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The Effect of The Presence of Agrochemical and Leachates in Ground Water on Public Health

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Abstract:

Purpose: This study assesses the effects of agrochemical and leachates present in and Ground water on public health in Niger state and its environs, to carry out this study four research were raised for the study with four research questions and four research hypotheses.

Methodology: The physicochemical parameters of ground water of four study in four different point area namely Minna, Suleja, Bida and Lapai. The ground water was collected from the wells located in these study Area during the months of February 2019 to November 2019. The depth of the bore wells ranged from 10-12m in all these stations. Chemical analysis of the water samples was carried out with a view to determine the chemical constituents of the water and the level of pollution in the project area. Thirteen (13) parameters were examined in sixteen water samples collected.

Findings: Physio-chemical parameters present in the various study area were considered to be insignificant hence the results also indicated that groundwater within the range of the study area had less concentration of agrochemical. Except electrical conductivity (EC), in W3 which was found to be lower than the1000 S/cm recommended by the WHO while W1, W2 and W4 were found to be higher than the world health organization standard.

Unique Contribution to Theory, Policy and Practice: This study however recommended that Good Agricultural Practice (GAP), proper timing and application of exact quantity of agrochemicals needed by crops and prevention of spillage during application should continue to be practice.

Key words: *Agrochemicals, Leachates, Ground Water, Public Health.*

I. Introduction

Groundwater quality may be defined as the state of being free from physical, chemical, and biological pollutants. Temperature, turbidity, color, taste, and odor make up the list of physical water quality parameters. Since most ground water is colorless, odorless, and without specific taste, we are typically most concerned with its chemical and biological qualities. Although spring water or ground water products are often referred to "pure" it quality is different from that of pure water Musa, (2013). Naturally, ground water contains mineral ions. These ions are slowly dissolved from oil particles, sediments, and rocks as the water travels along mineral surfaces in the pores or fractures of the unsaturated zone and the aquifer Nagida, (2015). These are referred to as dissolved solids. Some dissolved solids may have originated in precipitation water or river water that recharges the aquifer. Dissolved solids in any water may be divided into three groups: major constituents, minor constituents, and trace elements.

The total mass of dissolved constituents is referred to as the Total Dissolved Solids (TDS). In water, all the dissolved solids are either positively charged ions (cations) or negatively charged ions (anions). The total negative charged anions are always expected to be equals the total positively charged cations. A higher TDS means that there are more cations and anions in the water Mande, (2016). With more ions in the water, the water's electrical conductivity (EC) is also high. By measuring the water's electrical conductivity, we can indirectly determine its TDS concentration. At a high TDS concentration, water becomes saline Ayoda, (2011). Water with a TDS above 500 mg/l is not recommended for use as drinking water (EPA secondary drinking water guidelines).

Water with a TDS above 1,500 to 2,600 mg/l (EC greater than 2.25 to 4mmho/cm) is generally considered problematic for irrigation use on crops with low or medium salt tolerance. Except for natural organic matter originating from top soils, all of these naturally occurring dissolved solids are in organic constituents: minerals, nutrients, and trace elements, including trace metals. In most cases, trace elements occur in such low concentrations that they are not a threat to human health.

In fact many of the trace elements are considered essential for the human metabolism. High concentrations of trace metals can also be found in ground water near contaminated sources, however it would cause, posing serious health threats. Some trace constituents associated with industrial pollution, such as arsenic and chromium, may also occur in completely pristine ground water at concentrations that are high enough to make that water unsuitable for drinking. Microbial pollutants are also a natural constituent of ground water. Just as microbes are ubiquitous in the environment around us, they are very common in the subsurface, including ground water. Hydro geologists increasingly rely on these, for instance, for sub surface bioremediation of contaminated ground water.

Human activities can alter the natural composition of groundwater through the disposal or dissemination of chemicals and microbial matter at the land surface and into soils, or through injection of wastes directly into ground water. Groundwater pollution (or groundwater contamination) may be defined as the presence of pollutant or undesirable change in groundwater quality resulting from human activities as suggested by Musa, (2013).

Agrochemicals refers to the broad range of pesticides including insecticides, fertilizers, hormones, herbicides, fungicides, and other growth chemicals and concentrates of raw animal manure (cow dung and poultry droppings). Globally, agro-chemicals (agrichemicals) are used for improving soil fertility and crop productivity. These methods of farming have been used in agriculture especially cropping system.

II. The Study Area

Niger State is a state in Central Nigeria and the largest state in the country fig 2. The state capital is Minna, and other major cities are Bida, Kontagora, and Suleja. It was formed in 1976 when the then North-Western State was bifurcated into Niger State and Sokoto State Yaradua, (2004). The Nupe, Gbagyi, Kamuku, Kambari, Dukawa, Hausa and Koro form the majority of the numerous indigenous tribes of Niger State.

Niger State lies between latitudes 8°15’–11°15’N and longitudes 4°00–7°15’ E. Musa, (2013). It’s borderers in the North is Kaduna and Kebbi States and in the South by Kogi State. It shares boundary in the west with Kwara and Benin Republic and in the east with the Federal Capital Territory and Kaduna state. It is divided into twenty-five local governments with a landmass of about 80,000.00 square kilometers and a population of 3,920,000 (2006, census).

Figure 1: Map of Niger States showing the three Senatorial zone (Yaradua, 2004)

III. Methodology

The desk study involved collection of relevant topographic maps, review of literature and assembling of fielder. The topographic map was enhanced to the appropriate scale of 1:25,000 and was gridded to allow for fair capture of the entire area. This is subsequently followed by reconnaissance study, which involves introduction to the local Chief and moving around the village with a local farmer to located probable area for sample collection. This was done in the month of May, 2019

Sample and Sampling Method

Table 1: Site Specifications of Ground Water Samples

S/N	Sample Name	Sample Location	Habitat	Source
01	W1	Minna (m1m2m3m4)	Agricultural area	Well
02	W2	Suleja (s1s2s3s4)	Agricultural area	Well
03	W3	Lapai (l1l2l3l4)	Agricultural area	Well
04	W4	Bida (b1b2b3b4)	Agricultural area	Well

The physicochemical parameters of ground water of four study area namely Minna, suleja, Bida and Lapai. The ground water was collected from the wells at four different point each located in these study Area during the months of February 2019 to November 2019. The depth of the bore wells ranged from 10-12m in all these stations. The sampling locations source and corresponding habitats as well as the source of water are shown in table 4.1.

IV. Results and Discussion

Table 1 shows the public health impairment associated with agrochemical use in the study area. Diarrhea was indicated by 2%, Cough 2%, Cold 4%, Chest pain recorded 2% while Skin Diseases 1%. In W1 study area. In addition, 2%, 1%, 2.5%, 5.5%, 1.5%, 4.5% of respondents in W2 locations indicated that they experienced Diarrhea, Cough, Cold, Chest pain, Skin Disease respectively. However, 3.5%, 1.5%, 1.5%, 2%, 0.5% 2% was recorded for Diarrhea, Cough, Cold, Chest pain, Skin Disease respectively in W3 study area.

Furthermore W3 recorded 0.0% for diarrhea, 1% for cough, 5% for cold, 5% for chest pain, 5% for skin disease. This is an indication that there is little connection between the use of agrochemical and health implication in the study area. This study corroborates the findings of Truong et al. (1999), Damalas et al. (2011) and Ye et al. (2016) who reported cough, skin diseases and chest pain as some of the impairments associated with the use of agrochemical. In the overall study large number of respondents has no related health problem in the study area.

This research examined the effect of the presence of Agro chemicals and leachates in ground water on public Health in order to compare the concentration of the examined variable with the WHO as well as Nigerian standard of quality (Nig std). Thirteen (13) parameters were examined in relation to sixteen water samples collected. electrical conductivity (EC), W3 was lower than the1000

□S/cm recommended by the WHO while W1, W2 and W4 were found to be higher than the world health organization standard. Concentration of heavy metals and chemical parameters were not more available in groundwater.

Results also indicated that groundwater within the range of the study area had less concentration of heavy metals.

Conclusion

After evaluating the various researches relating to the effect of the presence of Agro chemicals and leachates in ground water on public Health by various authors, the following conclusions were drawn:

i. Groundwater is a universally valuable renewable resource for human life and economic development. Growth and development on the earth surface has rendered surface water of certain areas of the world useless despite its availability in large quantity.
ii. The study observes limited migration of agrochemicals into leachate from the base of the irrigation site to be the point source of groundwater. This provide groundwater functions for various purposes (such as domestic, industrial and agriculture). Implication of the groundwater pollution which was found to be insignificant can not be attributed to different public health related problems.
iii. Analysis of water samples collected from various locations revealed that many of the parameters use as measurement comply with WHO standards and Nigerian Standard. Groundwater in some of the study area may not requires precautionary measures before drinking. Concentrations of many variables were not detected in large quantity.
iv. Concentration of the examined parameters was analyzed, discussed and explained with relevant statistical tools. Electrical Conductivity (EC) has the highest degree of concentration, that is, concentration of EC in water directly influenced some parameters. Of more important is their reduction in relation to time.
v. However, not all public health related impairment could be related to contamination of ground water in the study area owing to the fat that the degree of the contamination by agrochemicals and leaches cannot be link to this ailment.

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