Assessment of Physicochemical Properties of Soil around Dr. Abubakar sola Saraki Memorial Abattoir, Ilorin, Kwara State, Nigeria

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***Abstract*- The study was carried out to assess the soil around Dr. Abubakar Sola Saraki memorial abattoir, Akerebiata, Ilorin. The physicochemical properties of soil found in the study area were assessed for pH, Electrical Conductivity, Available phosphate, Calcium, Exchangeable base, Organic matter content, Organic Carbon and TVC. pH and EC were found to be within the WHO permissible standard (6-9) except MSS3 whose pH is 9.6, this indicates alkalinity of soil, this could be as a result of cumulative deposition of animal bones and feed which are rich in calcium and carbonate-rich materials like soaps used in washing in the abattoir which are later absorbed by the soil. While the Available phosphate (7.94,8.02 and 8.7) were above WHO standard (0-5 ppm), which could be as a result of the uncontrolled deposition of animal dungs in the soil. Calcium range from 5.35348 to 5.75828, all figures are within the WHO set standard.**

Keywords: **physiochemical, Pollution, Abattoir, soil, abattoir**

I. INTRODUCTION

Natural contamination is seen as any condition or circumstance in which any substance or mix of substances present in the biological framework is hindering to the wellbeing of man, plant, and creature or influences the welfare of man now or at a later time [6]

One sort of waste that is of incredible worry to both urban and rural territories in Nigeria is the abattoir or slaughterhouse wastes [8]

Abattoir is any premises used for or with respect to butcher of animals whose meat is proposed for human usage, and consolidate a butcher house, anyway excludes a place organized on a farm [1]. [4] also defined an abattoir as a premise approved and registered by the authority in charge for healthy inspection and slaughtering of animals then for onward processing and preservation and storage of meat products for human consumption. Again, [3] characterizes abattoir as an extraordinary office structured and authorized for getting, holding, butchering assessing animal's meat and meat items before release to the general society.

Abattoirs all over the world are known to, directly or indirectly, pollute environment through the various means [19]

Abattoir activities might be another source of pollution since human activities such as animal production and meat processing have been accounted for to affect the soil and natural water composition leading to pollution of the soil, natural water resources and the entire environment [2]

The abattoir operators must know the contents of the wastes they generate with the view to making them environment friendly. This is more so when it is realized that waste from abattoir and other food production outlets have the capability of polluting the environment in the three possible states of solid, liquid and gas [8]. The basic procedures that happen in an abattoir are stunning, bleeding, hide removal or treatment, evisceration, carcass dressing and washing [14]. Various abattoirs have a boning procedure in which finished remains are cut into retail portions. Most abattoirs additionally have housings and divisions where offal are taken care off, which create esteem included items from housings (intestinal tract) and tasteful offal.

Abattoir effluents or waste is the products obtained from the abattoir after the slaughter of animals like cattle, sheep, goats etc. These effluents consist of blood, urine, faeces, water, bones etc [22].

The pollution problems include air, water, food and soil pollution [11].

Soil naturally is made out of different minerals, organic constituents and broken rocks which have been altered by environmental reactions [6,25]. Plants get their physical support from the soil, air, water, temperature moderation, nutrients, and protection from toxins. The conversion into nutrients of dead organic matter for both plants and animals takes place within the soil.

Soil is a natural store for various pollutants and contaminants. When pollutants or contaminants find their way into the soil,

they interact with the soil and thereby change the physicochemical properties of the soil.

Pollution includes natural as well as manmade substances or energy that may have an adverse impact on human health or wellbeing or on the natural or cultural heritage. Environmental degradation due to pollution in poor countries is pervasive, accelerating and unabated [12]. The effects of pollution are easily felt on the earth, plant and animals, but it is more difficult to reduce the amount of pollution put into the environment [27]. It is important also to note that even a very small concentration of persistent pollutants may cause irreparable damage to the ecosystem. Organisms susceptible even to low concentration may get eliminated [27].

Abattoir, also known as a slaughter house is a place where animals are butchered for food. (Collins English Dictionary). [1]defined abattoir as any premises utilized for or in connection with the slaughter of animals whose meat is meant for human consumption and it include a slaughterhouse but exclude a place arranged on a farm. Animals include cattle, sheep, pigs, goats and other equine animals. The slaughtering of animals for general consumption is unavoidable in many countries of the world. Public abattoir had been traced to Roman civilization and in France by 15th and 16th centuries, open butcher houses were among the general public facilities. In Nigeria, nearly every town and neighborhood is provided with slaughter house or slaughter slab.

In Nigeria, [28]detailed that, a cow produces 328.4Kg of waste after slaughtering in form of dung, bone, blood, horn and hoof. [10] concluded that the disposal of waste product is a reoccurring problem in the slaughter sector and on average, 45 per cent of each live beef animal, 53% of each sheep, and 34% of each pig consist of non-meat parts. The constituents of slaughter house waste and effluent vary from day to day depending on the number, types of stock being processed and the method [29].

[26] however states that waste can affect water, land or air qualities if proper management practices are not followed.

There are several types of pollution including air pollution, water pollution and soil pollution [11].

The blood from the slaughtered animals is left uncared for on the ground producing offensive odor causing pollution in the environment. This leads to pollution of such soils, natural water resources and the entire environment [2] thus, causing health problems among the people around.

Abattoir wastes usually are multi-dimensional, mainly organics containing fat, grease, hair, feathers, grit, flesh, manure, and undigested feed, blood, bones and process water[9,18]. Abattoir effluent contains blood, urine, other body fluids, animal faces, contaminated storm water, wash down from yards and stockyard transport vehicles and contaminated runoff from the wash down area within the abattoir. It contains significant amounts of pollutants; high concentration of N and P, large amounts of TSS, organic load (COD, BOD)[24].

The soil forms the preceding zone between the atmosphere and the rock cover of the earth, the lithosphere. It likewise forms the interface between water bodies (hydrosphere) and the lithosphere and along forming a part of biosphere. The soil may be defined as the uppermost weathered layer of the earth's crust in which are mixed organisms and products of their death and decay. It may also be defined as the part of the earth's crust in which plants are anchored. The soil is a complex organization being made up of some six constituents' namely inorganic matter, organic matter, soil organisms, soil moisture, soil solution and soil air. Roughly, the soil contains about 50-60% mineral matter, 25-35% water, 15-25% air and some percentage of organic matter (Chatwal et al, 2005). To assess the physiochemical properties of the soil around the abattoir is the objective of the study.

II. MATERIALS AND METHODS

Description of the Study Area

The study area for this project is Dr. Abubakar Sola Saraki memorial abattoir located in Akerebiata within the ancient city of Ilorin, the abattoir lies between latitude 8.52667 (8°31'36"), longitude 4.55284 (4°33'10") and altitude 291.3.

Sampling Procedures, Collection, Preparation and analysis.

Collection of soil samples was done by using an auger. In each case, a triangular block was cut with the help of the auger. Eight samples were collected in all, three samples at the upper stream, three samples at the mid-stream and two samples at the downstream, small distances from one another. From each site, soil samples were collected at 0 - 15 cm depths.

All samples were then sent to the Chemistry Laboratory of the University of Ilorin for physicochemical parameters analysis. Soil samples were brought to the laboratory in sterile containers and were spread out thinly on a piece of stout paper for drying in air in a shade. Entry of dust particles from air is prevented by covering the soil samples with superfine wire net. The big lumps were broken down, and plant roots, pebbles and other undesirable matter were removed.

After the soil became completely dry, it was sieved through a 2 mm sieve. The samples were preserved in clean polythene bags for analysis.

The pH was determined using the pH meter, a jenway 4010 conductivity meter was used for the determination of the Electronic Conductivity. The triple acid digestion method of sahrawat et al. (2002) was employed in determination of the mineral analysis, Phosphate was determined spectrophotometrically using UV/V's spectrophotometer model 721N. Total viable count was determined using the microbial assay method, organic matter and total organic content (toc) were determined using this procedure:

Determine and record the mass of an empty, clean and dry porcelain dish (mp).

- Place a part of or the entire oven – dried test specimen from the moisture content experiment in the porcelain dish and determine and record the mass of the dish and soil specimen (MPDS).
- Place the dish in a muffle furnace. Gradually increase the temperature in the 4400c. leave the specimen in the furnace overnight
- Remove carefully the porcelain dish using the tong (the dish is very hot) and allow to cool to room temperature. determine& record the mass of the dish containing the ash (BURNED SOIL) (MPA)
- Empty the dish and clean it.

Data Analysis

1. DETERMINE THE MASS OF THE DRY SOIL. =MD =MPDS –MP.
2. DETERMINE THE MASS OF THE ASHED (BURNED) SOIL.MA=MPA-MP.
3. DETERMINE THE MASS ORGANICMATTER.MO=MD-MA.
4. DETERMINE THE ORGANIC MATTER (CONTENT).
5. OM=(MO/MD) *100.

III. RESULT AND DISCUSSION

Table 2: Physicochemical parameters of the soil samples collected from the study area.

Samples	pH	EC (µS/cm)	Available phosphate Ppm	Calcium ppm	Exchangeable base %	Organic matter content %	Organic carbon %	TVC (Bacteria)
USS1	7.8	40	4.58436	5.4142	4.8	6.5517	3.7893	5
USS2	8.7	910	8.73784	5.6166	4.5	3.1641	1.8300	TNTC
USS3	7.3	180	4.44268	5.74816	5.1	0.0850	0.0492	13
MSS1	8.7	220	7.94368	5.75828	4.6	3.5924	2.0777	4
MSS2	8.6	380	4.54388	5.35348	1.5	2.9439	1.7027	TNTC
MSS3	9.6	700	4.6046	5.69756	4.5	1.5984	0.9245	3
DSS1	8.5	1640	8.02928	5.58624	4.0	1.8906	1.0935	233
DSS2	8.1	80	4.46292	5.3636	4.8	2.3827	1.3731	52
WHO	6-9	1000	0-5	150	NS	NS	NS	NS

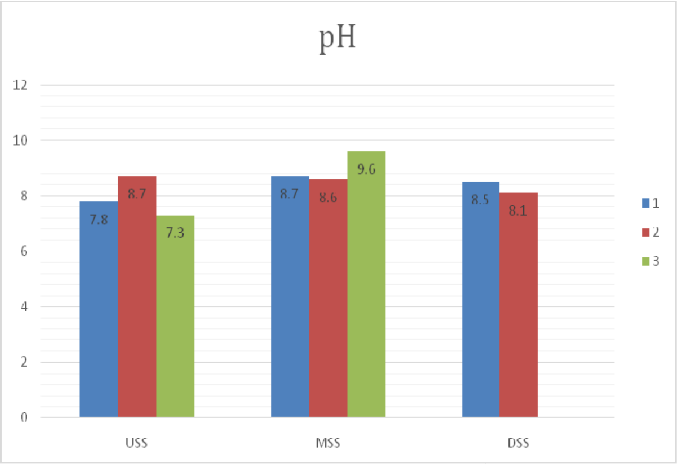

Figure 1 showing the pH values collected from the study area

DSS=Upstream water,

MSS=Mid-stream water

DSS=Downstream water

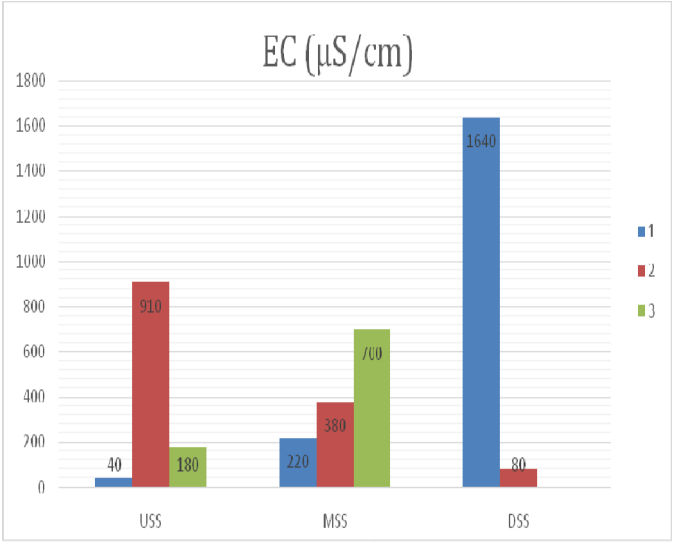

Figure 2 showing the Electronic Conductivity values collected from the study area

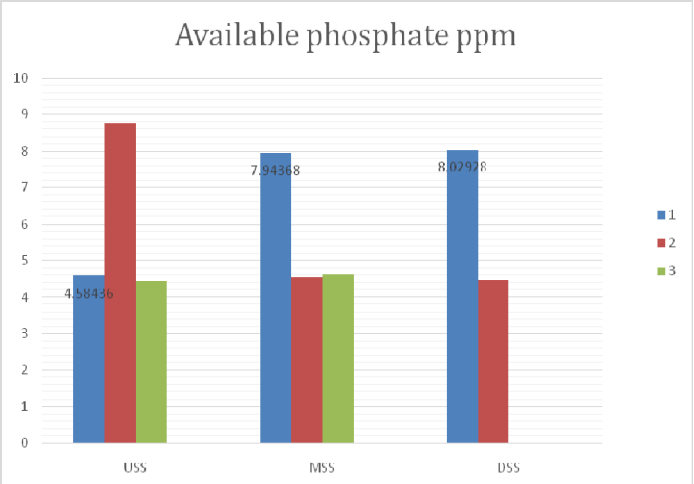

Figure 3 showing the Available phosphate values collected from the study area

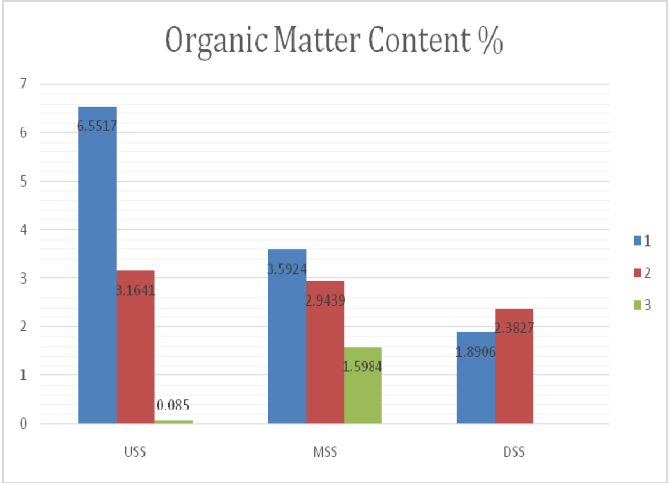

Figure 6 showing the Organic matter content values collected from the study area

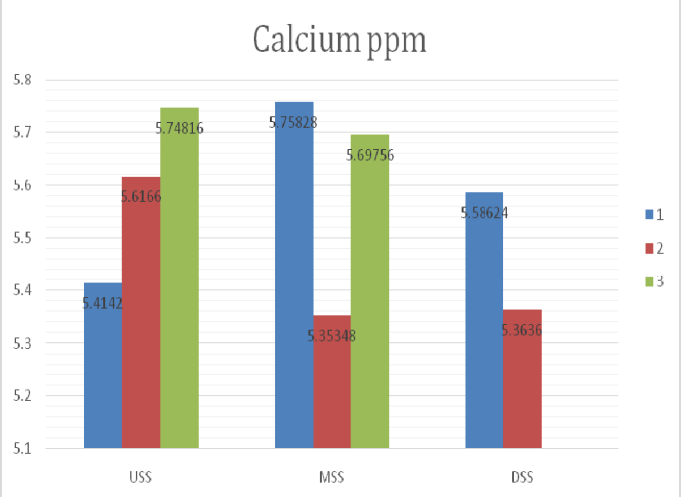

Figure 4 showing the Calcium values collected from the study area

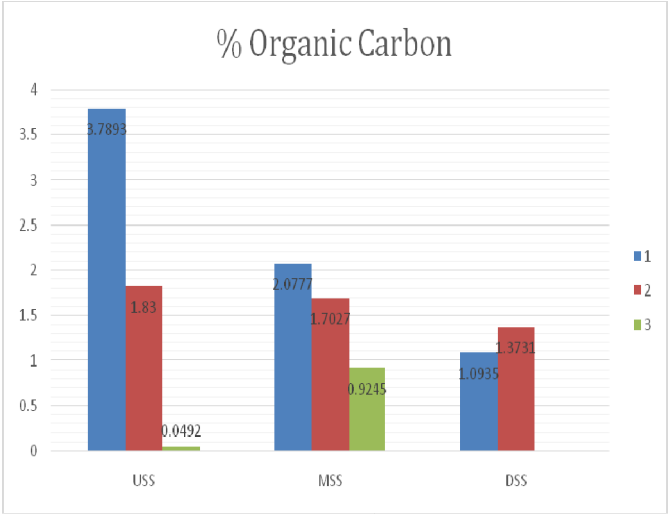

Figure 7 showing the Organic carbon values collected from the study area

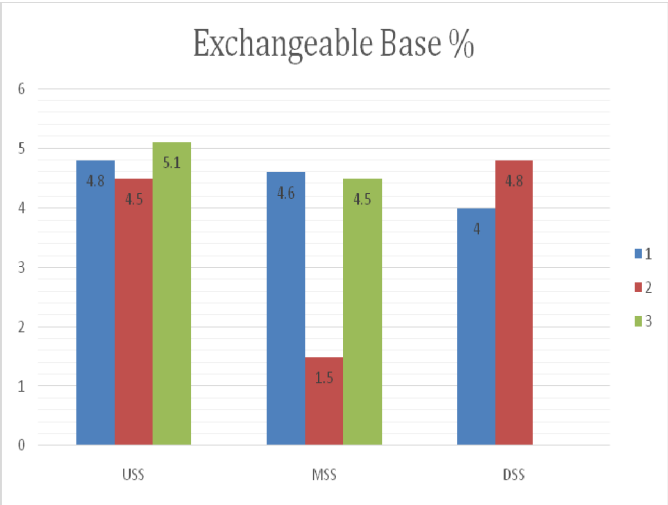

Figure 5 showing the Exchangeable base values collected from the study area

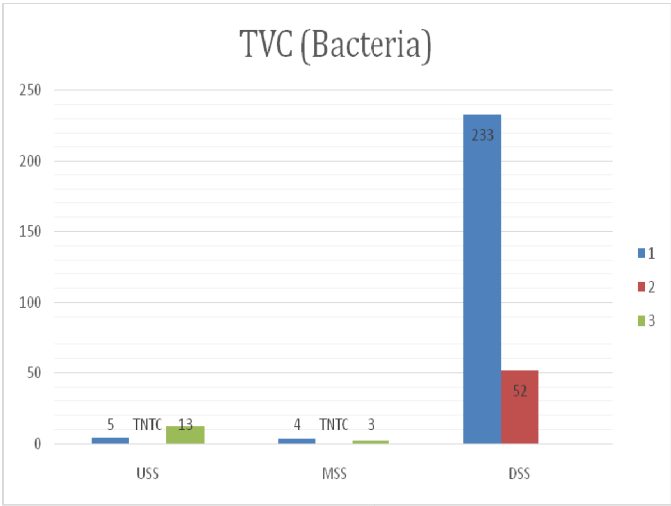

Figure 8 showing the Total viable count of Bacterial values collected from the study area.

Discussion

From the results of the samples above, table 2 and Figure 1, shows that the pH values recorded for the soil samples ranged from 7.3 to 9.6. However, these values all fell within the WHO set limit of 6 to 9 which is said to be a normal soil except for MSS3 that is slightly above 9 which is said to an alkaline soil [16]this possibly could be as a result of cumulative deposition of animal bones and feed which are rich in calcium and carbonate-rich materials like soaps used in washing in the abattoir which are later absorbed by the soil. interestingly, there appears a significant increase in pH when compared to the pH value of soils within Niger Delta region as reported by [10, 30, 15,23] which are known to be quite acidic. These increase in pH could be attributed to the type of wastes deposited from the slaughter houses which results in reduced anaerobic in the soils [20]. According to [5], Soil pH (acidity and alkalinity) play the greatest influence on availability of nutrients to plants and the type of organism found in the soil.

Electrical conductivity is the ease to which a substance allows free flow of electricity through the ions in electrolytes of soil sample. The value of the electrical conductivity varied from 40.0 to 1640 μS/cm in the various samples where DSS1 has the highest value while DSS2 recorded the lowest (figure 2, table 2). All samples were within the permissible limit set by WHO except for samples DSS1 that is higher than the set limit. The observed high value of electrical conductivities of this soil sample is an indication of interference from anthropogenic factors. Conductivity value is higher than those observed in other studies in abattoir [21,18]. High conductivity values imply the presence of soluble salts in the soil [5].

From the Available phosphate result obtained from the analysis shown, MSS1 possess the highest value 8.73784 ppm while MSS2 recorded the lowest 4.44268ppm (figure 3, table 2), All samples were above WHO maximum permissible value of 0-5 ppm. Excess phosphorus in soil can become a point source of pollution, because the excess not utilized by plants is wash away by runoffs into ponds, lakes and rivers. Though phosphorus promotes plant growth in soils, yet its excess in water promotes algal growth, which if persistently continues can lead to algal bloom.

The values of Calcium gotten from the analysis range from 5.35348 to 5.75828 (figure 4, table 2), all figures are within the WHO set standard.

The figures gotten for exchangeable base varies from 1.5-5.1 with USS3 having the highest and MSS2 having the lowest figures.

The Total Viable Count (Bacterial) at MSS2 and USS2 were too numerous to count which shows they are numerous in the soil, which indicates the soil is rich, the activities of the bacterial will make nutrient available for the plants around. The Total Viable Count (Bacterial) ranges from 3-233 at other levels.

The organic carbon (OC) content varied from 0.0492% - 3.7893% from the sample analyzed. The organic matter (OM) content varied from 0.0850% -6.5517%. These three parameters are used to express the organic richness of the soil environment. The soil organic carbon is obtained by decomposition of the plants, animals and anthropogenic sources such as chemical contaminants, fertilizers or organic rich waste [31]. The amount of total organic matter in any soil determines the nutrient content and any changes will alter the quality and quantity of soil fertility. The stability of the TOM stabilizes soil pH (an important factor in nutrient availability to plants). One of the factors which determine the level of organic matter in soil is management practices (Campbell et al 1996, Kong et al 2009)

IV. CONCLUSION

The study reveals the determination of some selected physicochemical properties (pH, Electronic Conductivity, Available Phosphate, Calcium, Exchangeable Base, Organic Matter Content, organic Carbon, total Viable Count (bacterial)) in the soil. Some of the parameters in the soil are found be within the permissible range set by WHO.

Available phosphate is found to exceeds the set limit, which may result from the uncontrolled deposit of animal dungs in the soil. Excess phosphorus in soil can become a point source of pollution, because the excess not utilized by plants is wash away by runoffs into ponds, lakes and rivers. Though phosphorus promotes plant growth in soils, yet its excess in water promotes algal growth, which if persistently continues can lead to algal bloom.

The soil is also found to be rich in organic nutrients.

There is need for regular monitoring of these chemicals in the soil around the study area to prevent excessive build-up in the food chain. There is call for proper management of abattoir effluent discharge and stop the discharge of abattoir waste to the environmental in an unsafe manner. The remediation of the contamination of soil is necessary not only to preserve soil but also to safeguard ecosystem and will also provide information for background levels of metals of this studied area.

ACKNOWLEDGMENT

The authors acknowledged Mr. Tijani of Department of Chemical Engineering, University of Ilorin where the analysis was done and Mr. Opasola of Department of Environmental Health Science for helping out with the praticals.

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