

**Ishani Chakrabartty (SCOPUS ID: 57202151838)**

## PERSONAL INFORMATION

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Assistant Professor, Department of Applied Biology, School of Biological Sciences,  
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<http://www.iamishani.blogspot.com>

## EDUCATION

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**2014–2019: PhD in Biosciences and Bioengineering at Indian Institute of Technology Guwahati, India**

- **Thesis title:** Investigation on the vibrational and antimicrobial potential of (E)-labda-8(17), 12-diene-15, 16-dial from *Alpinia nigra* (Gaertn.) B.L. Burt
- **Coursework score :** CGPA 9.33/10
- Supervised two Mtech students successfully.

**2012-2014: Master of Science (M.Sc.) in Biotechnology at Tezpur Central University, Assam, India**

- Study emphasis : Molecular biology and biotechnology and its related subjects like analytical techniques, immunology, virology, protein biochemistry and genetics
- Second rank holder in the MBBT Department
- Overall score : CGPA 8.8/10

**2009-2012: Bachelor of Science (B.Sc.) in Zoology at Miranda House, Delhi University, Delhi, India**

- Study emphasis: Zoology (Hons.) with specialization in Reproductive biology
- Experienced with animal dissection
- Minors: Botany and Chemistry.
- 1<sup>st</sup> rank holder in the Zoology Department for 3 years consecutively
- Overall score : 76.09%

## RESEARCH EXPERIENCE

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**July 2014 –July 2019: Research fellow at Indian Institute of Technology Guwahati, Assam, India**

- **Natural products:** Isolation and characterization of natural compounds by organic

solvent extraction from medicinal plants, microbiological screening of natural products, microemulsion preparation

- Handling different instruments like flow cytometer, fluorescence microscopy, soxhlet apparatus etc.
- Other analytical techniques: HPLC, FTIR, Raman spectroscopy and HRMS

**Jan-May 2014: Research Student at Tezpur Central University, Assam, India**

- **Thesis title:** Deciphering the mechanism of anti-bacterial potential of “green synthesized” Ag nanoparticles
- Supervisor: Dr. Nima D. Nmasa
- Learnt nanotechnology, microbiology and spectroscopic tools of characterization as major components

**June-July 2013: Summer Intern at SCIR-NEIST, Jorhat, Assam, India**

- **Project title:** Isolation of microbes from soil and screening for candidal activity
- Supervisor: Dr. T. Bora, Former Head, Department of Biotechnology, CSIR-NEIST

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**TEACHER, VOLUNTEER, WORK AND LEADERSHIP EXPERIENCE**

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**9/20-Present, Teacher and Mentor at Department of Applied Biology, USTM**

- Currently working as an Assistant Professor, Dept. of Applied Biology, School of Biological Sciences, USTM
- Teaching courses like Genetics, Recombinant DNA technology, Microbiology, Animal Biotechnology, IPR and Biotechnology in Human Welfare at UG and PG level
- Member of IQAC and Event Management in Applied Biology Dept., USTM
- Overall mentoring of students and molding them in a good way

**8/19-8/20, Teacher and Administrator at Department of Science, PAFGC**

- Served as Head of Department, Dept. of Science, PAFGC, Mangalore University
- Teaching courses like Human Physiology, Food Packaging, Analytical techniques, General Microbiology, Brewing and Fermentation Technology and IPR to B.Sc. (FT and FND) students
- Responsible for the maintenance of proper discipline and decorum of the college
- Organized annual college events like Food fest, College day and Sports day
- Conducted small association events like Sexual harassment and Women Empowerment, Drug abuse etc.

**8/14 – 7/19, Teaching Associate at Department of BSBE, IIT Guwahati**

- Represented the department and lab on Research Conclave (Institute Open Day).
- Delivered presentations and conducted laboratory demonstrations for Masters students
- Worked as a volunteer in the organizing of AdMAT (2014), FABACTCS (2016) and 3<sup>rd</sup> Research Conclave (2017), Sensitization workshop on Technological Empowerment of Women (2017), Indo-US Flow Cytometry Workshop (2019)

**07/14 – 06/16, Lab Maintenance at Applied Biodiversity Lab**

- Responsible for proper induction of new summer interns in the lab.
- Coordinate the lab funds and maintenance.

**Journal Publications:**

- **Chakrabartty I**, Vijayasekhar A, Rangan L\* (2019) Therapeutic potential of labdane diterpene from *Alpinia nigra*: Detailed hemato-compatibility and antimicrobial studies; **Natural Product Research**, 35 (6), 1000-1004 (Impact factor 1.98)
- **Chakrabartty I\***, Kalita NK, Boruah P, Katiyar V, Hakeem K, Rangan L\* (2020) Physico-rheological characterization of organically derived seed samples from *Alpinia nigra*, an ethnic medical plant of North East India; **Industrial Crops and Products**, 152 (112560), [doi.org/10.1016/j.indcrop.2020.112560](https://doi.org/10.1016/j.indcrop.2020.112560) (\*Corresponding author; Impact factor 4.8)
- Baruah PK<sup>#</sup>, **Chakrabartty I<sup>#</sup>**, Mahanta DS, Rangan L, Sharma AK, Khare A\* (2020) Efficacy of cellulose paper treated with Cu and Ag oxide nanoparticles synthesized via pulse laser ablation in distilled water in the annihilation of bacteria from contaminated water; **Review of Scientific Instruments**, 91 (034105), [doi. 10.1063/1.5144495](https://doi.org/10.1063/1.5144495) (<sup>#</sup>Equal contribution) (Impact factor 1.58)
- Basak S, **Chakrabartty I**, Hedao V, Shelke RG, Rangan L\* (2018) Assessment of genetic variation among wild *Alpinia nigra* (Zingiberaceae) population: Genome mining and molecular marker approach; **Molecular Biology Reports**, 46 (1), 177-189 (Impact factor 2.1)
- **Chakrabartty I**, Baruah PK, Panda AN, Khare A, Rangan L\* (2018) Hybrid formulation of Cu nanoparticles and labdane diterpene from *Alpinia nigra*: a vibrational spectroscopic study; **Journal of Applied Spectroscopy**, 85 (5), 983-990 (Impact factor 0.8)

**Full paper proceedings:**

- Baruah PK, Raman MA, **Chakrabartty I**, Rangan L, Sharma AK and Khare A (2018) Antibacterial effect of silk treated with Ag and Cu nanoparticles synthesized by pulsed laser ablation in distilled water; **AIP Conference Proceedings 1953**; [doi: 10.1063/1.5032399](https://doi.org/10.1063/1.5032399)
- Rangan L\*, Tushar, Basak S, **Chakrabartty I**, Ghosh S, Das A, Kumar M, Sadokpam S, Vijayasekar A, Hedao VS, Kumar V and Ramachandran S (2018) Maintaining Biodiversity in North-east India: Ethno-medicinal usage of Zingiberaceae; **BVA Proceedings (In Press)**

**Book chapter:**

- Baruah PK, Nath A, **Chakrabartty I**, Singh A, Das A, Rangan L, Sharma AK and Khare A (2019) Surface enhance Raman scattering and antibacterial capability of pulsed laser ablated metal/metal oxide nanoparticles **In: Advances in Science and Technology**; 1: 140-144
- Mushtaq W, Shakeel A, Fazili MA, **Chakrabartty I**, Sevindik M (2020) Pros and Cons of Nanotechnology. In: Hakeem K., Pirzadah T. (eds) **Nanobiotechnology in Agriculture**. Nanotechnology in the Life Sciences. Springer, Cham; 207-222

- **Chakrabartty I\*** (2021) Plant based nanoparticles and their applications. In Hakeem K. (ed) **Nanotechnology: Applications in Biological Sciences**. Springer (In Press)
- **Chakrabartty I\*** (2021) Plant metabolic engineering: For a futuristic economy. In Aftab T., Hakeem K. (eds) **Metabolic Engineering in Plants: Fundamentals and Application**. Springer (Accepted)

#### Conferences:

- **Chakrabartty I**, Kalita NK, Katiyar V, Rangan L\* (2019) Physico-rheological characterization of organically derived seed samples from *Alpinia nigra*; **Indian Plant Science Congress (IPSC'19)**, 23<sup>rd</sup> – 25<sup>th</sup> January 2019, pp 116
- Sadokpam S, **Chakrabartty I**, Rangan L\* (2019) Anti-bacterial susceptibility assessment of microemulsion formulation of labdane from *Alpinia nigra*; **Indian Plant Science Congress (IPSC'19)**, 23<sup>rd</sup> – 25<sup>th</sup> January 2019, pp 108
- **Chakrabartty I\*** and Rangan L (2018) *Alpinia nigra*: The unexplored ore of Zingiberaceae for future therapeutics; **Indo-Japan Bilateral Symposium for Future Perspectives of Bioresource Utilization in North East India (IJBS'17)**, 1<sup>st</sup>-4<sup>th</sup> February 2018, IIT Guwahati, pp 68 (Oral presentation) (Awarded best oral presentation)
- **Chakrabartty I**, Panda AN, Khare A and Rangan L\* (2017) FT-IR, FT-Raman, NMR and SERS studies of labdane diterpene from *Alpinia nigra*; **National Workshop on Fluorescence and Raman Spectroscopy (FCS)**, 17<sup>th</sup> – 21<sup>st</sup> December 2017, IIT Guwahati, pp 123
- **Chakrabartty I** and Rangan L\* (2017) Understanding the unique inhibitory potential of (E)- labda – 8 (17), 12 – diene – 15, 16 – dial, a bioactive compound from *Alpinia nigra*, on the growth kinetics of *Candida albicans*; **Bioprocessing India**, 9<sup>th</sup> – 11<sup>th</sup> December 2017, IIT Guwahati, pp 84
- **Chakrabartty I**, Vijayasekhar A. and Rangan L\* (2017) Viability assessment of bacteria under the treatment of (E)-labda-8(17), 12-diene-15, 16-dial, a bioactive compound from the seeds of *Alpinia nigra*; **Translational Research on Natural Products for Therapeutic Uses (TRNPTU)**, 21<sup>st</sup> November 2017, IASST Guwahati, pp 13 (Awarded best poster)
- Sadokpam S, **Chakrabartty I** and Rangan L\* (2017) Formulation strategies and anti-candidal assessment of a labdane-type diterpene from *Alpinia nigra*; **Translational Research on Natural Products for Therapeutic Uses (TRNPTU)**, 21<sup>st</sup> November 2017, IASST Guwahati, pp 24
- **Chakrabartty I**, Khare A, Panda AN and Rangan L\* (2017) Vibrational spectroscopic studies of bioactive labdane diterpene from seeds of *Alpinia nigra* in conjugation with Cu nanoparticles; **International Conference on “Sophisticated Instruments in Modern Research” (ICSIMR)**, 30<sup>th</sup> June-1<sup>st</sup> July 2017, IIT Guwahati, pp 98
- **Chakrabartty I** and Rangan L\* (2017) (E)-labda-8(17), 12-diene-15,16 dial from *Alpinia nigra*: Is it a potential agent against *Candida albicans*??; **3<sup>rd</sup> Research Conclave**, 16<sup>th</sup>-19<sup>th</sup> March 2017, IIT Guwahati, pp 106 (Department winner in best poster category)

- Vijayshekhar A, **Chakrabartty I**, Khare A and Rangan L\* (2017) Effect of labdane diterpene dialdehyde –a bioactive compound from the seeds of *Alpinia nigra*, on erythrocytes; **3<sup>rd</sup> Research Conclave**, 16<sup>th</sup>- 19<sup>th</sup> March 2017, IIT Guwahati, pp 96
- **Chakrabartty I**, Khare A and Rangan L\* (2016) Investigating the inhibitory effect and possible mode of action of (E)-Labda-8(17), 12-diene-15,16-dial from *Alpinia nigra* on *Candida albicans*; **International Conference on Current Trends in Biotechnology (ICCB) organized by BRSI**, 8<sup>th</sup> – 10<sup>th</sup> December 2016, VIT Vellore, pp 344
- **Chakrabartty I** and Rangan L\* (2016) Isolation, identification and flow cytometric investigation of DNA leakage from *Candida albicans* upon treatment with (E)-labda-8 (17), 12-diene- 15, 16- dial from *Alpinia nigra*; **9<sup>th</sup> Annual TCS Event and Flow cytometry workshop on flow applications in basic, applied and clinical biology (FABACTCS)**, 3<sup>rd</sup> – 5<sup>th</sup> November 2016, IIT Guwahati, pp 60
- **Chakrabartty I**, Khare A, Panda AN and Rangan L\* (2016) Raman spectroscopic studies of labdane diterpene, a bioactive compound from the seeds of *Alpinia nigra*; **22<sup>nd</sup> Indian Society for Chemists and Biologists (ISCB 2016) International Conference**, 6<sup>th</sup>-8<sup>th</sup> February 2016, Uka Tarsadia University, Surat, pp 150

#### Seminars:

- COVID-19 and its associated facets – 2 Day International Virtual Lecture Series organized by Dept. of Applied Biology, University of Science and Technology Meghalaya (International Lecture Series, June 2021)
- Recent Advances in Biotechnology and Microbial Infection at University of Science and Technology Meghalaya at Meghalaya (National Webinar, May 2021)
- Entrepreneurship and You – Opportunities and Challenges at Talent Research Foundation at Mangalore (National Webinar; August 2020)
- Expanding Language World for Learners at SDM College of Business Management at Mangalore (National Webinar; August 2020)
- Therapeutic Potentials of Spices and Herbs in Relation to COVID-19 at Besant Women's College at Mangalore (National Webinar; July 2020)
- COVID-19- Coping with the pandemic and challenges in an outbreak at IQAC, D R College, Golaghat, Assam (International Webinar; July 2020)
- COVID-19 Awareness Programme, NSS of SPW Degree and PG College at Tirupati (National Webinar; July 2020)
- Cyber Awareness: Strategies for Safeguarding Ourselves from Cybercrimes and Cyber attacks, by IQAC, New Prince Shri Bhavani Arts and Science College at Tamil Nadu (Webinar; July 2020)
- Preventing Sexual Harassment in Educational Institutions, by Centre for Women's Studies, Mangalore University at Mangalore University (February 2020)
- Sensitization Workshop on Technological Empowerment of Women, by Department of Biosciences and Bioengineering, IIT Guwahati at IIT Guwahati (November 2017)
- 9<sup>th</sup> Annual TCS Event and Flow cytometry workshop on flow applications in basic, applied and clinical biology, by Department of Biosciences and Bioengineering, IIT Guwahati and Dr. B. Borooah Cancer Institute, Guwahati at IIT Guwahati (November

2016)

- Women In Science Congress organized by US Embassy at US Embassy, New Delhi (September 2011)

### **Workshops:**

- “herSTART Mega Bootcamp” – part of herSTART programme organized by GUSEC and UNICEF (May 2021)
- “*Teachers’ role in Implementation of New Education Policy (NEP)*” – Awareness, Orientation, Challenges, and Responses by Bharatiya Shikshan Mandal, NITI Aayog in collaboration with University of Science and Technology Meghalaya (February 2021)
- 1- day workshop on *Food Quality and Safety Management for export of Processed Foods*, USTM, IIFT and APEDA (February 2021)
- 1-week Online Certificate Course on *Digital Teaching Techniques*, ICT Academy (July-August 2020)
- 2-Day Online Workshop on *Aligning Yourself to Publishing Process*, Research Academy on Campus, Elsevier (2020)
- 20th Indo-US Flow Cytometry Symposium cum Workshop on *Applications of Flow Cytometry in Biotechnology*, IIT Guwahati (2019)
- Workshop on *Research Methodology* in Reflux, IIT Guwahati (2018)
- Workshop on *ZE5 & Droplet Digital PCR – QX200*, IIT Guwahati (2017)
- Indo – Japan Workshop on *Translational Agriculture – Avenues for International Cooperation*, IIT Guwahati (2017)
- *ACS on Campus*, IIT Guwahati (2016)
- *Flow Cytometry Data Analysis*, by Department of Biotechnology, IIT Guwahati at IIT Guwahati (February 2015)
- *Advanced Techniques in Cell and Molecular Biology*, by Department of Biotechnology, IIT Guwahati at IIT Guwahati (June 2014)
- *Cell Culture Techniques* at Tezpur University, Assam (April 2014)
- *Application of Bioinformatics Tools* in Biological Sciences at College of Veterinary Science, Assam Agricultural University, Guwahati (January 2014)
- *Gene Polymorphism* organized by DBT Star College Project at DS Kothari Centre for Research and Innovation in Science Education, Miranda House, University Of Delhi (June 2011)

### **IPR Workshops:**

- Intellectual Property Rights, by Assam University, Silchar, in collaboration with ASTEC, Guwahati (April 2021)
- Intellectual Property Rights- hands on training on patent search, by Research Conclave 2017, IIT Guwahati at IIT Guwahati (March 2017)

- Intellectual Property Rights, by IPR Cell, R&D Section, IIT Guwahati at IIT Guwahati (November 2016)
- Protection of Traditional Product Names in the North East Region using Geographical indications. Its importance in enhancing business and promoting Regional Art and Craft, by Ministry of Commerce and Industry, Department of Industrial Policy Promotion, GI Registry, Chennai, Govt. of India at NEDFi Auditorium, Guwahati (February 2015)
- Capacity Building in Effective Management of Intellectual Property Rights (IPRs) in Biotechnology by Universities and Research Institutes in Assam, by Biotech Consortium India Limited (BCIL), New Delhi at College of Veterinary Science, Assam Agricultural University, Guwahati (November 2014)

## SCHOLARSHIPS AND AWARDS

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- Awarded **Best Science Story** by **AWSAR-DST**, Govt. of India, **2019**
- Awarded **Best Blogger of the Year** 2019-20 by **GISR Foundation**
- Awarded **Best Oral Presentation Award** at IJBS' 17 (Indo-Japan), IIT Guwahati, **2018**
- Awarded **Best Poster Award** at TRNPTU, IASST Guwahati, **2017**
- Awarded **Departmental Winner** in the **Best Poster** Category at 3<sup>rd</sup> Research Conclave, IIT Guwahati, **2017**
- Cracked regional level competitive exam, **State Level Eligibility Test (SLET) in Life Sciences, 2014** which makes one eligible for lecturership in the field of life sciences in North-East India
- Cracked national level competitive exam, **Graduate Aptitude Test in Engineering (GATE in Life Sciences), 2014** - This is awarded by the MHRD, India for a duration of 5 years after enrollment in PhD
- Awarded **Academic Prize-2011** and **Academic Prize-2012** for academic year **2011-2012** and **2012-2013** respectively, by **Miranda House, University of Delhi**, for securing *highest marks in Part I & II and Part I, II & III* Examination in **B.Sc (Hons.) Zoology**
- Awarded **Anundoram Borooah Award** for academic year 2007-08 by **Planning & Development Department, Government of Assam**, for excellent academic performance in securing *First Division with Distinction Marks in HIGH SCHOOL LEAVING CERTIFICATE* Examination, 2007

## OTHER INTERESTS

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### 08/15 – Present, Social Worker

- Lifetime member of the Environment and Consumer Protection Foundation (ECPFO)
- Lifetime member of Biotech Research Society of India (BRSI)
- Member of International Natural Product Science Taskforce (INPST)
- Volunteer at **LedBy Foundation** that is dedicated to working with Indian Muslim Women (April 2021-Present)
- Counselor in a North-East based NGO '**Xomidhan**' that thrives to help young people of NE India by providing career and educational guidance (May 2020-Present)

- Freelance writer for a Pune based start-up “**Mirage Vialista**” (March 2019-July 2019)
- Writer on social issues in **The Assam Tribune**, a local English daily of Assam and an online forum called **Countercurrents.org**, **Voice of Margin** and **The Eleventh Column**
- Have an own blog called “**Ishani’s Pen**” ([www.iamishani.blogspot.com](http://www.iamishani.blogspot.com))
- Regular writer for a blog called “**Rise for India**” to generate awareness among masses in general and young people in particular towards the burning issues currently existing the Indian society; a very small yet firm step (till 2016)
- Associated with a non-religious organization called “**Who is Hussain?**” a group of like-minded individuals who work together to try their best to spread goodness in the society (till 2016)
- Participated in “Spit-free India Movement” to prevent the spread of COVID 19 (June-August 2020)

## REFERENCES

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1. Prof. Latha Rangan  
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Indian Institute of Technology Guwahati  
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## DECLARATION

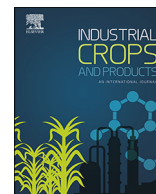
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I declare that the information provided above is true.



Shanty





# Physico-rheological characterization of organically derived seed samples from *Alpinia nigra* (Gaertn.) B.L. Burt, an ethnic medicinal plant of Northeast India

Ishani Chakrabartty<sup>a,b,\*</sup>, Naba Kumar Kalita<sup>c</sup>, Pankaj Boruah<sup>c</sup>, Vimal Katiyar<sup>c</sup>, Khalid Rehman Hakeem<sup>d</sup>, Latha Rangan<sup>a,\*</sup>

<sup>a</sup> Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Assam, 781039, India

<sup>b</sup> Department of Science, P. A. First Grade College (Affiliated to Mangalore University), Konaje, Mangalore, Karnataka, 574153, India

<sup>c</sup> Centre of Excellence for Sustainable Polymers, Department of Chemical Engineering, Indian Institute of Technology Guwahati, Assam, 781039, India

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## ARTICLE INFO

### Keywords:

*Alpinia nigra*  
Contact angle  
Diterpene  
Seed extracts  
Thermal stability  
Viscosity

## ABSTRACT

*Alpinia nigra* (Gaertn.) B.L. Burt is one of the most easily available culinary items as well as medicinal plants of Northeast (NE) India. Physico-rheological characterization of the colloidal seed extracts of *A. nigra* and an isolated compound molecule, labdane diterpene-(E)-labda-8 (17), 12-diene-15, 16-dial- is carried out in the current study. Ideally, studies on the rheological or physical properties (which are important for industrial application) of plant derived secondary metabolites are lacking. In this context, the present study has been taken up. The optimum seed-to-solvent ratio for maximum yield of seed extracts is found to be 1:6. Contact angle value indicates the hydrophobicity of these plant samples; labdane diterpene being the most hydrophobic. All the samples exhibit specific rotation and hence, optical behavior. The DSC results suggest the lack of crystallinity of the samples; the compound exhibits the characteristic behavior of diterpenes like drimenol, cninin etc. The plant extracts and compound show a high degree of thermal stability. The viscosity of the samples shows an increasing trend with concentration but a decreasing trend with temperature; labdane diterpene exhibits the highest viscosity at all temperatures. The results obtained provide interesting insight towards the application of the *A. nigra*-derived extracts in the food and pharmaceutical industries.

## 1. Introduction

An economy based on biological resources provides hope to the developing countries for better sustainability. There is a worldwide awareness for the improvement of bioresource preservation and their sustainable utilization. Plants are one of the most important and beneficial natural resources. They have always attracted the attention of the scientific community due to their countless benefits to mankind in various areas like medicines, cosmetics, food etc. In addition, plants play the most important role in environmental clean up and add enormously to the beauty and aesthetic appeal of nature. The current century observes a paradigm shift of the bioprocess and pharmaceutical industry towards the use of plants as they open new avenues for product development, less processing cost, drug development and environmental impact; a huge amount of reduction in pollution can be achieved through the use of plant-derived biodegradable, eco-friendly

disposables. After all, consumption of plant based diets contribute to environmental sustainability (Fischer et al., 2012; Lacour et al., 2018). Thus, the advancement of green chemistry and biological studies provide a new network of inter-disciplinary research to ensure maximum benefit with the lowest possible risk to mankind (ACS, 2015; Harborne, 1998).

Like all other countries of Asia, the Indian subcontinent is endowed with natural beauty and resources. The luxurious forests of the country are rich in “green” wealth that house plants containing many bioactive compounds. The NE India has different climatic zones like tropical, sub-tropical, temperate and alpine; hence, this region flourishes in its flora and fauna, particularly in the growth of valuable medicinal plants (Shankar et al., 2017). Hippocrates had said, “Let food be thy medicine and medicine be thy food.” In the plant kingdom, the Zingiberaceae family seems to abide by Hippocrates’ vision, as it is well known for its medicinal as well as culinary properties. The NE region of India houses

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# Efficacy of cellulose paper treated with Cu and Ag oxide nanoparticles synthesized via pulsed laser ablation in distilled water in the annihilation of bacteria from contaminated water

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Prahlad K. Baruah , Ishani Chakrabartty, Dipta S. Mahanta, Latha Rangan, Ashwini K. Sharma, and Alika Khare



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# Efficacy of cellulose paper treated with Cu and Ag oxide nanoparticles synthesized via pulsed laser ablation in distilled water in the annihilation of bacteria from contaminated water

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Prahlad K. Baruah,<sup>1,2,a)</sup>  Ishani Chakrabarty,<sup>3</sup> Dipta S. Mahanta,<sup>4</sup> Latha Rangan,<sup>3</sup> Ashwini K. Sharma,<sup>2</sup> and Alika Khare<sup>2</sup>

## AFFILIATIONS

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## ABSTRACT

In the present work, nanoparticles of copper and silver synthesized via pulsed laser ablation of the respective targets in distilled water are applied to cellulose filter paper to check their effectiveness in the annihilation of bacteria from contaminated water. The treatment of the filter paper with the nanoparticles is found to be an excellent way to get rid of two common bacteria, *Staphylococcus aureus* and *Escherichia coli*, from contaminated water. The spread plate method on agar, employed to test the antibacterial efficacy of the nanoparticle-treated papers, clearly shows the absence of bacterial growth upon coming into contact with the nanoparticles in the filter paper. These results were further substantiated by the growth kinetic study of the bacteria that exhibited slow growth of the bacteria that were exposed to the nanoparticles. The morphology of the bacteria that came into contact with the nanoparticles is found to be adversely affected by the nanoparticles. Both copper and silver nanoparticles show a similar extent of antibacterial activity.

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## I. INTRODUCTION

The plasmonic properties of metal as well as its oxide nanoparticles (NPs) have been utilized in numerous applications including plasmon-based sensors, surface enhanced Raman scattering (SERS), metal enhanced fluorescence, photodegradation, flexible electronics, and color printing.<sup>1–12</sup> Recently, the antibacterial properties of these NPs have paved the way for their successful implementation in treating bacterial infection.<sup>13–16</sup> This aspect, associated with metallic NPs, has been keenly investigated in the last decade and has provided extremely interesting insights.<sup>17</sup> The interest behind the increased use of NPs in antibacterial applications is particularly

due to the injudicious use of antibiotics, which is believed to be the reason behind the emergence of several drug-resistant bacterial strains.<sup>14</sup> The exact mechanism of the antibacterial action of NPs has eluded scientists for a long time. However, the antibacterial activity of NPs is generally attributed to a few common factors.<sup>13,18</sup> First, the change in the permeability of the bacterial membrane due to the accumulation of NPs leads to the uncontrolled exchange of cellular organelles, which disrupts the normal functioning of the cells. Second, the generation of oxidative species from the NPs leads to oxidative damage to cellular structures. Then, there is also a possibility of the NPs entering the cell and depleting the adenosine triphosphate (ATP) production



# Therapeutic potential of labdane diterpene isolated from *Alpinia nigra*: detailed hemato-compatibility and antimicrobial studies

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SHORT COMMUNICATION



## Therapeutic potential of labdane diterpene isolated from *Alpinia nigra*: detailed hemato-compatibility and antimicrobial studies

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### ABSTRACT

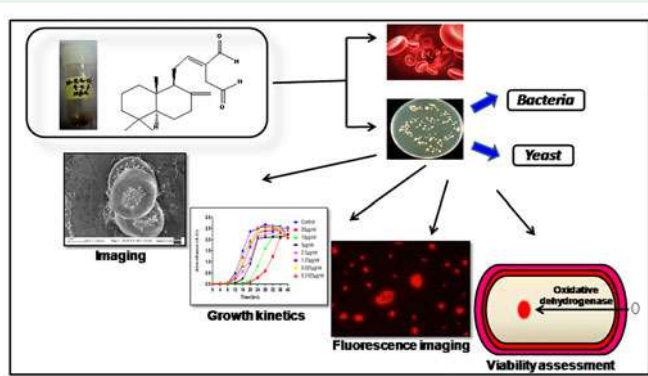
(E)-labda-8(17), 12-diene-15,16-dial has been isolated from the seeds of *Alpinia nigra* that is unsuitable for oral administration and evident from *in silico* studies. The present investigation therefore deals with understanding the effect of this compound on RBCs for intravenous administration. No prominent hemolytic effect of compound at a concentration of  $\leq 0.4$  mg/ml was found whereas higher concentrations perforated RBC membrane. The molecule showed remarkable inhibitory potential against Gram negative bacteria (concentration  $\geq 0.025$  mg/ml) causing cell lysis. In case of pathogenic yeast *Candida albicans* although growth was inhibited (concentration  $\geq 0.0025$  mg/ml), growth kinetic study revealed that the diterpene significantly delayed fungal growth (concentration 0.005–0.020 mg/ml) by preventing substrate uptake and was able to extend its lag phase in a dose-dependent manner. This study tries to unveil the mechanism of action of this diterpene on microorganisms with differential cell wall compositions.

### ARTICLE HISTORY


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### KEYWORDS

*Alpinia nigra*; *Candida albicans*; Gram negative bacteria; labdane diterpene; RBCs



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# Pros and Cons of Nanotechnology



**Waseem Mushtaq, Adnan Shakeel, Mohammad Afaan Fazili,  
Ishani Chakrabartty, and Mustafa Sevindik**

## 1 Introduction

Global food demand is rising at an alarming rate as the human population is increasing exponentially and may hit a record of nine billion by 2050. To combat this problem of food demand various strategies are being implemented to increase the productivity of crops and protect them from agricultural pests. The increased population rate forces agricultural society to find new ways of improved crop productivity. The problem of poverty and malnutrition has become a deep concern for countries across world. The progress in agriculture sector plays a critical role in population growth and economic forums as it produces raw materials for food and feed industry. With economic development, the soil nutrient balances are differed.

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# **Antibacterial effect of silk treated with silver and copper nanoparticles synthesized by pulsed laser ablation in distilled water**

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# Antibacterial Effect of Silk Treated with Silver and Copper Nanoparticles Synthesized by Pulsed Laser Ablation in Distilled Water

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**Abstract.** The antibacterial activity of three kinds of silks viz. Eri, Pat and Muga treated with silver and copper nanoparticles is reported in this paper. The nanoparticles have been synthesized by pulsed laser ablation of the respective metal targets in distilled water. Treatment of the silk pellets with the synthesized nanoparticles exhibited definite antibacterial activity whereas no such activity is observed in the untreated silk pellets.

## INTRODUCTION

Noble metal nanoparticles (NPs) have been proved to be extremely important in plasmonic applications.<sup>1</sup> In addition, these NPs especially silver (Ag) and copper (Cu) NPs have excellent antimicrobial properties.<sup>2</sup> Ag NPs are used as biological tags in biosensors and also in wound dressings due to the strong anti-bacterial and anti-fungal properties associated with it.<sup>3</sup> Cu NPs also exhibits these properties and are therefore used in plastics, coatings, etc.<sup>4</sup> Hence, the addition of these NPs to a particular material can act as a protective layer for that material against bacteria. Silk is one such material which has immense importance in textile industries. Some silks are known to possess medicinal properties and are therefore used in biomedical applications.<sup>5</sup> Of late, addition of NPs to silk have shown increased anti-bacterial properties.<sup>6</sup> Keeping in view the importance of silk and the need to develop an effective antibacterial protective layer, in the present work an attempt has been made to study the effect of treatment of Ag and Cu NPs on three common silks viz. Eri, Pat and Muga. These natural varieties of silks are woven from the silkworms *Philosomia ricini*, *Bombyx mori* and *Antheraea assamensis*, respectively. The NPs have been synthesized by the effective method of pulsed laser ablation in liquid (PLAL) which does not necessarily involve the addition of any chemical reagent. The well-established method of agar plate method is used for the antibacterial study.

## EXPERIMENTAL DETAILS

The threads of Eri, Pat and Muga silk were cut into small pieces and then further cut down into very fine pieces. The fine pieces of each type of silk were grinded in a mortar using a pestle until all the pieces were smudged and made into either a cotton-like structure or a coarse powder. These grinded samples were put in KBr Die maker and a pressure of about 60 kg/cm<sup>2</sup> was applied on it to make a pellet.