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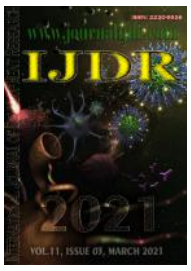

RESEARCH ARTICLE **OPEN ACCESS**

COMPARATIVE ELEMENTAL ANALYSIS OF SOME SELECTED HEAVY METALS IN SOME BRAND OF DUST AND DUSTLESS CHALK OBTAINED FROM GOMBE STATE MAIN MARKET

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ABSTRACT

The investigation on the level of heavy metals contents in dust and dustless chalks such Nickel(Ni), Zinc (Zn), Iron (Fe), Lead (Pb), and Cupper (Cu) in the dust and dustless was determined. Fe has very high concentration in both samples. In dust it was found to be 14.7 and 8.15 in dustless respectively. Themoisture content of dust and dustless chalk which obtained from the analysis which show that the moisture content of dustless is lower than the dust sample.

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INTRODUCTION

Chalk used in school classrooms comes in slender sticks approximately 9 mm in diameter and 80 mm long, cheap and effective in teaching and learning. Almost all chalk produced today is dustless which still produces dust but settle faster unlike the earlier softer chalk tended to produce a cloud of dust that some feared might contribute to respiratory problems (Thareja P, *et al.*, 2011). As found in nature, it has been used since prehistoric times, according to archaeologists, it helped to create some of the earliest cave drawings which are protected with shellac or a similar substance, have survived (Alves *et al.*, 2014). Chalk can be molded into sticks for the convenience of artists (Nikam *et al*., 2013). Chalk board teaching is a conventional method of teaching from prehistoric times which is almost mandatory for a conventional classroom system but it posed serious chalks health hazards to a teacher and students. As the chalk is scratch on the chalk board the particles are released into the surrounding air. The Inhabitants inhale fraction of school chalk dust, which usually becomes trapped in the mucous layer of the throat and upper lung. For the inhabitants with chronic breathing issue like asthma, and exposure to chalk dust can aggregate the problem further. The dust settled on the body parts, clothes and furniture etc may lead to skin irritations and allergies (Monica *et al.*, 2011). Despite the fact that school chalk can now be produced locally, there is need to meet standard. A good quality chalk must be non-porous, non-toxic, non-brittle, oil-free and must have the ability to give good inscription (Corazza *et al.* 2011). The basic raw materials required in the manufacture of school chalk include, limestone (Calcium Carbonate), gypsum, pigments and water. These materials are available in large quantities in Nigeria and could be easily source (Mainka, *et al.* 2015). There are several raw materials used for the production of blackboard chalk and these raw materials could be used separately or combined. The different raw materials include Gypsum ($CaSO_4.2H_2O$), Calcium Carbonate ($CaCO_3$), cement, bones, kaolin ($Al_2O_3.SO_2H_2O$), and fertilizer. These raw materials are available in great quantities in several parts of the country.

MATERIALS AND METHOD

The apparatus and reagent used are; Analytical weighing Balance, Crucible, Conical flask, Beaker, Mortal and pestle, Heat plate,

Funnel, Filter paper, Muffle furnace, Hydrochloric Acid (HCl), AAS (atomic absorption spectrometer)

Sample Collection, treatment and preparation; The dust and dustless chalk was Collected from chalk Production Company and a bookshop in Gombe State Main Market respectively.The Dust and Dustless chalk was grounded into a fine powder using mortal and pestle, the fine powder was then ashed using muffle furnace at temperature of 800° C for 30minute.4 g of the ashed powder was weighed using Analytical weighing balance and was dissolved in 100 ml volumetric flask containing ratio 1:1 of HCl Hydrochloric Acid and distilled water.

RESULTS AND DISCUSSION

The results of this work were represented in tabular and graphical form. Results were devoted to determine the heavy metals (Copper, Zinc, Lead, Nickel, and Iron) in dust and dustless chalk sold in Gombe state of Nigeria.

Table 1. Show that the flame atomic absorption spectrophotometer for dust chalk

Concentration mg/L					
Dust	Fe	Ni	Cu	Zn	Pb
1	15.0	0.759	0.246	0.635	0.485
2	14.8	0.502	0.167	0.570	0.454
3	14.3	0.397	0.164	0..546	0.448
Mean	14.7	0.553	0.192	0.584	0.462
SD	14.7	0.553	0.192	0.584	0.462
	±0.40	±0.1861	±0.0468	±0.0461	±0.0200

Table 2. Show that the flame atomic absorption spectrophotometric for dustless chalk

Concentration mg/L					
Dustless	Fe	Ni	Cu	Zn	Pb
1	7.75	0.787	0.077	0.264	0.491
2	8.56	0.844	0.078	0.223	0.517
3	8.15	0.915	0.057	0.210	0.535
Mean	8.15	0.848	0.071	0.232	0.514
SD	8.15	0.848	0.071	0.232	0.514
	±0.405	±0.0640	±0.0115	±0.0284	±0.0221

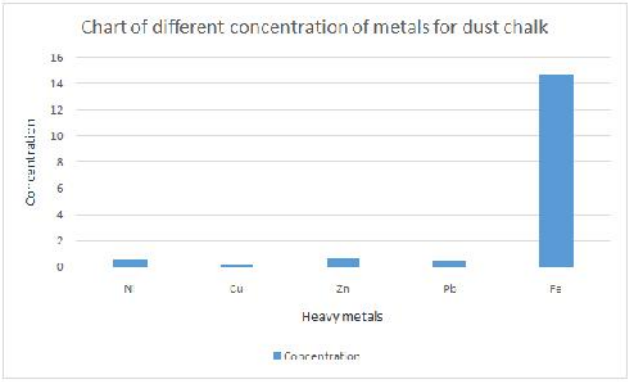

Figure 1. Histogram of Comparison of Some Heavy Metals Content in dust chalk for the Following Elements (Cu, Zn, Pb, Ni, and Fe)

Concentration of heavy metal in dust and dustless chalk is as follows, for dust Pb 0.462 mg/kg with SD 0.0200 mg/l, Ni 0.553 mg/kg with SD 0.1861 mg/kg, Cu 0.192 mg/l with SD 0.0468 mg/kg, Zn 0.584 mg/kg, with SD 0.0461 mg/l, Fe 14.7 mg/kg with SD 0.40 mg/kg and for dustless Pb 0.514 mg/kg with SD 0.0221 mg/kg, Ni 0.848 mg/kg with SD 0.0640 mg/kg, Cu 0.071 mg/kg with SD 0.0115 mg/kg, Zn 0.232 mg/kg, with SD 0.0284 mg/kg, Fe 8.15 mg/kg with SD 0.405 mg/kg. This work focuses on five toxic heavy metals (Cu, Zn, Ni, Fe and Pb) in dust and dustless chalk sold in Gombe state.

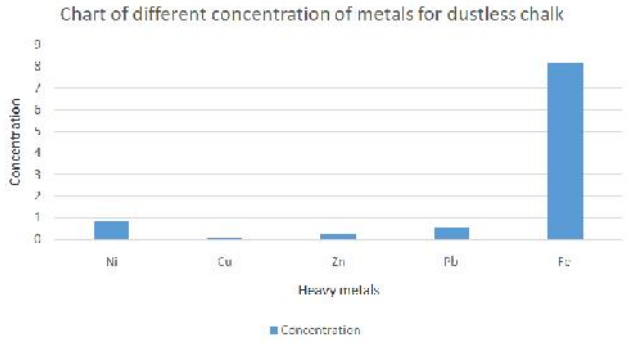

Figure 2. Histogram of Comparison of Some Heavy Metal Content in dustless chalk for (Cu, Zn, Pb, Ni, and Fe)

Table 4.1 shows the mean concentration of triplicate analysis of the samples using AAS techniques. Cu: the mean concentration of Cu was 0.192 ppm in Dust and 0.071 of Dustless respectively. Sample Dust recorded the highest value of Cu concentration (0.192 ppm) while sample Dustless was the least (0.071 ppm).

Zn: the mean concentration of Zn was 0.584 ppm in Dust and 0.232 of dustless respectively. Sample Dust recorded the highest value of Zn concentration (0.584 ppm).

Pb: the mean concentration of Lead was 0.462 ppm in the Dust and 0.514 Dustless, respectively. Sample Dustless recorded the highest value of pb concentration (0.514 ppm)

Ni: the mean concentration of Ni was (0.553 ppm) in the Dust and (0.848 ppm) 0f Dustless respectively. Sample Dustless recorded the highest value of Ni concentration (0.848 ppm).

Fe: the mean concentration of Fe was (14.7 ppm) in the dust and (8.15ppm) of dustless respectively. Sample dust recorded the highest value of Fe concentration (14.7 ppm).

The concentration of metal in the Dust ‘and Dustless chalk are present in Table 1 and Table 2 above in Dust, concentration Fe was the highest (14.7mg/kg), followed by Zn (0.584 mg/kg) followed by Cu (0.192mg/kg) .Similarly in the Dustless concentration Fe was equally the highest (8.15mg/kg), followed by Ni (0.848mg/kg) respectively. The result revealed that the concentration of Fe was the highest in both Dust and dustless Chalk. The moisture content of Dust and Dustless chalk which obtained from the analysis show the moisture content of Dustless is low.

CONCLUSION

This research work was carried out on Dust and Dustless chalk sold in Gombe State, shows concentration of heavy metals present of (Fe, Cu, Zn, Pb and Ni) to be above the permissible ranges of the following standard organization WHO/FAO, USEPA, EU and Dutch target value. Therefore the periodic test should be run on Teachers using chalk as a means of teaching and delivering lecture regularly to asserting the level of heavy metals in their blood serum and also to prevent them from getting exposed to heavy metals contamination and health risk hazards.

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