

PDF - COMPARATIVE ANALYSIS OF SODIUM HYDROXIDE, CHLORINE AND DILUTION EFFECTS ON CASSAVA WASTEWATER CYANIDE REMOVAL - researchcub.info **ABSTRACT**

This project, compared three different oxidizing agents in the reduction of cyanide content of cassava wastewater in order to facilitate cassava wastewater degradation. Analysis of Variance was used to verify if there is a significant difference on their rates of reaction with cyanide. A second test using the Scheffé law was carried out to further investigate which of them reacts faster with cyanide if at all there is a significant difference on rates of reaction of Sodium Hydroxide, Chlorine and Water with cyanide. Some parameters like BOD<sub>5</sub>, Cyanide, COD and Coliform were analyzed also to support the investigation. From the results of the analysis, it can be concluded that Sodium Hydroxide (NaOH) is a better oxidizing agent for cassava wastewater pre – treatment since it results in greater removal of BOD<sub>5</sub>.

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## CHAPTER ONE

### 1.0 INTRODUCTION

#### 1.1 Background Of The Study

Wastewater is categorized according to the source of discharge like domestic wastewater,

industrial wastewater, sanitary wastewater etc. The effluent from industries is known as industrial wastewater and is noticed in all industries, leather industries, textile industries, paper industries, chemical industries, steel industries (Chanlett, 1979). In 1961 approximately 69 percent of all industries discharged their wastes into municipal sewers and most of these did not provide any treatment at all (Chanlett, 1979). Some standard methods for sampling, analyzing, reporting and testing industrial wastewater have been developed over the years by international bodies like the American Society for Testing Materials (ASTM) committee. There are seven basic categories of industrial wastewater use, namely steam generation, heat transfer, solvent action, raw materials, nuclear energy and kinetic energy. Wastewater treatment has posed a very pressing problem in both rural and urban cities especially in our country Nigeria.

Owing to change in technology, population and mode of living, the effects of various physical, chemical and biological factors on the treatment of the wastewater has been deemed necessary to review. It is equally pertinent to explore the effect of cyanide on the degradation of cassava wastewater. Since cassava, together with its various associated products, is the most widely used staple food in many parts of the country, much waste is generated during cassava processing. The environmental effect of the cassava wastewater therefore should be taken into account because a greater part of the wastewater generated during the process will turn into domestic waste while others will percolate into the soil. Cassava wastewater is an inevitable substance released during cassava starch processing. They are either a by-product of initial production process, or they arise when the cassava tubers are indiscriminately discharged to a nearby water body. Of course, a large percentage of African dwellers use cassava tubers as food when processed in different forms depending on the species. During cassava starch production, large amounts of cyano-glycosides are released and hydrolyzed by plant borne enzymes, leading to Cyanide concentration in the wastewater as high as 200mg/l. If this cassava wastewater is not properly treated to eliminate the cyanide and is discharged indiscriminately, an acute health condition can result due to the toxicity of the cyanide. Thus, the treatment of the cassava wastewater has to be efficiently done before discharging it to a nearby stream or river since most communities in Africa (Nigeria in particular) produce large quantities of cassava wastewater as a result of the use of the cassava for food.

Cyanide is a substance that is formed in combination with other chemicals in the environment. It refers to the  $CN^-$  anion radical. Compound that release cyanide can be inorganic or organic in nature, but the one present in cassava wastewater is free and organic in nature. Of these compounds, the one people are most likely to come into contact with are: Hydrogen cyanide, Sodium cyanide and Potassium cyanide. Hydrogen cyanide is a colourless gas or liquid with a faint bitter almond odour. Sodium cyanide and Potassium cyanide are both colourless solids that have a slight odour of bitter almonds in damp air.

Cyanide can be man – made or free naturally occurring substance. They are found in a number of foods which includes: cassava, sweet potatoes, yams, maize, millet, bamboo, sugarcane, peas and beans as well as kernel of almond, lemon, lime, apple, pear, cherry, apricot, and plum. Examples of cyanides levels measured in selected foods include: 0.001 to 0.45 µg/g for soy protein products, 1 mg/l for cassava and 0.1 to 3 mg/l for lima beans. The presence of cyanide in food of plant origin has been attributed to natural production within the plants and uptake from the surrounding.

Free cyanide is found in cassava wastewater. During degradation of cassava wastewater, the presence of this free Cyanide inhibits the activities of micro – organisms that degrade cassava wastewater. Degradation of cassava wastewater simply means the breaking down of cassava wastewater into simpler molecule by micro – organisms such as pseudomonas. It can be aerobic or anaerobic. Pseudomonas breaks cyanide into carbon dioxide and ammonia, cyanide can also be broken down by oxidation into cyanate and nitrogen by ozone.

### **1.1.1 Effects Of Cassava Toxic Chemicals On Nigerians**

Although it was concluded that despite the pathological conditions in Nigerian, cases of Tropical Ataxic Neuropathy (TAN) are similar to those observed elsewhere, it is not justifiable to assume that those represent clinical variants of the same disease. Since, when a diet is poor, multiple nutritional deficiencies usually occur together although one single factor may exercise overriding influence in association with others that combine to produce the final picture. TAN was observed to be prevalent in areas of intense cultivation of cassava, high frequency of cassava consumption, and high thiocyanate levels. The disease was rare among 1 – 10 years old, and although it tended to run in some families, there was no evidence to indicate it was genetically inherited. In one village, the average incidence was 3%, but was 8% among those 50 – 60 years old. Goiter was observed to be 2% – 5% higher among patient with TAN. It has been observed that certain local cassava preparations such as purupuru may contain 50 mg of cyanide per 3 kg of product compared to a lethal dose of 60 mg. There is no inverse relationship observed between iodine content of drinking water and incidence of goiter in areas where TAN occurs. A survey revealed a high correlation between intake of dry, smoked, unfermented cassava and goiter incidence. Kwashiorkor among children is another condition that may result from cassava dependency due to imbalance.

## **1.2 STATEMENT OF THE PROBLEM**

As the activities of man undoubtedly results in the accumulation of wastes, our concern therefore is to drastically reduce, treat and if possible eliminate completely the danger imposed by the discharge of these wastes. Pollution caused by cassava wastewater is a threat to life and needs urgent attention, if not properly treated before disposal. Cyanide in cassava wastewater has ability to cause significant social disruption and demands special

attention to public health preservation. Exposure to high concentrations of cyanide can cause death within seconds to minutes. Hence this research on how to reduce or if possible eliminate completely, the danger imposed by the discharge of this wastewater.

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