# Green Synthesis of Zno Nanoparticles Using Nephelium Lappaceum Extract and its Antiseptic Property

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## ABSTRACT

The goal of the present investigation we explore the environmental benign synthesis of antimicrobial targeted to prepare ZnO nanoparticles from Rambutan fruit extract to provide anti-oxidant, anti-anemic, anti-cancer and anti-septic activity by greener method. Zinc oxide nanoparticles (ZnO NPs) which has potential applications like anti-bacterial, anti-fungal, anti-diabetic, anti-inflammatory, wound healing, antioxidant and apoptotic properties. In this present study we synthesis the zinc oxide nanoparticles by using Rambutan fruit extract and prepared nanoparticle is characterized by using UV analysis. The bioactive analysis along with antibacterial properties of methanolic extract of Rambutan fruits were carried out by disc diffusion method against *Staphylococcus aureus* and *Escherichia coli.*

**Keywords:** zinc oxide nanoparticles, rambutan, antiseptic

## 1. INTRODUCTION

The development of green processes for the synthesis of nanoparticles is evolving a crucial branch of nanotechnology [1 and 2]. In this present investigation, ZnO NPs were synthesized via greener method using Nephelium lappaceum L extract and characterized by UV analysis. The UV–visible absorption was performed to research the binding interaction between ZnO NPs. This study was administered to point out the potential antianemic and antiseptic properties [3] of Nephelium lappaceum L aqueous and ethanolic extracts. The fruits Nephelium lappaceum L reduce the anemia and increase the hemoglobin level to produce Red blood corpuscle. The fruits contains rich source of nutrients and antioxidants. The Nephelium Lappaceum L vitamins, minerals also contain an honest amount of copper for proper growth maintenance of varied cells.

**Figure -1 Rambutan fruits.**

## 2. MATERIALS AND METHODS

### 2.1. Sample Preparation for *Nephelium lappaceum* L (Bhat *et al.*, 2016)

*Nephelium lappaceum* L are bought from supermarket located in Villupuram. The extraction of the fruit secondary metabolites are achieved by ultrasonication extraction at 40°C under 250hz for 30 min. Fresh *Nephelium lappaceum* L fruit was deseeded, cleaned and cut into 2.5 cm x 2.5 cm pieces with a thickness of 0.4 cm-0.6 cm. The 10g of fruit flush is kept in 100 ml ethanol and ultrsonicated for 1h.Similarly fruit is extracted with water. The concentrated ethanol extract filtered with Whatman filter paper [5 and 6].

**Figure - 2 Sample Preparation for *Nephelium lappaceum* L**

### 2.2. Phytochemical analysis of *Nephelium lappaceum*

### Qualitative Screening

Qualitative phytochemical analysis was performed by using appropriate procedures by (Harborne (1973), Trease and Evans (2002) and Sofowara (1993)) involving extraction. Isolation and identification of secondary metabolites [9]. Preliminary qualitative phytochemical analysis [10] was carried out to identify the secondary metabolites present in the various alcoholic and aqueous extracts of *Nephelium lappaceum*.

**2.3. Synthesis of ZnO nanoparticles** (Dobrucka and Dlugaszewska, *2015)*

For the synthesis zinc oxide nanoparticle 50mM of zinc sulphate was prepared in double distilled water. 50 mL of ZnSo4 solution was mixed with 5mL of extract separately for ethanol and water in another setup 50mL of ZnSo4 mixed with one ml of 0.2 N NaOH and then added with extract. The entire flask then placed in a water bath at 60° C for 15 min and then kept under shaking until the colour change. ZnSO4 alone used as control. Precipitate was centrifuged at 15,000 rpm for 30min and collected for further studies [4]. A light yellow coloured powder was obtained and this was carefully collected heated at 100°C for 1 h to remove impurities. (Senthilkumar and Sivakumar, 2014) [11][12].

## 3. CHARACTERIZATION OF ZINC REDUCTION

### UV-VIS spectrophotometer

The optical transmission/absorption spectra of ZnO dispersed in aqueous was recorded using a UV-VIS spectrophotometer in the wavelength range 200–800 nm (UV-750; jasco, Tokyo, Japan).

## 4. RESULTS AND DISCUSSION

Rambutan (*Nephelium opossum* L) is one of the most important tropical fruits (plate 1) was collected and the flush were used for ultrasonication with ethanol. Both hot water and ethanolic extract were subjected to qualitative phytochemical (plate 2) analysis and the data were given in table 1. The phytochemical data given in table 1 shows presence of flavonoids, alkaloids, steroids, terpenoid, saponins, reducing sugar and phenols were detected in both extract.

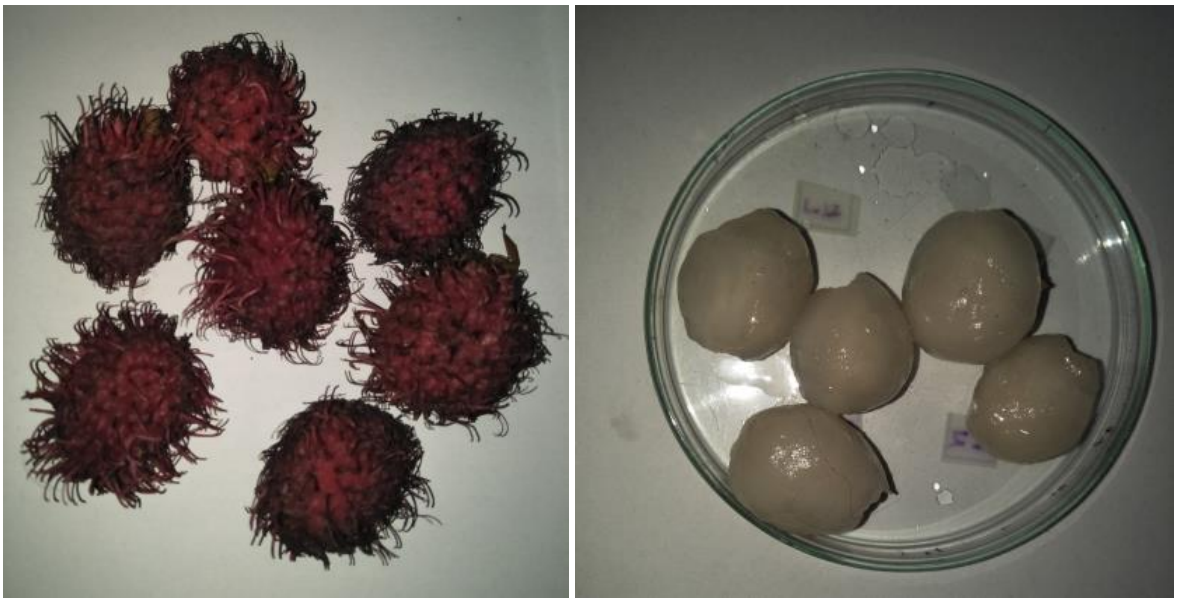

**Fig 3 - Collection and Processing of *N. Lappaceum* Fruit**


**Fig 4 - Ultra Sonication and extraction**

**Table 1: Qualitative Phytochemical analysis**

| Serial. No | Test | Ethanol Extract | Aqueous Extract |
|---|---|---|---|
| 1. | Flavonoids Test | Positive | Positive |
| 2. | Keller killian Glycosides | Negative | Negative |
| 3 | Anthraquinones | Negative | Negative |
| 4 | Reducing sugar fehlings | Positive | Positive |
| 5 | Steroids | Positive | Positive |
| 6 | Terpenoids Test | Positive | Positive |
| 7 | Tannins Test | Negative | Negative |
| 8. | Phenols Test | Positive | Positive |
| 9 | Saponins Test | Positive | Positive |
| 10 A | Mayer Test-alakaloid | Positive | positive |
| 10.B | Wagner Test –alkaloid | Positive | Negative |

**Synthesis of zinc oxide nanoparticles**

Reduction of 50mM zinc sulphate (ZnSO4) under *N. lappaceum* fruit extracted with ethanol. Ethanolic extract alone showed reduction and formation but the water extract failed to produce precipitation. Further addition of NaOH showed increases the reduction rate was noted by formation of more precipitation. Reduction of zinc was completed at 6 h and changes of white to yellow colour were observed. Further the precipitation formation enhanced by the addition of 1NNaOH indicates that NaOH mediated reduction $ZnSO_4$ as zinc

hydroxide further reduces as ZnO nanoparticle by fruit extract. Medium without NaOH shows less amount of precipitate formation of zinc nanoparticle confirmed by UV absorption shown in Figure 2.

UV spectrum reveals showed five different absorption peak (Table 3) and maximum UV spectrum was retained around 203. The absorption peak was recorded in each spectrum in range of 250 -300nm which is a characteristic band for the pure ZnO. It is reported that the intensity of absorption peak in UV–visible spectrum is related with particle size of nanoparticles. As the particle size decreases, absorption peak shifts towards lower wavelength that is blue shift. Absence of any other peak in the spectrum confirms that the synthesized products are ZnO only (Salahuddin *et al.,* 2015). SEM image clearly shows that the zinc oxide nanoparticles obtained by green method shows presence of polydisperse. Green reduction offers difference in morphology from spherical to rectangle shape with average particle size. The UV spectrum of the ZnO NPs displayed the surface plasmon resonance (SPR) peak at 260-280 nm which is a characteristic of these nanostructures reported by (Karthik *et al.,* 2017), A broad absorption peak was observed in each spectrum at 260-380 nm which is a characteristic band for the pure ZnO (Chieng and Loo, 2018).

**Table 2 : UV visible spectrum range of Zinc oxide nanoparticle**

| Name | No. | Peak (nm) | Peak (AU) |
|---|---|---|---|
| ZN-F-NaOH | 1 | 208.80 | 4.0000 |
| | 2 | 277.40 | 1.3251 |
| | 3 | 860.05 | 0.0942 |
| | 4 | 988.30 | 0.0698 |
| | 5 | 1,051.70 | 0.0569 |

**Antibacterial activity of ZnO Nanoparticle**

Antibacterial, activity of ZnO nanoparticle were given in plate 5a-e. Antibacterial activity was tested against *Staphylococcus aureus* and *E.coli* by disc diffusion method. The test pathogen was sensitive to ZnO nanoparticle and the size and zone of inhibition is 18 mm in diameter against *S.aureus* and 16 mm against *E.coli* at 20µg level (Plate). No activity was recorded at 5,10 µg and fruit extract alone.[8] Thitilert decha et al.(2010) demonstrated antibacterial activity of ZnO nanoparticles synthesized through green route using *Nephelium lappaceum*, which showed antibacterial activity against Gram positive bacteria. From the primary phytochemical screening, ethanol extract of *Nephelium lappaceum* has got biologically active compounds present in zinc oxide enhanced in the presence stronger antibacterial activity. The absence of this barrier in gram (+) bacteria allows the direct contact of phytochemical make easier to kill the pathogen. Yuvakkumar et al (2014) prepared ZnO nanocrystals with rambutan peel extract and coated on cotton fabric and cotton showed good antibacterial activity towards *Escherichia coli* [4 and 7].

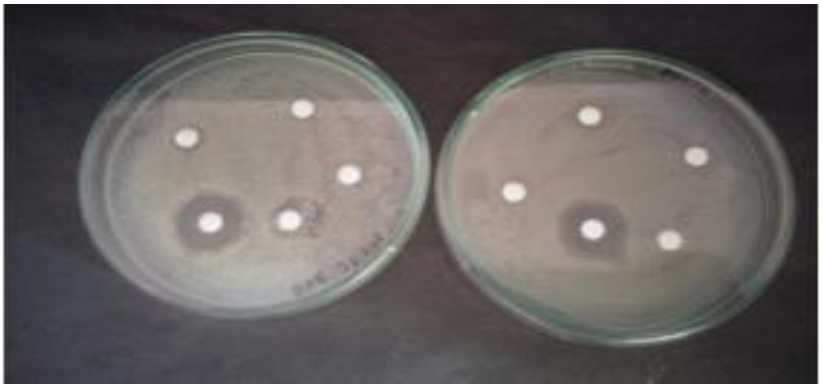

**Fig - 5 Antibacterial activity of ZnO nanoparticle (*S.aureus and E.coli*)**

## 5. SUMMARY AND CONCLUSION.

In the present investigation, a sustainable novel green synthetic strategy applied to synthesis zinc oxide nanomaterial by employing *Nephelium lappaceum* L., fruit extract as a natural reducing agent. Green synthesis of zinc oxide nanocrystals was carried out via natural fruit extract of rambutan. Extract of Rambutan fruit obtained by water and ethanol by ultrasonication. Water extracts less significantly reduced zinc sulphate and ethanolic extract acted as good reducing agent. Formation of zinc oxide nanocrystals was confirmed employing standard characterization studies followed by physical changes. The biosynthesized ZnO NPs were characterized by UV spectroscopy. Further it has had potent antibacterial, activity. ZnO nanocrystals showed good antibacterial activity towards *S.aureus* and *E.coli.* The present study concludes that the tested extracts have moderate to potent antioxidant activity, acting as reducing agent for ZnO synthesis. Subsequently the ZnO found to be potent antibacterial agent becomes very useful application in antiseptic.

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**Conflict of Interest** - Nil

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