

DECLARATION

I, **Ms. Mahima Misti Sarkar**, hereby declare that the work presented in my thesis entitled “*Evaluation of silica nanoparticles and their functionalization in the alleviation of salinity stress in two legumes – Lens culinaris and Glycine max*” has been carried out by me under the supervision of **Dr. Swarnendu Roy**, Assistant Professor, Department of Botany, University of North Bengal for the award of the degree of **Doctor of Philosophy (Ph.D.) in Science (Botany)**. I also declare that this thesis or any part of this has not been submitted for any other degree/diploma either to this or other Universities.

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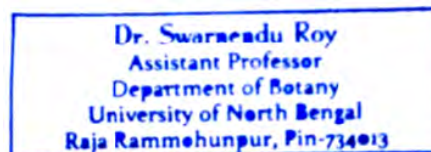
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FEBRUARY 2024



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Author Name	Mahima Misti Sarkar
Title	Evaluation of silica nanoparticles and their functionalization in the alleviation of salinity stress in two legumes - Lens culinaris and Glycine max
Paper/Submission ID	1373731
Submitted by	nbuplg@nbu.ac.in
Submission Date	2024-01-29 11:17:23
Total Pages	298
Document type	Thesis

Result Information

Similarity **0 %**

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Language	English
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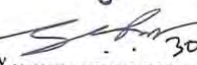
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
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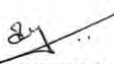
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ACKNOWLEDGEMENTS

It is a genuine pleasure to express my profound thanks and gratitude to my sir, mentor, supervisor, and guide, **Dr. Swarnendu Roy**, Assistant Professor, Plant Biochemistry Laboratory, Department of Botany, University of North Bengal. His timely advice, meticulous scrutiny, scholarly advice, scientific approach, and overwhelming attitude to help everybody have always encouraged me to accomplish my research work.

I express my sincere gratitude to **Prof. Aniruddha Saha**, HOD, Department of Botany, University of North Bengal, for his kind advice in the journey of my research work.

I would like to extend my gratitude to all the faculty members, **Prof. Subhas Chandra Roy**, **Prof. Arnab Sen**, **Prof. Manoranjan Choudhury**, **Dr. Piyush Mathur**, and **Late Dr. Palash Mandal**, of the Department of Botany, University of North Bengal, for their constant encouragement and suggestions.

I would also like to thank all the non-teaching staff of the Department of Botany, for their administrative assistance throughout my research tenure.

I would like to convey my keen gratefulness to the DST-FIST-sponsored Central Instrumentation Facility (CIF) - Department of Botany, Department of Chemistry, Department of Pharmaceutical Technology, and University Science and Instrumentation Centre (USIC) of the University of North Bengal. Additionally, Sophisticated Analytical Instrument Facility (SAIF), Indian Institute of Technology, Bombay; Sophisticated Analytical Instrumentation Facility (SAIF), and Central Instrumentation Facility (CIF) of Panjab University; Sophisticated Analytical Instrumentation Centre (SAIC), Tezpur University; University Scientific and Instruments Centre (USIC), Karnataka University, Dharwad; Central Instrumentation Facility (CIF), Lovely Professional University; Nucleome Informatics, NKC Centre for Genomic Research, Hyderabad, for allowing me the access to their instrumentation facility for all the nanoparticle sample characterization and RNA-Seq analysis.

I would also like to acknowledge the **University Grants Commission** (UGC, New Delhi, Govt. of India) for providing fellowship in the form of JRF and SRF (Award No. 16-6(DEC. 2018)/2019(NET/CSIR)).

I also want to convey my gratitude to **Dr. Soumya Mukherjee**, **Dr. Tarun Kumar Dua**, and **Dr. Paramita Paul** for their valuable inputs in my publications.

A special thanks to all my fellow scholars of the Plant Biochemistry Laboratory, including **Mr. Ashis Sarkar, Mr. Biswanath Karmakar, Mr. Dibakar Ghosh, Mr. Raja Ghosh, Mr. Bittu Paul, Mr. Buddhadev Sarkar, Ms. Puja Saha, Md. Salman Haydar, and Mrs. Anindita Ghosh Basu** for their encouragement, help, and support during the tenure of my research work.

I would like to express my heartfelt thanks to all the research scholars and project fellows of the Department of Botany, University of North Bengal, for their cooperation and help throughout these years.

I would like to show my love and care to all the dissertation students, including **Mehebab Alom, Jadav Debgupta, Ahona Guha, Kritika Pokhrel, Pritha Rudra, Sayani Sarkar, Sankhasubra Ghosh, Tapas Das, Barnita Dey, Ankit Roy, Anuradha Adhikary, Barnali Mandal, Mitali Rava, Shrijita Paul, Debojeet Choudhury, Akanksha Bhagat, Prasanti Karkidoli, Soumili Chakraborty** for their cooperation through my tenure.

I would like to thank all the administrative sections and Officers of the **University of North Bengal** for their kind help and cooperation throughout my research work.

I want to convey my deepest gratitude to all the **teachers** who have embraced me with not only the bookish knowledge but also the lessons for making me a better human being.

Finally, I express my profound gratitude to my parents, **Mrs. Minati Sarkar** and **Mr. Mrinal Kanti Sarkar**, my elder brother **Bulet Kanti Sarkar**, and my full family for providing me with unfailing support and continuous encouragement throughout my years of study.

Thank you

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PREFACE

In the rapidly expanding world population, the necessity of “Sustainable Food Security” has been a serious matter of concern. The accelerated environmental pollution and global warming have brought forth various destructive forces engulfing global food production. Among those disparaging forces, salinity has emerged as one of the crucial abiotic stresses that impede substantial damage to the production of food crops. Salinity affects the overall plant health, resulting in poor growth and development of plants along with loss in plant productivity and nutritional components. Mother Earth was initially nurtured with excessive amounts of fertilizers and minerals to confront these challenges. Instead of curing the complications, the over-application of these chemical fertilizers has worsened the situation, resulting in the loss of soil fertility. Therefore, a consequential demand for alternative sustainable strategy is a matter of high priority.

Nanotechnology has emerged as a viable solution in the past decade to address this crisis. Nanomaterials having a high surface area to volume ratio, are easily uptaken by plants playing a more interactive role with the cellular active components, and thus, their efficiency also gets amplified. Silica is a semi-essential element; its deficiency can retard the essential plant responses. In this connection, silica nanoparticles (SiNPs) possess great crop improvement potential because they can translocate more silica to plants. Applying SiNPs has been manifested to improve plants’ tolerance to salinity. Moreover, the surface functionalization of these nanomaterials increases their efficiency and reduces the toxic effects at higher concentrations. Hence, this thesis explores the synthesis of SiNPs and sugar-functionalized SiNPs and their implementation against the NaCl-induced salinity stress in lentil and soybean plants.

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