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PII: S0167-577X(18)31603-3  
DOI: <https://doi.org/10.1016/j.matlet.2018.10.038>  
Reference: MLBLUE 25079

To appear in: *Materials Letters*

Received Date: 29 January 2018  
Revised Date: 18 July 2018  
Accepted Date: 6 October 2018

Please cite this article as: K. Raja, R. Sowmya, R. Sudhagar, n.S. Moorthy, K. Govindaraju, K.S Subramanian, Biogenic ZnO and Cu nanoparticles to improve seed germination quality in blackgram (*Vigna mungo*), *Materials Letters* (2018), doi: <https://doi.org/10.1016/j.matlet.2018.10.038>

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## Biogenic ZnO and Cu nanoparticles to improve seed germination quality in blackgram (*Vigna mungo*)

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### Abstract

Biogenic ZnO and Cu nanoparticles for accessing its impact in improving germination and seedling vigor in black gram (*Vigna mungo*) is reported herein. Invigoration studies have been conducted under *in vitro* conditions where seeds treated with different concentrations of ZnO and Cu nanoparticles among which ZnO nanoparticles at 600 mg/l, Cu nanoparticles at 400 mg/l in aqueous solutions for 3 h and dry dressed with ZnO nanoparticles at 1100 mg/kg and Cu nanoparticles at 900 mg/kg have significantly improve seed quality of black gram.

**Keywords:** Biomaterials; Nanoparticles; Black gram; Nanoprimering; Seed germination; Seedling vigor

### 1. Introduction

In agriculture, nanoscience has initiated nanoprimering of seed using nanoparticles to improve germination of low vigor seeds. Agriculture being a viable complex system has restricted the exponential growth of nanotechnology in the field of agriculture. Recently, functional nanoparticles are gradually gaining a global attraction of agricultural scientist due to their infusion in seed invigoration, plant growth and pest control. Infusion of nanotechnology in seed science apparently substantiated the germination and seedling vigor under optimal and sub optimal conditions. Carbon nanotubes have been used to improve germination of tomato seeds through permeation of moisture [1]. Application of nanoparticles in the plant growth and pest control is recently practiced with the mixture of nano-SiO<sub>2</sub> and nano-TiO<sub>2</sub> which increased the nitrate reductase in soybean increasing its germination and growth [2]. Use of nanoparticles in rice germination elucidates significant reduction in root growth, increase in hydrogen peroxide levels and MDA amounts [3]. In seed science nanoparticles/nanoproducts improve the germination and seedling vigour under optimal/sub optimal conditions. In this study, biogenic ZnO and Cu nanoparticles are used in enhancing seed germination and vigour of blackgram by wet and dry seed treatment method.

### 2. Materials and methods

#### 2.1. Materials

Genetically pure black gram (*Vigna mungo* (L) Hepper cv. VBN 6 used for the study has been procured from National Pulse Research Station, Pudukkottai. Fresh leaves of both coriander *Coriandrum sativum* (*C. sativum*) and *Nerium* (*N. oleander*) were collected from Tamil Nadu

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