line with Down and Stocks (1977) who reported that acidification is gradual. The pH of sol in the gardens G1 and G2 near the mines are 6.89 and 7.02. These values are slightly acidic and may be due to continous cropping in the gardens. The pH of the control site which is several kilometers awy from the mined sites is 7.44. The pH values are still within the optimum condition for crop production (Florida Phosphate Council, 2008).

Table 1: pH of soil in the sites studied

Soil pH	1st	2nd	3rd	Mean	SD	Min.	Max.
EM	7.54	7.54	7.57	7.55	0.016	7.54	7.57
WM	7.44	7.46	7.45	7.45	0.01	7.44	7.46
PM	7.63	7.66	7.63	7.64	0.016	6.87	6.90
G1	6.87	6.90	6.90	6.89	0.016	6.87	6.90
G2	7.00	7.02	7.04	7.02	0.02	7.00	7.04
CS	7.44	7.48	7.40	7.44	0.04	7.40	7.48

CONCLUSION

It can be concluded, that heavy metal contamination of soil due to mining can be manifested before acidification as it has been discovered through this study.

Nonetheless, there is need for continous study of the soil in the area in order to detect the acidification as soon as it starts manifesting. Early remediation of the soil will not involve problem of acidification, Appropriate liming is recommended for the regulation of acidity in the acidic soils.

RECOMMENDATIONS

The data obtained in the course of the study has shown that acidification of the soil in the iron ore mine is not yet detectable. The farmers farming near the mines need not panic about soil acidity and its allied problems for now.

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