



Synthesis and characterization of slow-release nitrogen fertilizer and its effect on the growth of *Vigna radiata* L.

Avimanu Sharma and Ritu Singh

Department of Environmental Science, School of Earth sciences, Central University of Rajasthan,
Bandarsindri, Ajmer 305801, Rajasthan (India)

Email: imabhimanyu146@gmail.com



Background problem and Introduction

Is Agrochemical Contamination Killing Nebraska's Children?
The harrowing trail of toxic nutrients in farm country water

This is the first of a two-part series. Read part two here.

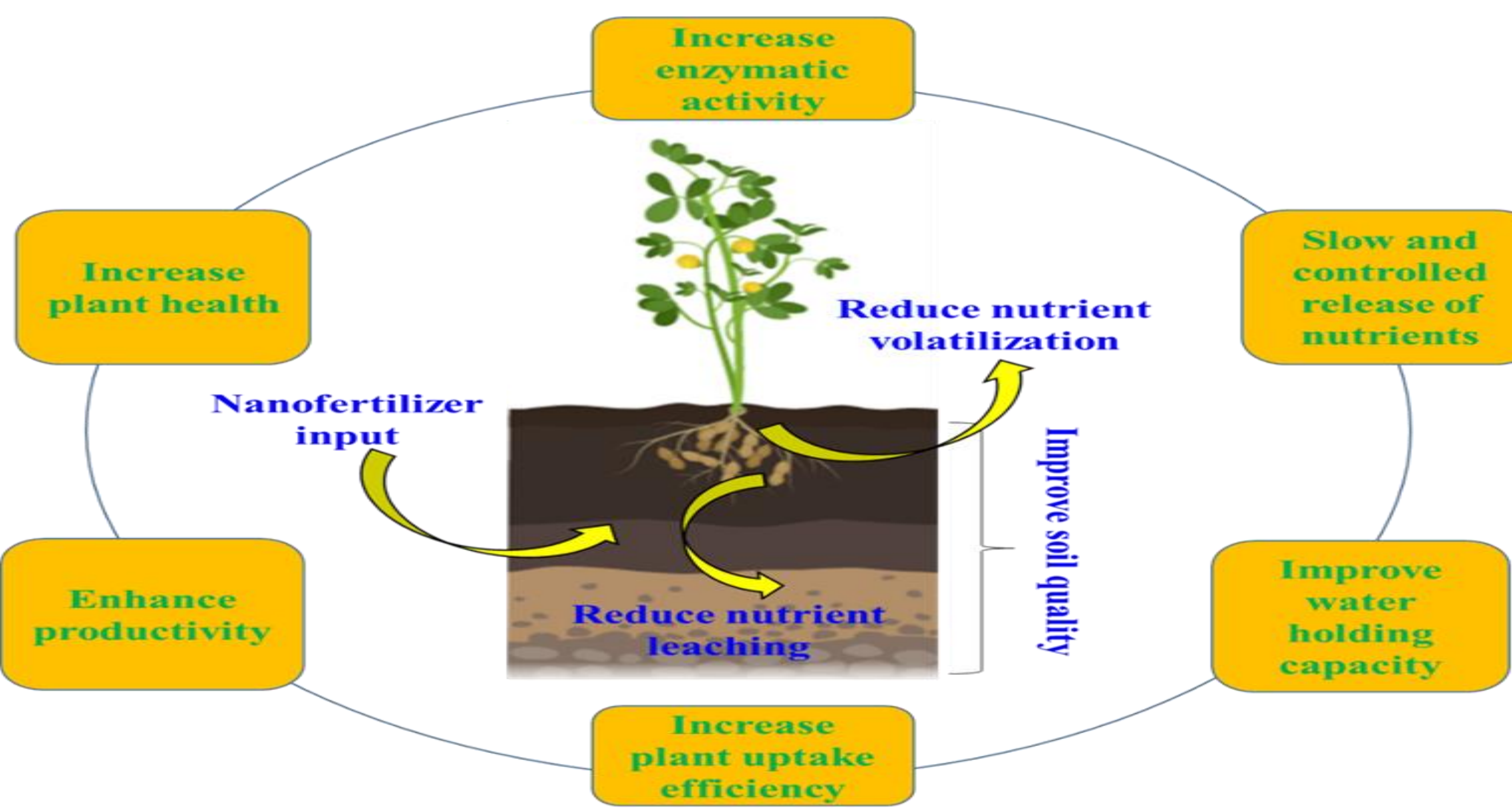
By Brett Walton, Circle of Blue – February 2, 2022

Photography and videography by J. Carl Ganter

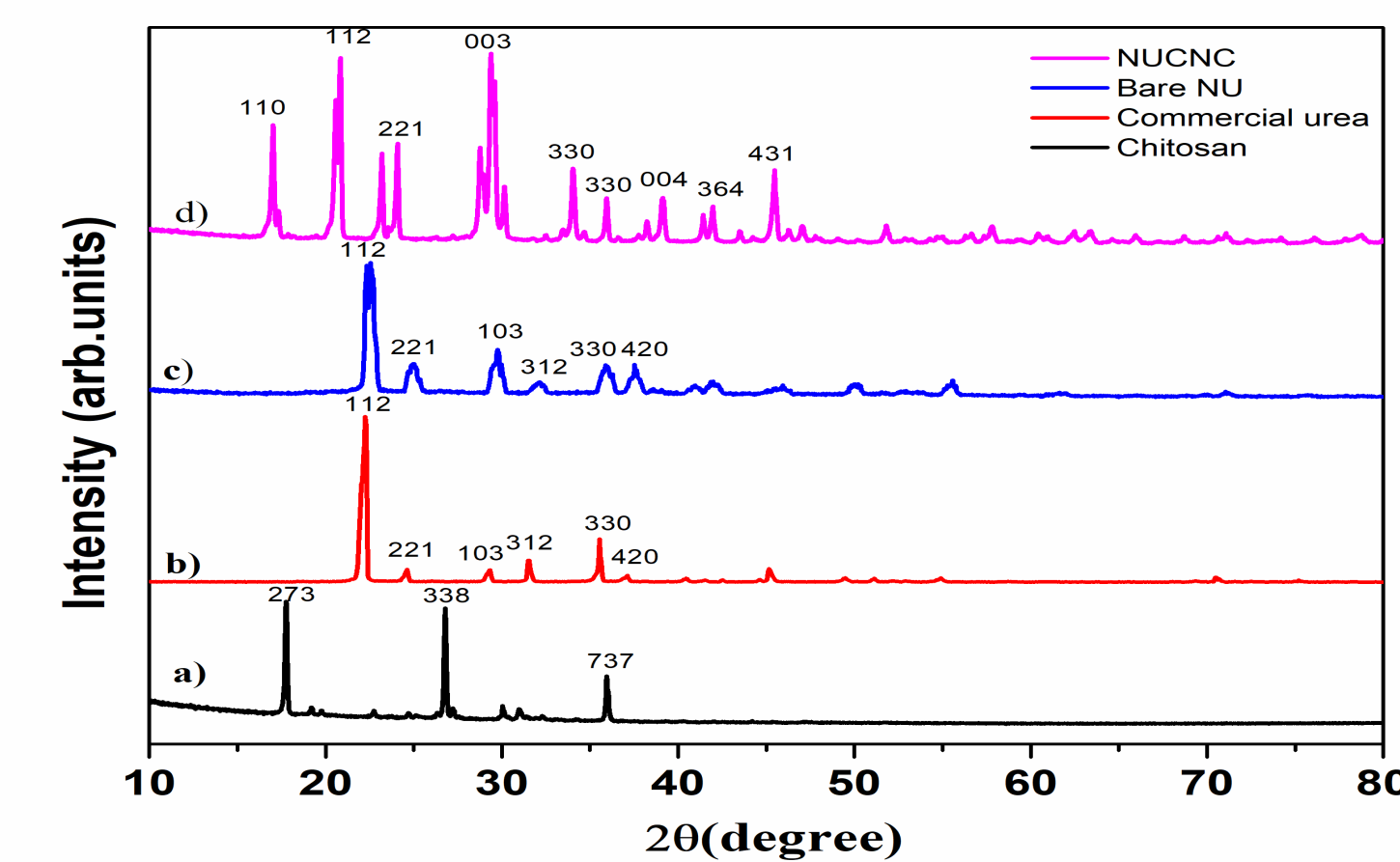
AURORA, Neb. — In the final, frantic hours Jacob Peters's body gave out. As nurses worked to stabilize his vitals, his blood pressure dropped. Fluid built up in his abdomen and brain. He vomited. His words were slurred.

A ventilator kept the 17-year-old alive long enough for his younger brothers, Jerod and Dalton, and other family members to make the two-hour drive to the Omaha hospital where his parents stood vigil. On November 16, 2011, at 6:12 p.m., Jacob died, nine months after he was diagnosed with a rare and aggressive form of lymphoma.

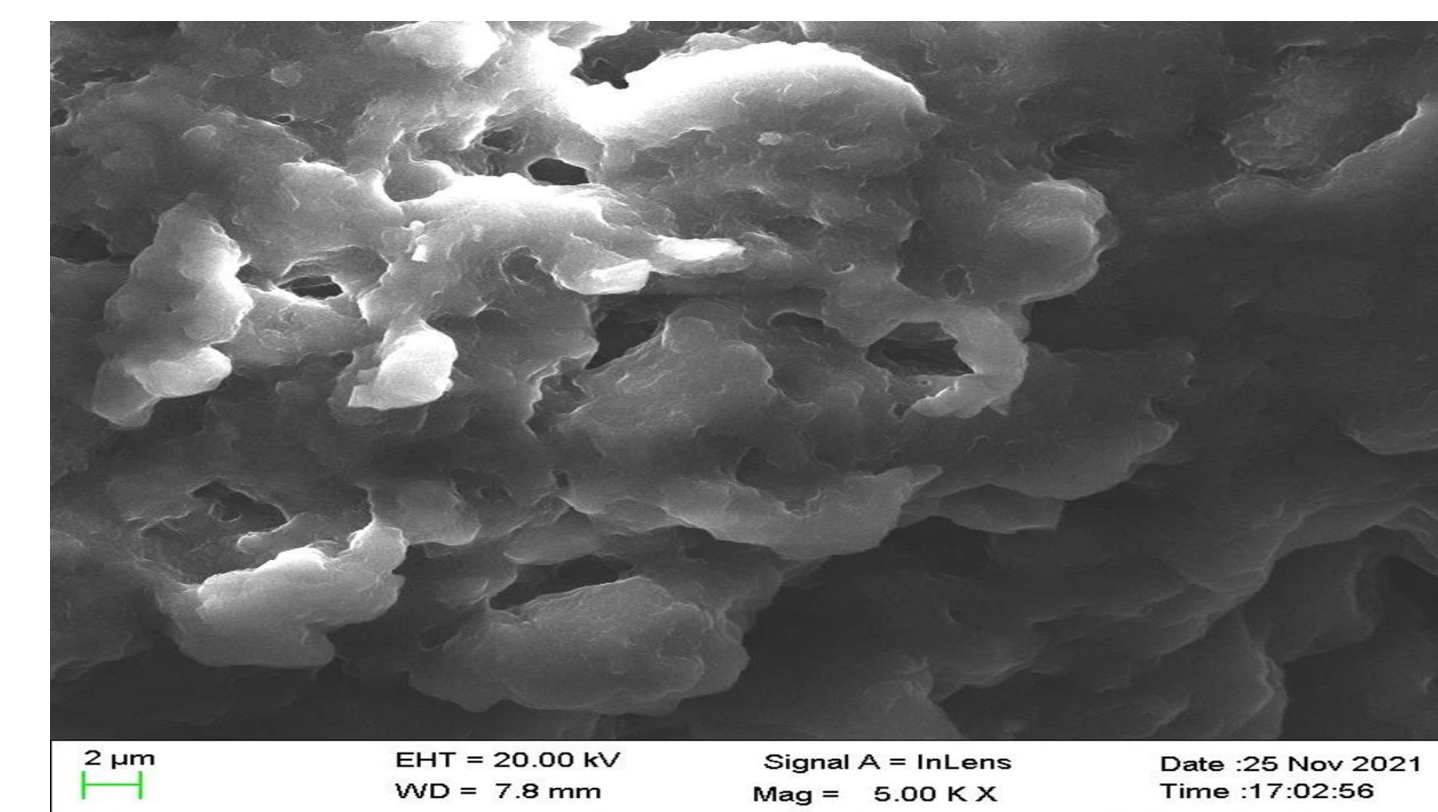
A decade later, Jacob Peters's death turns out to be much more than a dreadful heartbreak for a small town, farm country family. His parents, Gary and Shari Peters, documented six more kids in Aurora diagnosed with cancer from 2005 to 2013. Of the seven, including Jacob, Circle of Blue confirmed that five died and two survived.



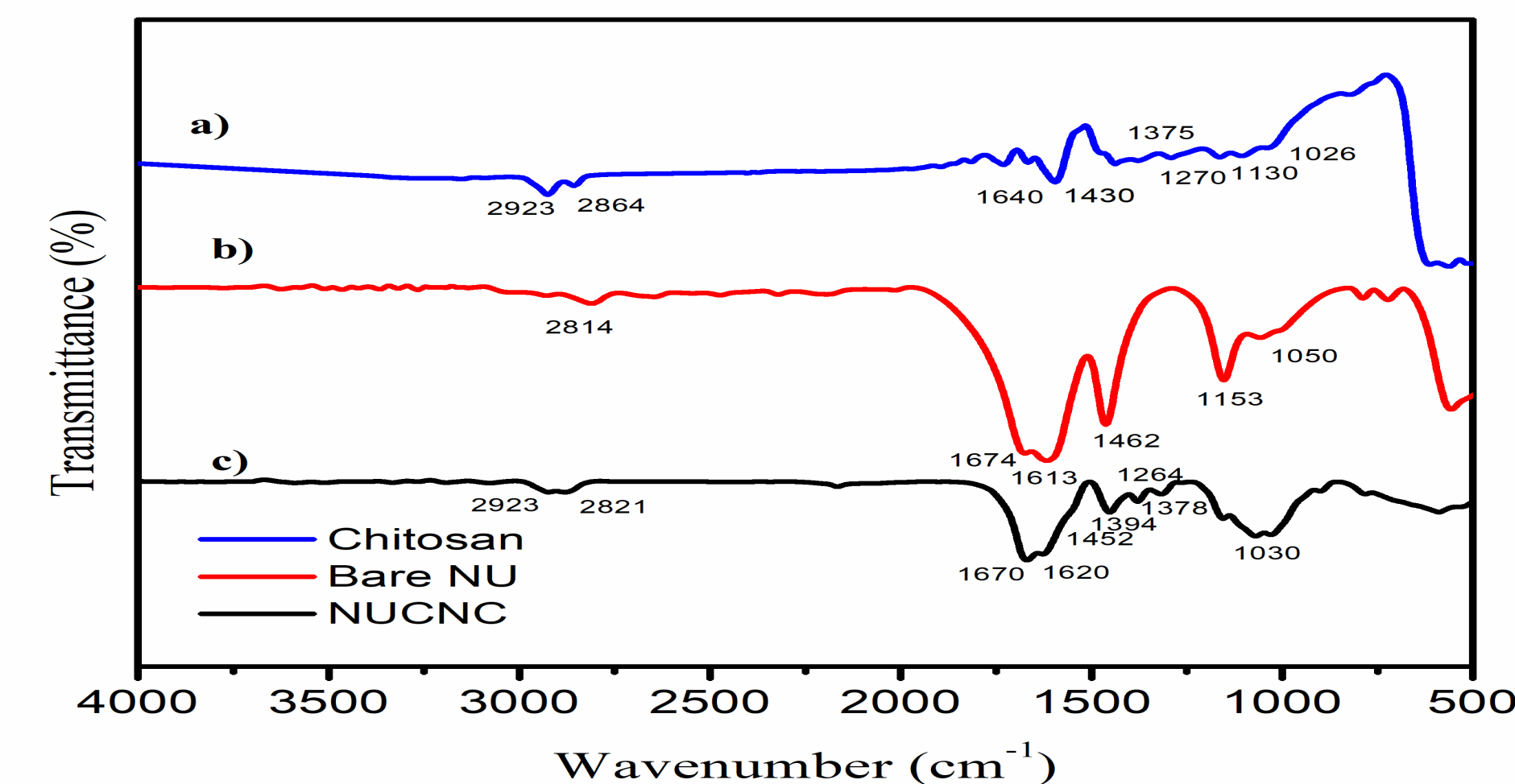
Characterization



XRD



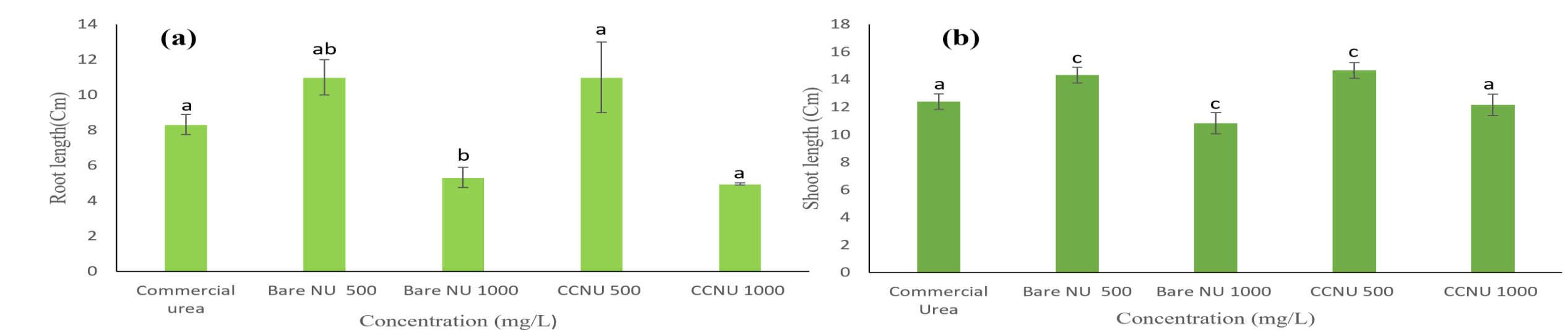
FESEM



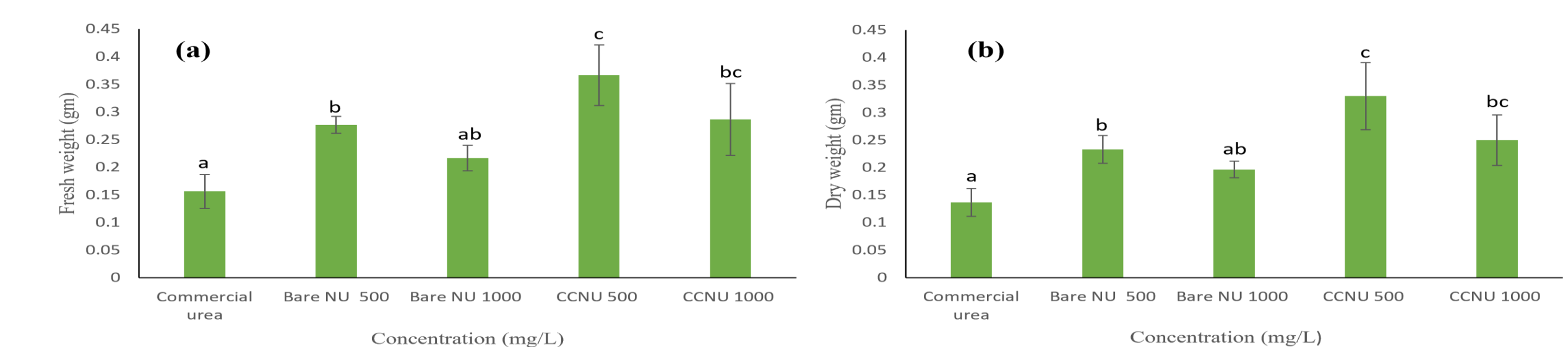
FTIR

- The sharp as well as intense peaks are the indication that the NUCNC particles are highly crystalline in nature, and this is a desirous trait for slow-release fertilizers
- The slight shifting of N-H bands in NUCNC suggests that there is significant interaction between the urea and the chitosan molecules most likely through carbonyl and amine groups.
- The surface coating of nano-urea is rough, disorganized and have very small pores into it. The chitosan deposits in several agglomeration forms serves as a physical barrier which could limit the rate of water diffusion as well as matrix dissolution along with urea release.

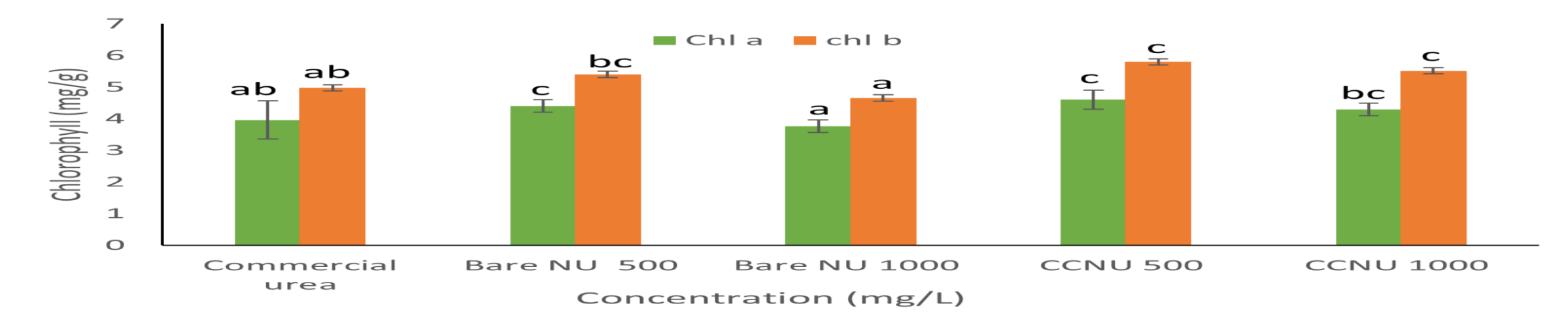
Results



Root-Shoot length

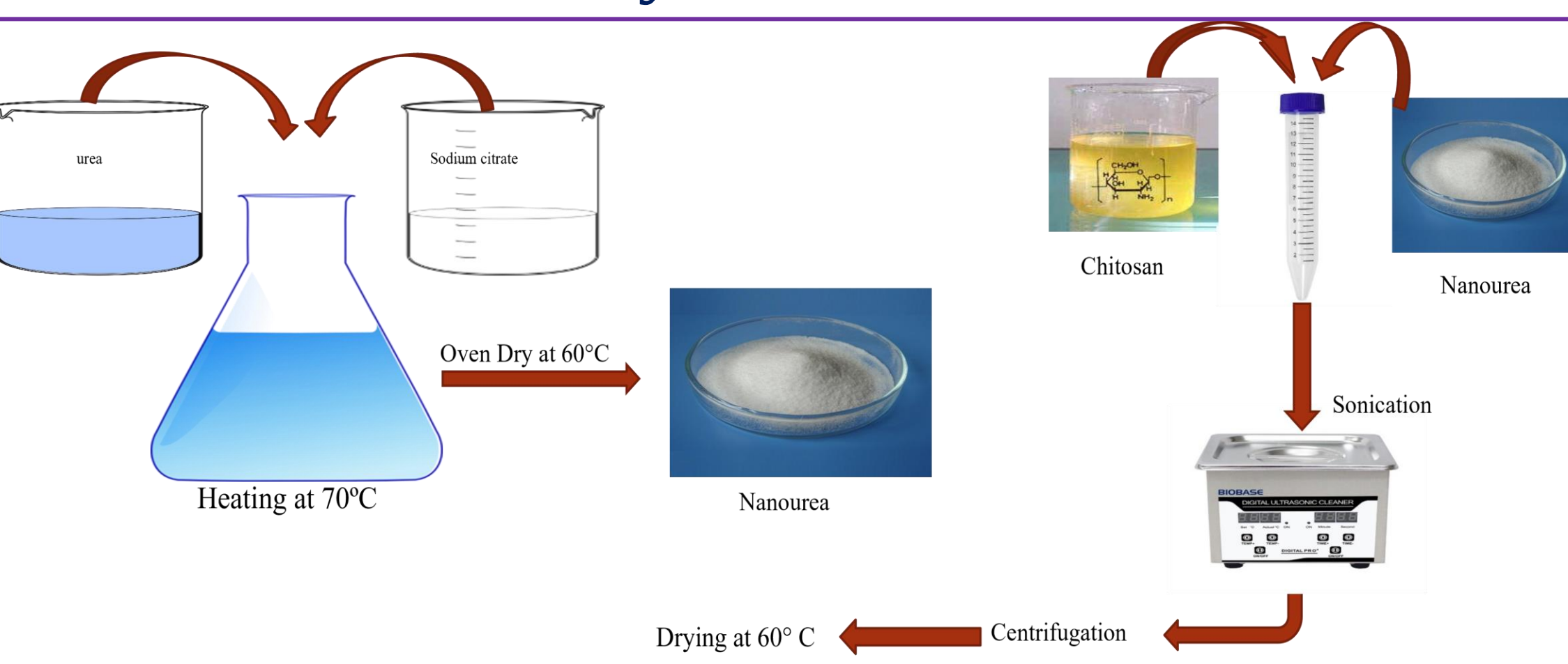
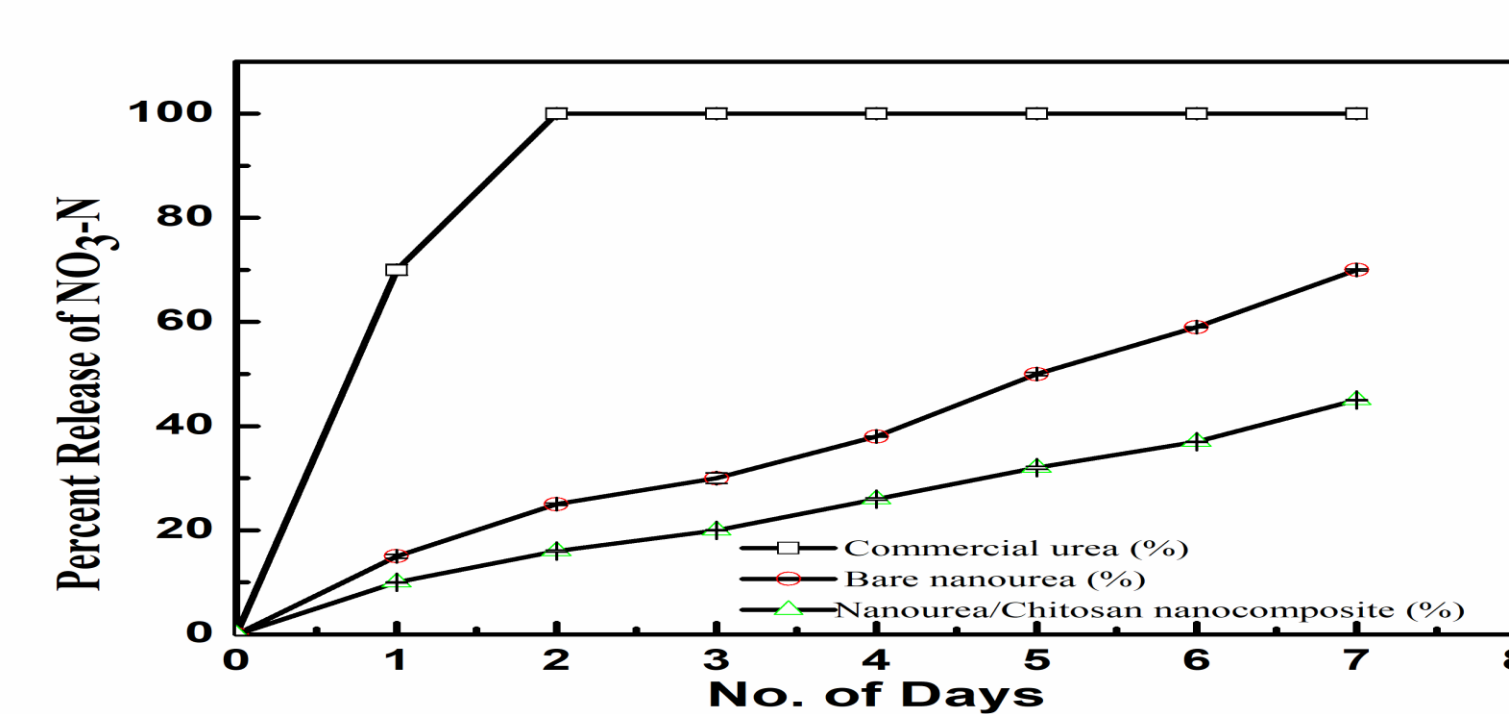


Biomass

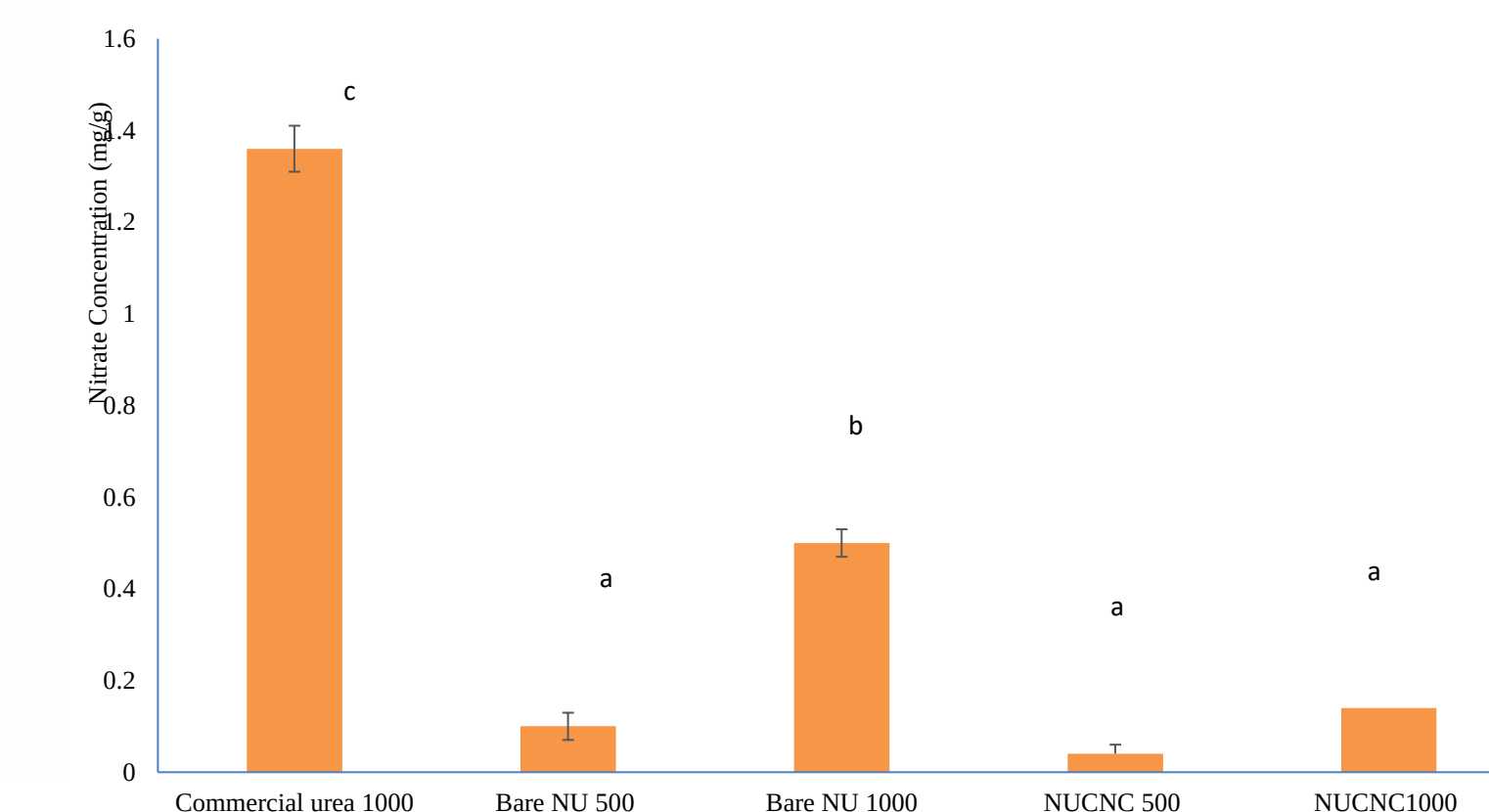


Chlorophyll

Synthesis



Nitrate release(%)



Nitrate content in plants(mg/g)

Conclusion

- The present study investigates the potential efficacy of nanofertilizer as an environment friendly slow-release nitrogen fertilizer on *Vigna radiata* L.
- The efficacy of NUCNC was compared with bare NU and commercial urea at different doses and 500 mg/L of NUCNC showed best results.
- The in vitro studies further confirmed that the application of NUCNC enhances the growth and development of *Vigna radiata* L. showing higher values for germination percentage and index, plant height, biomass, and chlorophyll as compared to bare NU and commercial urea.
- Furthermore, the protein and total phenolic content and free radical scavenging activity were also observed to be highest in plants fertilized with NUCNC.
- The findings implies that coating nano-urea with chitosan could not only improve the plant's growth acting as slow-release fertilizer but also help in mitigating the environmental issues associated with the use of conventional urea.