

# Purification of polluted water from Jibia dam Nigeria using powdered Moringa oleifera seeds

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**Abstract**-Water has been an essential basic need for humanity since millennia; this ranges from drinking, washing, bathing, and also for tourism and industrial purposes. In developing countries like Nigeria, purification of water is one of the most expensive process in obtaining purified or treated water for drinking. The use of excessed fertilizer, quarrying activities, construction activities, and insecticides contributes heavily in making the water to become unfit for human use. Many studies have been carried out to assess the workability of Moringa oleifera seed in purifying polluted water, search on the internet indicates no similar research has been carried out using Moringa oleifera seed in purifying polluted water from Jibia dam Nigeria, hence the need to conduct the research on assessing the effectiveness of Moringa oleifera seed in purifying polluted water from Jibia dam Nigeria. Samples were obtained in the dam in four different directions. The samples (A,B,C,D and E) of polluted water were subjected to jar tests, PH -tests, and turbidity tests and the results obtained were within the limit set by World Health Organization. The PH for safe drinking water should be from 6.0 to 8.0 and the turbidity level should not be more than 5NTU. The average value for turbidity level of the unpurified water samples was found to be 284.97NTU and that of pH was found to be 9.212. The average value for Turbidity in the purified samples were found to be 0.268NTU, and that of PH was found to be 7.10.

**Keywords:** Water, purification, moringa oleifera, seeds

## 1. INTRODUCTION

Water is used for a variety of purpose like drinking, washing, and other domestic and industrial application [2]. Countries that are less developed like Nigeria, water purification plants are highly expensive to run and the ability to pay for services is minimal and skills as well as technology are scarce [4].

Water is a chemical compound with chemical symbol of H<sub>2</sub>O ( containing Hydrogen and Oxygen only), and it is a liquid at room temperature, boils at 100°C, freezes at 0°C and regarded as a universal solvent [2].

In many places, the chemical substances used in purifying polluted water are very expensive and have to be imported in hard currency, and many of these chemicals are associated with human health and environmental problems [3].

Jibia dam is situated along southern ward and joined with different tributaries of water ways. It is a multipurpose dam designed and constructed for irrigation, human consumption and for livestock as well as fisheries production, and it contains about 121.00million cubic meters of water and with about 20.00 million cubic meters of evaporation losses.

The immediate causes of water in the dam to become turbid or polluted has been due to the large presence of clay soil, and weathered rocks along the tributaries that connect the dam.

Moringa oleifera is grown and consumed widely throughout the tropics. It is also found in many states in northern Nigeria and it is locally known as Zogale [2]. The evergreen or deciduous foliage (depending on climate) has the length of 1 to 2 in diameter of the flowers. The seed of Moringa oleifera contains significant quantities of low molecular weight ( water soluble proteins) which carries positive charge like magnet and attracting the predominantly negative charge particles ( such as clay silt, bacteria and other toxic particles) [7].

Among the most used treatment process in purifying water in the industry in the past is coagulation-flocculation that is followed by sedimentation, filtration, and disinfection which is usually done using chlorine [3].

Water is typically referred to as polluted when it is impaired by anthropogenic contaminants and either does not support a human use such as drinking water, or undergoes a marked shift in its ability to support its constituent biotic communities, such as fish. Natural phenomena such as volcanoes, algae blooms, storms, and earthquake also cause major changes in water quality and the ecological status of water [4].

The capability of aluminum sulphate to reduce turbidity of the water sample can be explained as such, when it is added to water, aluminum salts are hydrolyzed producing cationic species responsible for absorbing negatively charged particles of the colloidal and also for neutralizing their charge [8].

The responsible mechanism of *Moringa oleifera* for the ability to reduce turbidity is due to the seed protein containing positive charges that attracts negatively charged particles in the water [6][7].

Pure water, also known as purified water, is a water from a source that has removed all impurities. Distilled water is the most common form of pure water. Many hazardous chemicals have been employed in treatment plants, but phytochemicals (chemicals compound from plants) found in *Moringa oleifera* seed could be used in purifying polluted water and are chiefly available with little or no health effects and also have similar effects (containing proteins molecules which have ability to coagulate the turbid water by destabilizing colloidal properties of the turbid water) with that of conventional coagulants, apart from the aforementioned property, it also has antimicrobial activities [6].

About one billion peoples in the world lack safe drinking water and more than six millions die from diarrhea every year. Many of the conventional chemicals used in purifying polluted water are heavily associated with human health and environmental problems [3]. It is therefore pertinent to assess the effectiveness of *Moringa oleifera* seed in purifying polluted water.

## **2. MATERIAL AND METHODS**

### **2.1 SAMPLE COLLECTION**

The raw or polluted water was collected from Makiyawa water treatment plant Jibia dam Nigeria, the water samples were stored and capped in different gallons. While the *Moringa oleifera* seeds were procured from Jibia market Nigeria. The standard water (Distilled water) was also obtained from Makiyawa water treatment plant Jibia dam Nigeria.

### **2.2 PREPARATION OF THE SAMPLES**

Ten (10) seed kernels of the *Moringa oleifera* were crushed and sieved to obtain the fine powder of *Moringa oleifera* seed. The raw or polluted water samples were obtained from four different directions of the Jibia dam Nigeria.

### **2.3 PH TEST FOR RAW/POLLUTED WATER**

Small amount of the polluted water sample was taken into the beaker and PH Value was taken using PH meter

### **2.4 TURBIDITY TEST FOR RAW/POLLUTED WATER**

Small quantity of the polluted water sample was taken into the turbidity meter and the turbidity level was recorded.

### 2.5 JAR TEST FOR RAW/POLLUTED WATER

This test was done in order to determine the correct amount of the Moringa oleifera seed powder needed to purify 200ml of raw/polluted water sample. 1.0g, 2.0g, 3.0g, 4.0g, and 5.0g of Moringa oleifera seed powder were taken and placed into five different 200ml beakers respectively ( containing the polluted water samples).

PH test and turbidity test were all carried out in each of the beakers ( that are containing the samples) and the most neutral ones

were observed and recorded by comparing with standard ( Distilled or pure water sample).

### 3. RESULT AND DISCUSSION

From table 1.0,1.1, and 1.2, it can be observed that, sample B with PH value of 7.12 was the most neutral of all the samples A,C,D, and E. Also from the turbidity level, the sample B contains the lowest turbidity level of 0.24NTU. Indicating the high level of clarity of the purified sample. Similarly, in the jar test it can be observed that 2.0g of the Moringa oleifera seed powder (in 200ml of the polluted water) was found to be the most corrected amount in purifying the sample of the polluted water with turbidity level of 284.9NTU in 200ml beaker. The WHO ( world Health Organization) specification (2017) for safe drinking water is as follows:

- I. For turbidity level of drinking water is 5NTU
- II. For P<sup>H</sup> value of drinking water should be between 6.0 to 8.0 .

Going by the aforementioned WHO standards on safe drinking water, it could be inferred that , the values obtained for the sample A,B,C,D and E were within the WHO recommendations on safe drinking water[8]

TABLE 1.0 presents the P<sup>H</sup> value for the samples before and after purification process

Sample	PH-values before purification process	PH-values after purification
A	9.46	6.73
B	9.45	7.12
C	9.30	7.23
D	9.13	7.13
E	8.72	7.25

TABLE 1.1 presents turbidity level of the samples before and after purification process

Sample	Turbidity level before purification	Turbidity level after purification
A	285NTU	0.28NTU
B	284.94NTU	0.24NTU
C	284.97NTU	0.26NTU
D	284.96NTU	0.27NTU
E	284.98NTU	0.29NTU

NTU: NEPHELOMETRIC TURBIDITY UNIT

TABLE 1.2 PRESENTS THE MASS(ES) OF MORINGA OLEIFERA SEED POWDER, THEIR PH VALUE AND TURBIDITY.

SAMPLE	MASS OF MORINGA OLEIFERA SEED POWDER (GRAM)	TURBIDITY LEVEL (NTU)	PH-VALUE
A	1.0	0.28	6.73
B	2.0	0.24	7.12
C	3.0	0.26	7.23
D	4.0	0.27	7.13
E	5.0	0.29	7.25

#### 4. CONCLUSION

Water is used for a different purposes like washing, drinking, bathing and other numerous industrial applications. The seeds of Moringa oleifera contains significant qualities such as presence of low molecular weight (water soluble proteins), and presence of positive charge. These proteins-positive charge attracts predominantly negative charged particles ( such as clay silt, bacteria and other toxic particles in the polluted water). This ability of Moringa oleifera seed to attract aforementioned charged particles helps in killing germs. This study therefore shows that Moringa oleifera seed powder can be used in purification any type of polluted water on earth. This research corroborate with earlier similar research results conducted by different researchers in ascertaining the effectiveness of Moringa oleifera seed in purifying polluted water.

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