Name: Ezeata Raphael Anayochukwu

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Topic

Green synthesis of copper oxide nanoparticles (CuO NP) using gongronema latifolium(Utazi Leave) extract for effective photocatalytic degradation of dye.

# Chapter one

## 1.1 BACKGROUND STUDY

## 1.2 AIM AND OBJECTIVES

## 1.3 JUSTIFICATION AND SIGNIFICANCE

# CHAPTER TWO

## LITERATURE REVIEW

*Gongronema latifolium* Benth belongs to the family Asclepiadaceae. It is an edible nutritional/ medicinal plant mostly found in the rain forest zones in Nigeria and other tropical African countries (Chattopadhyah, 1999; Hutchinson & Dalziel, 1931). The plant produces white latex and yellow flowers (Hutchinson & Dalziel, 1931) and can be propagated by seed or stem cuttings (Edim et al., 2012). *G. latifolium* is known by the Ikales of Ondo State of Nigeria as Iteji (Morebise et al., 2006; Morebise & Fafunso, 1998). The Igbos call the plant Utazi, the Efik/ Ibibio call it Utasi while the Yorubas call it Arokeke (Edim et al., 2012). To the Akan-Asantes of Ghana, G. latifolium is known as Kurutu Nsurogya; the Serers of Senegal call it Gasub while to the Kissis of Sierra Leone it is known as Ndodo-Polole (Edim et al., 2012).

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Figure 1 The Gongronema latifolium plant

## NUTRITIONAL USES OF GONGRONEMA LATIFOLIUM

The leaves of G. latifolium are used as vegetables in preparation of soups to which they add a bitter-sweet flavor (Iwu, 1988; Morebise & Fafunso, 1998). The leaves are also sometimes used to spice locally brewed beer (Edim et al., 2012). The soft stem is used as chewing stick in Sierra Leone (Mosango, 2015).

## ETHNOMEDICAL USES OF GONGRONEMA LATIFOLIUM

There have been reports of various uses of Gongronema latifolium in folklore medicine by different ethnic groups. (Morebise & Fafunso, 1998) reported that the leaves of this plant are used by the Ikales of Ondo State of Nigeria to treat malaria, nausea and anorexia. Edet et al also reported that the leaf extract of G. latifolium is commonly used by the Efik and Quas tribes of Cross River state of Nigeria to treat malaria, diabetes, hypertension and constipation (Edet et al., 2011).

Mosango reported that *G. latifolium* is used in some West African communities to treat cough, intestinal worms, dysentery, dyspepsia and malaria. He reported that in Sierra Leone, an infusion or decoction of the stems with lime juice is taken to treat colic and stomach aches, while in Senegal and Ghana, *G. latifolium* leaves are rubbed on joints of children to help them walk while the boiled fruits of this plant are eaten as a laxative (Mosango, 2015). Essien et al reported that G. latifolium is used to treat cough in Nigeria (Edet et al., 2011). Asthmatic patients can chew the fresh leaves of G. latifolium to relieve wheezing while a cold maceration of the roots of the plant can be consumed as treatment for asthma (Essien et al., 2007; Mosango, 2015). Mosango also reported the use of this plant in some communities to treat viral hepatitis, bilharzia and other microbial infections(Mosango, 2015).

Iwu and Oliver-Bever reported that the leaves of G. latifolium are used in some local communities as a vermifuge and stomachic (Iwu, 1988; Oliver-Bever, 1986). Owu et al reported that the leaves are also used to treat dyspepsia in some local communities (Owu et al., 2012). Essien et al. reported that the leaves of G. latifolium are used to treat fowl cough in Nigeria(Essien et al., 2007).

# Chapter three

## 3.1 Material and Reagent used

1. Extract from *Gongronema Latifolium*
2. Copper nitrate trihydrate (95% Cu(NO3)2.3H2O)
3. Sodium hydroxide (99% NaOH)
4. Ethanol (97%)
5. Distilled water

## 3.2 Apparatus and Equipment

1. Magnetic stirrer
2. Magnetic bar
3. pH meter
4. Thermometer
5. Electric blender
6. Oven
7. Furnace
8. Glass rods
9. Crucibles
10. Plastic bottles
11. Beakers
12. Concial flasks
13. Volumetric flasks
14. Spatula
15. Dropper
16. Paper tape
17. Whatman no 42 filter papers
18. Hand gloves
19. Nose masks

## 3.4 Preparation of the leaf extract

Fresh leaves of *Gongronema Latifolium* were collected from Nsukka community in Nigeria. 10g of the leaves were thoroughly washed with distilled water to remove any dust, after which it was cut into small pieces and added into 100ml of water in a beaker and heated at 800C on an electric heater for 2 hours. After being cooled at room temperature, it was filtered using whatmann filter paper to extract the filtrate. The extract was stored in a container in a refrigerator until use.

## 3.5 Green Synthesis of Copper oxide nanoparticles

CuO nanoparticles were synthesized by using 0.1M Cu(NO3)2.3H2O. 100ml of the copper nitrates was taken in a 250ml Erlenmeyer Flask and 25ml of the *Gongronema Latifolium* extract was added slowly to reduce copper ions to its copper oxide nanoparticles. Then, 10ml of 2M NaOH solution was added to adjust pH to 11 while stirring it constantly. The solution was stirred continuously at 800C for 2 hours. The blue coloured solution turned green immediately and after about 2 hiurs, a dark brown precipitate formed indicated that all the copper ions have been reduced and CuO nanoparticles have been formed. The obtained precipitate was centrifugated at 10,000 rpm for 10mins and washed several times using distilled water and ethanol for removal of impurities, and the sample was dried at 800c for 2hours.

Preparation of 100ml of Cu(NO3)2.3H2O

Mass = 2.42g of Cu(NO3)2.3H2O

Preparation of 10ml of NaOH

Mass = 0.8g NaOH

## 3.5 Characterization and Analysis