

# ANNUAL | 2024 REPORT | 2025



## **BCSIR DHAKA LABORATORIES**

Bangladesh Council of Scientific and Industrial Research  
Dr. Quadrat-i-Khuda Road, Dhanmondi, Dhaka-1205  
Website: [www.dhakalabs.bcsir.gov.bd](http://www.dhakalabs.bcsir.gov.bd)

## Citizen Charter of BCSIR Dhaka Laboratories

- ✓ The research achievements are published in the reputed national and international journals that are necessary for the students engaged in higher education and scientists as well
- ✓ The experienced scientists of different disciplines co-supervise the research works of the MPhil and PhD students of the universities as co-supervisor
- ✓ The process developed by the scientists are offered to the entrepreneurs' as leased out process for production
- ✓ Molecular detection and quantification of different elements and contaminants of food, feed and other samples by real time PCR, protein analyzer, LC MS AAS, FTIR and other different analytical services
- ✓ The scientists of these laboratories visit different factories and industries every year to chalk out their problems and try their best to mitigate those.
- ✓ GMO testing, bird-flu detection and other microbiological services are provided.
- ✓ Different products and goods imported from abroad are analyzed. As a result appropriate measurement about the quality of the product can be ascertained which helps government getting revenue.
- ✓ In order to set the tube-wells of the projects at right place, water and sand samples of deep and shallow tube-well were analyzed in this laboratory which played vital role for the success of the project.
- ✓ Different types of fertilizers supplied by different sugar mills are analyzed in these laboratories. As a result, it has become possible to produce improved quality sugar cane for which growers are benefited much.
- ✓ Different goods and products supplied by different private agencies and entrepreneurs are analyzed in these laboratories which help them to produce quality goods and products.
- ✓ Dissemination of knowledge and information about technological achievements of the scientists through exhibition, seminar and workshop
- ✓ Arrangement of science fair each and every year as part of implementation of BCSIR Act -2013 in order to flourish the intelligence of young scientists of school and college level

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## Message from the Chairman of BCSIR

I am delighted to pen down this message expressing my heartiest appreciation to the BCSIR Laboratories Dhaka for unveiling their research & development (R&D) accomplishments for the fiscal year 2023-2024. Being the largest multidisciplinary research unit of Bangladesh Council of Scientific and Industrial Research (BCSIR), this institute is always in the leading position in conducting R&D projects. This report showcases their remarkable R&D efforts across diverse disciplines and highlights the significant findings which enrich the scientific community at home and abroad as well as pave the way for practical applications to improve lives and support national development.

As Bangladesh stands on the brink of a transformative era-the rise of a 'New Bangladesh' built on equity, innovation, and progress-the contributions of our scientists take on even greater significance. In this pivotal moment, the work of our scientists is not just about breakthroughs in technology but also about shaping a more equitable and sustainable future. Their tireless efforts honor the sacrifices of our martyrs and reflect an unwavering commitment in building a prosperous, sustainable future. BCSIR Laboratories, Dhaka is steadfastly contributing to national priorities and driving the economic vibrancy of our country through groundbreaking research and development.

Over the years, this institute has expanded its research capabilities, collaborative endeavors, and supervisory roles across a diverse range of fields. These include chemistry, bioequivalence and pharmaceutical sciences, fiber and polymers, pulp and paper, industrial physics, physical instrumentation, genomics, applied botany, zoology, soil, water, and environmental sciences. Its outreach programs and partnerships with industries and educational institutions will empower the next generation of scientists, fostering innovation.

The institute also organizes a robust array of training sessions, workshops, and weekly seminars, equipping scientists with the skills to tackle emerging challenges confidently and seize opportunities in a rapidly evolving world. Notably, this unit also supports industrial sectors by developing new products, enhancing the quality of existing ones, and providing testing services for both export and import items, thereby strengthening the link between research and industry.

In addition to its research endeavors, BCSIR Laboratories, Dhaka actively mentors MS, MPhil, and PhD students from various universities, nurturing academic excellence and advancing scientific research. These collaborative efforts highlight the institute's dedication to empowering young minds and fostering a culture of innovation that extends far beyond its walls.

I extend my heartfelt gratitude to the Director, scientists and staff of BCSIR Laboratories, Dhaka for their tireless endeavor and significant contribution towards the development of the nation

**Dr. Samina Ahmed**  
Chairman, BCSIR



## Message from the Director of BCSIR Laboratories Dhaka



I am imbued with a profound sense of pride and optimism to introduce the R&D activities & achievements report of BCSIR Laboratories, Dhaka for the fiscal year 2023-2024. This report reflects a detailed account of the wide range of research activities, scientist training programs, and overall progress achieved by the BCSIR Laboratories, Dhaka.

Dhaka Laboratories was founded in 1955 and named BCSIR Laboratories, Dhaka in 1978 through a Presidential Ordinance (Ordinance No. (V) of 1978) which have further grown to encompass extensive scientific and technological research and provide analytical services across seven divisions: biological, chemical, fiber and polymer, pulp and paper, industrial physics, physical instrumentation, and pharmaceutical sciences research divisions. This institute has made significant technological contributions in various areas, playing a pivotal role in advancing societal efforts related to medicine, chemical technology, genomics, environment, nanotechnology, and instrumentation, thereby supporting the nation's development objectives.

This vision of 'New Bangladesh' born in the wake of the historic July Movement, transcends mere ideology; it represents a firm commitment to creating a future where every citizen has the opportunity to thrive. This commitment is highlighted by the recent 'Anti-discriminatory Movement' led by our nation's youth, which emphasizes the importance of equality and justice in creating a society without prejudice where everyone has a chance to succeed. As scientists, our role extends beyond pursuing research excellence; we must serve as a driving force for societal transformation, using science to realize our collective aspirations and benefit all, rather than just a privileged few.

BCSIR Laboratories, Dhaka is a prominent and esteemed institution within BCSIR, dedicated to supporting the industrial sector by developing new products, process and patents, and providing testing services for imports and exports. The institute hosts training programs, workshops, and weekly seminars, empowering scientists to address evolving challenges. It is worth mentioning that an ultra-modern pharmaceutical research laboratory was established in this fiscal year under the annual development project of the Government of Bangladesh, focusing on bioequivalence studies and new drug discovery.

At last, I extend my sincere appreciation to the chairman of BCSIR for the support in enhancing our research quality. I also acknowledge the committee members for their efforts in compiling this report and express deep gratitude to the scientists and staffs of this unit for their unwavering dedication. Together, we are shaping a future where science and society progress hand in hand, building a 'New Bangladesh' that fulfills the aspirations of all its citizens. I am eager to see the progress in the coming years and the ongoing advancements in research at the laboratories.

**Dr. Md. Hossain Sohrab**  
Director  
BCSIR Dhaka Laboratories

## Editorial Committee



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**08. Safaet Alam**  
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Administrative Officer

## BCSIR Dhaka Laboratories



BCSIR Dhaka Laboratories commenced its magnificent journey as the 'East Regional Laboratories' of the Pakistan Council of Scientific and Industrial Research (PCSIR) in 1955. Dr. Muhammad Qudrat-i-Khuda, the eminent scientist and educationist, conceived the idea and took initiative for establishing such a laboratory in this part of the continent. Later, it expanded its domain to several full-fledged multi-disciplinary regional laboratories and institutes. BCSIR Dhaka Laboratories focuses its research and development in the arenas of Biology, Chemistry, Fibre and Polymer, Genomics, Industrial Physics, Pulp and Paper, Physical Instrumentation, Pharmaceutical Sciences etc. In addition with R&D activities, this laboratories renders analytical and testing services to various public and private bodies, entrepreneurs and individuals. Our scientists also supervise a significant number of students of post-graduate, doctoral and post-doctoral level from different universities every year and give them scientific and technical support for their thesis work. BCSIR Dhaka Laboratories is serving the nation dedicatedly for achieving our mandate of scientific and technological advancement, addressing national priorities and thus contributing to the economic vibrancy of the country.

### **Mission of BCSIR Dhaka Laboratories**

To carry out, promote and guide scientific, industrial and technological research on various fields of pure and applied sciences that optimizes the economic, environmental and societal benefits for the people of Bangladesh.

### **Vision of BCSIR**

To be a center of excellence in science and technology.

## BCSIR Dhaka Laboratories at a Glance

Establishment : 1955  
 Present Director : Dr. Md. Hossain Sohrab  
 Total number of research Divisions : 07

### Projects

Total ongoing R&Ds : 44

### Achievements

Number of published papers : 107  
 Number of accepted processes : 05  
 Number of patents : 03 (submitted)

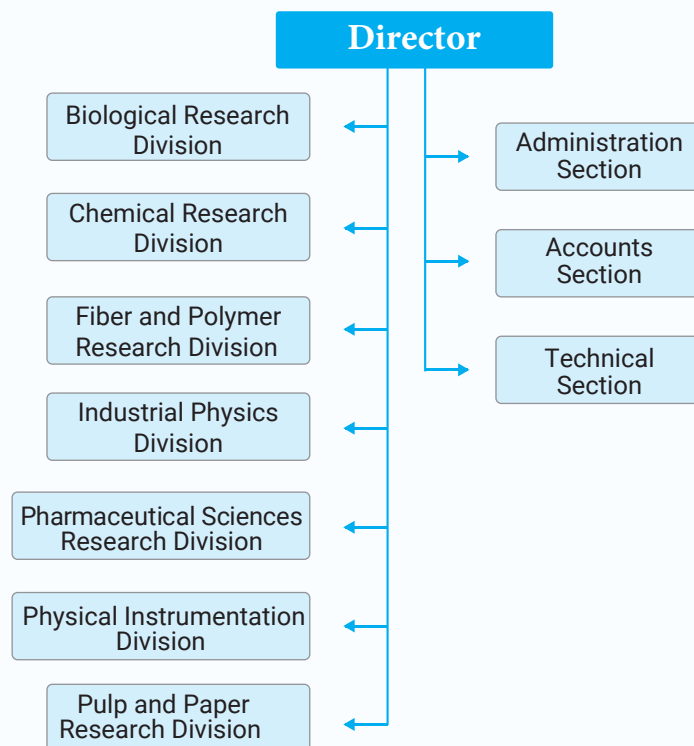
### Services

Analytical services : 3255  
 Thesis MSc/PhD students supervision : 54

### Manpower (Active)

Number of scientists : 90  
 Number of officers : 15  
 Number of staff : 51

## Organizational Chart of BCSIR Dhaka Laboratories



## Table & Contents

○ Biological Research Division (BRD)

01

○ Chemical Research Division (CRD)

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## BIOLOGICAL RESEARCH DIVISION (BRD)



### Biology, A Way of Green Life

Biological research division is the largest division in BCSIR laboratories, Dhaka which conducts research and development activities in six (06) different sections:

- Number of scientists : 28
- Total ongoing R & D : 24
- Analytical services : 3255

- Soil and Environment: Conduct research on Environmental pollution and health risk assessment, Pollution mitigation and remediation techniques, soil health improvement, air quality modeling system.
- Tissue Culture: Biotechnological research along with whole genome sequencing of human, bacteria and viruses as well as metagenomic study using Next Generation Sequencing (NGS) technique.
- Applied Botany: research on economically important algae, medicinal, horticultural and flowering plants culture and producing and marketing Spirulina.
- Plant Pathology: Conducts research on plant fungus, bacteria, algae etc. and isolation, identification and characterization of plant fungi, bioactive metabolites from endophytic fungi and to find out the plant diseases caused by fungus and bacteria and their remedy by biological means.
- Zoology: contriving socio-economic and industrial need base projects through applied zoology and molecular biology.
- Plant Physiology: Study on the expression and application of plant metabolites, development of stress tolerant plants.

### R & D Projects:

#### 01. Airborne multipollutants in and around Dhaka city: Source apportionment and health risk assessment

*Mohamma Moniruzzaman (PL), Md. Kamal Hossain, Md. Ahedul Akbor, Badhan Saha, Afroza Parvin, Afsana Parvin and Priyanka Dey Suchi*

### Introduction:

Air pollution remains one of the most acute problems in metropolitan city like Dhaka. Air pollution with multi-pollutants has become an important issue of urban air quality due to the adverse health effects of these compounds on human. The ever-increasing rate of air pollutants sources such as vehicles, industrial units, and urbanization lead to a significant decline in ambient air quality. The particulate bound different multi-pollutants like heavy metals (chromium, lead, cadmium, mercury, nickel etc.) and organic compounds - polycyclic aromatic hydrocarbons (PAHs), dioxin, furan, BTEX, PFAS are transferred by these fine particles and can enter into respiratory system through breathing. These pollutant compounds were produced by incomplete combustion of fossil fuels and biomass. These pollutants are ubiquitous and not only pollute the close area to the resources but also can travel long distances and pollute receptor sites that are far from their sources.

## Objectives:

- Evaluate the dispersion and deposition pattern of air borne multi pollutants (trace metals, PAH, PCBs, BTEX, PFAS, Dioxin, Furans, Micro plastic and bioaerosols) in ambient air.
- Determine the source apportionment of these pollutants.
- Investigate the airway deposition of pollutants in respiratory system and Risk assessment for different age group of people.
- Develop community multi scale air quality modeling system (CMAQ) for Dhaka city.
- Propose mitigation strategies for specific pollutant using source apportionment and air mass trajectory.

## Work Progress:

Thirteen (13) research articles have been published under this R&D project

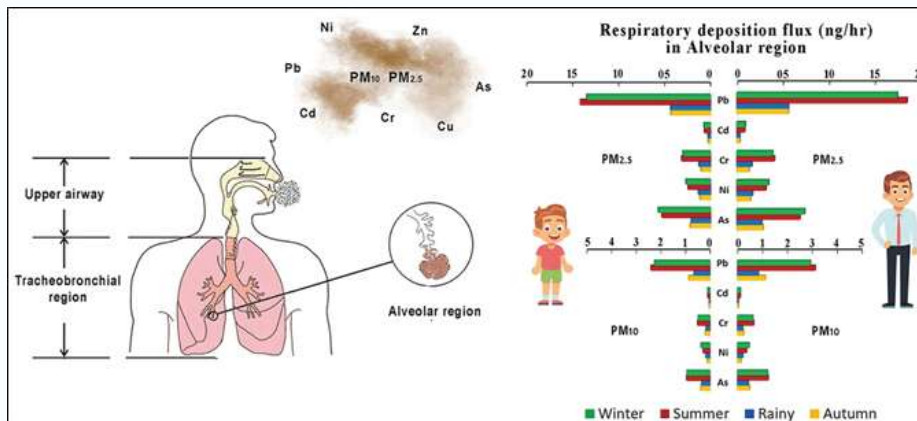


Fig. 1: Seasonal changes and respiratory deposition flux of PM2.5 and PM10 bound metals in Dhaka, Bangladesh

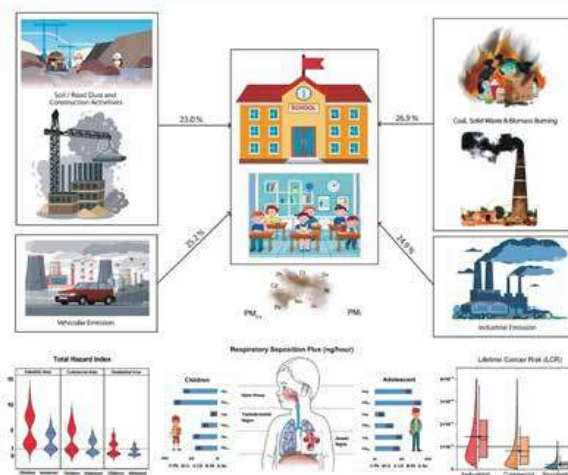


Fig. 2: Impact of Inhaled Fine-Submicron Particle-Bound Metals on School-Aged Children in Dhaka City

## 02. Spatial distribution and ecological risk assessment of trace metals in tidally active delta in Bangladesh

Md. Kamal Hossain (PL), Mohammad Moniruzzaman, Badhan Saha and Afroza parvin

### Introduction:

This study aimed to evaluate the concentration, distribution, along with the environmental and human health impact of eight heavy metals-Pb, Cr, Cu, Cd, Zn, Mn, Ni, and As-on St. Martin’s Island in the northeastern Bay of Bengal, and in doing so to help implement new legislations to protect the island. Focusing on the island’s significance as a tourist destination, with seafood being a prominent dietary component, three sample types (sediment, seawater, and crustaceans) were selected for a comprehensive assessment, considering seasonal

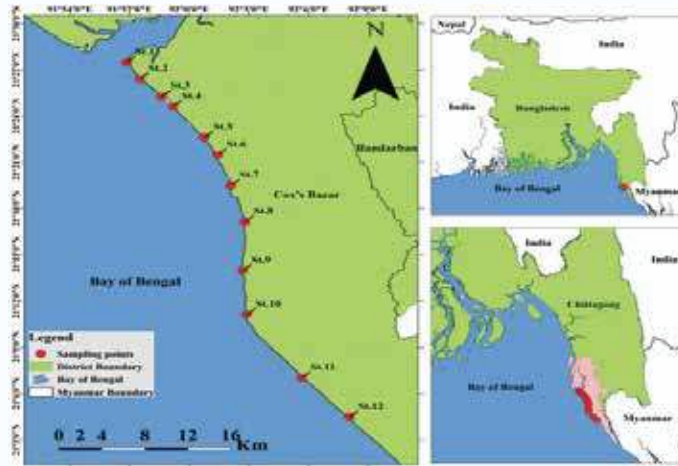


Fig. : The location of the area of interest with sampling locations depicting the 12 sites

**Objectives:**

- to assess the degree of contamination
- to identify the possible source and distribution of metals

**Work Progress:**

- Metal contamination was of no concern for sediment samples
- Water samples displayed higher than the suggested concentration by USEPA
- The health risk index displayed a higher risk for children consuming crustaceans
- As and Ni had the highest probability of producing cancer
- Most metals around the island were of anthropogenic origin

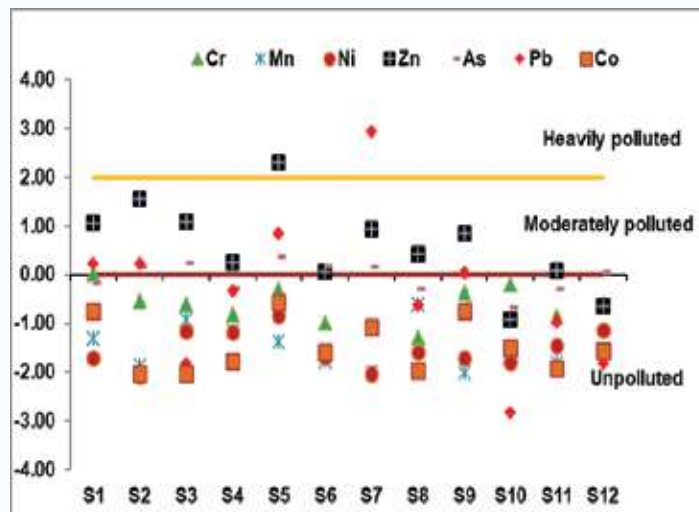


Fig. 2: Geo-accumulation of metals in Cox’s Bazar. Most metals apart from Pb and Zn do not display any signs of hazardous accumulation

**03. Exploring the emerging airborne pollutants and their derivatives on child health in Dhaka**

*Afroza Parvin (PL), Mohammad Moniruzzaman, Md Kamal Hossain, Badhan Saha and Afsana Parvin*

**Introduction:**

Alarming threat to human health by particulate matter (PM) inhalation is closely related with its size, physico-chemical properties. Particles less than 2.5 μm can enter the alveolar regions, mix with blood, and prolapse to organs outside of the lungs, including the brain, heart, and liver. Multiple investigations have demonstrated that metals constitute a substantial portion of PM and are closely linked to detrimental health outcomes including reduced lung function, cardiovascular disorder, kidney dysfunction, strokes, tuberculosis, bronchitis, and chronic cough.

### Objectives:

- Assess the level of emerging pollutants and their derivatives in the school environment
- Characterize the composition, seasonal variation, and pollutant sources in the school of Dhaka
- Investigate the deposition of airborne pollutants in the respiratory
- Analyze the risk assessment of pollutants for children

### Work Progress:

- PM sample was collected from the school
- The impact of PM bound metal on child health was identified and characterized
- Published Paper (Afroza Parvin, Mohammad Moniruzzaman, Md Kamal Hossain, Badhan Saha, Afsana Parvin, Priyanka Dey Suchi et al. "Multivariate toxicological assessments of inhaled fine-submicron particle-bound metals in school-aged children of Dhaka city." Atmospheric Pollution Research, 2025, 102545)

## 04. Source apportionment and health risk assessment of emerging air pollutants in industrial areas of Dhaka

*Badhan Saha (PL), Mohammad Moniruzzaman, Md. Kamal Hossain, Md. Ahedul Akbor, Md Humayun Kabir, Afroza Parvin and Afsana Parvin*

### Introduction:

Emerging air pollutants (EAPs) in the global atmosphere pose serious risks to the environment and human health. While international research has focused mainly on terrestrial and more recently atmospheric ecosystems, studies on EAPs in Bangladesh especially in the periphery of small and medium industrially active areas in Dhaka city are scarce. More significantly the pollutants carried by the particulate matters of 2.5, 1, and less than 0.1  $\mu\text{m}$  of sizes posed significant health risk as these pollutants can penetrate deep into the lungs, enter the bloodstream, and affect vital organs like the brain, heart, and liver. Few studies have explored EAP types, sources, or health impacts in Dhaka's industrial outskirts, limiting effective air quality management. Different particulate bound metals are linked to lung, cardiovascular, kidney diseases, strokes, tuberculosis, and respiratory issues. Identifying specific EAPs and their sources is vital to reduce pollution risks and protect public health in Bangladesh.

### Objectives:

- Identify and quantify emerging air pollutants in the textiles, cookware, plastic recycling, chemicals, batteries, tanneries, and metallurgical industries in Dhaka
- Determine the sources and evaluate the industrial contributions to these emerging air pollutants in industrial areas of Dhaka
- Assess airway deposition of pollutants in the respiratory system and risk assessment for different age group of peoples
- Develop and recommend effective air quality management plans to mitigate the risks posed by emerging pollutants

### Work Progress:

- Different particulate matter samples of various sizes (PM<sub>2.5</sub>, PM<sub>1</sub>, and ultrafine particles less than 0.1  $\mu\text{m}$ ) from multiple small and medium industrially active areas in Dhaka, including Postogola, Dholaikhal, Lalbagh, Keranigan, and Kamrangirchar, have been collected
- Detailed analysis of metals and trace metals present in the collected particulate matter across all size fractions (2.5  $\mu\text{m}$ , 1  $\mu\text{m}$ , and <0.1  $\mu\text{m}$ ) has been done
- Comprehensive data interpretation to identify patterns and pollutant concentrations in different industrial areas in different-sized particulate matter has been performed
- Health risk assessments based on the metal concentrations in the particulate matter to evaluate potential impacts on human health have been carried out
- Sample collection from other industrially active areas in Dhaka is going on.

## 05. Formulation of safe and nutritious poultry feed using microalgae and macrophytes

*Nahid Sultana (PL), Mahmuda Begum, Md. Rakibul Hasan, Shanzida Islam and Md. Ahedul Akbor*

### Introduction:

The development of poultry feed using microalgae and macrophytes offers a sustainable and innovative alternative to traditional protein sources. Microalgae, such as Spirulina and Chlorella, are rich in high-quality protein, essential fatty acids, vitamins, minerals, and bioactive compounds. Similarly, macrophytes like duckweed provide significant protein, minerals, and beneficial pigments. These alternative ingredients can enhance the nutritional value of poultry feed, boost bird health, and improve the quality of meat and eggs, while also reducing the environmental footprint associated with conventional feed sources.

### Objectives:

- To develop a nutrient enriched antibiotic free poultry feed
- To compare the quality of egg and meat in comparison to existing market feed
- To determine the feasibility of microalgae and macrophytes in improving poultry diet

### Progress Achieved:

- Spirulina: Best for extending laying period and improving egg weight with high protein, moderate amino acid profile, and lowest lipid content in eggs. Hepatoprotective benefits are observed.
- Seaweed: Yield highest total egg number and moderate egg quality improvements, rich in beneficial lipids but lowest for most beneficial amino acids
- Duckweed: Best amino acid enrichment and can moderately replace protein sources at up to 10-15% inclusion. Over supplementation (>20%) harms growth and production
- Implementation: For optimal productivity and quality, use recommended inclusion rates. Over-supplementation, particularly with duckweed, reduces performance

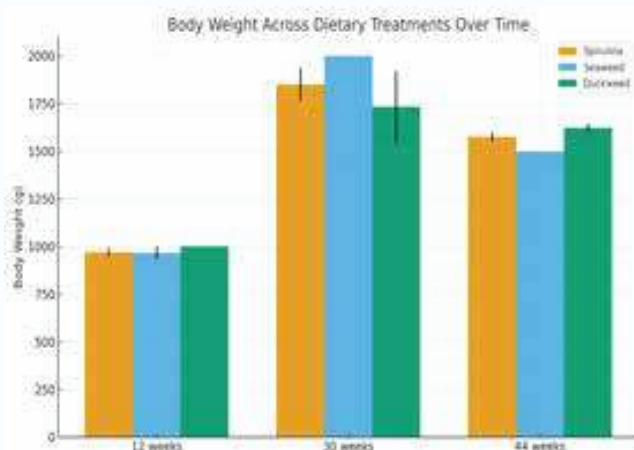


Fig. 1: Growth Performance of hens treated

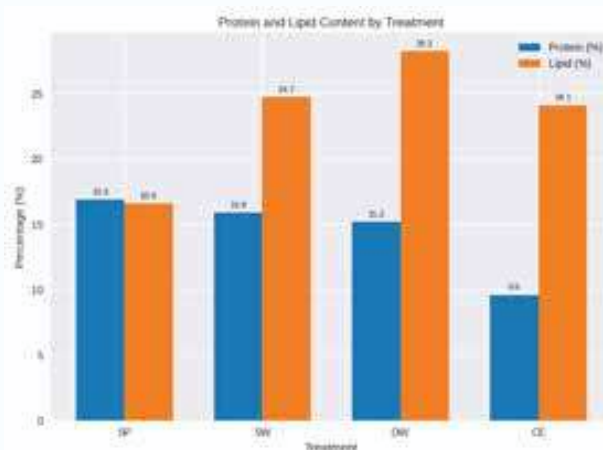


Fig. 2: Protein and Lipid content in eggs from experiment

## 06. Development of molecular biomarkers for antibiotic and heavy metal pollution in fish and their microbes

*Mahmuda Begum (PL), Mohammad Moniruzzaman, Nahid Sultana, Md. Humayun Kabir, Md. Murshed Hasan Sarkar, Md. Mahfujul Hasan and Shanzida Islam*

### Introduction:

In a developing country like Bangladesh, environmental pollution has become an alarming issue. Heavy-metals such as copper (Cu), zinc (Zn), lead (Pb), nickel (Ni) and chromium (Cr) may cause serious health risk to fish and human body due to their high persistence accumulation and bioaccumulation nature. In addition, antibiotics are increasingly

applying in expanded aquaculture practices to treat infectious diseases and to promote growth performances of fish. The misuse of antibiotics in fish feed may affect the physiology of fish (e.g., growth), and dysbiosis (changes in microbial changes) and often induce to growth of resistant bacteria to specific antibiotics. The development of a successful biomarker of metal and antibiotic pollution to assess ecological risk for fish could be a sensitive tool for bio-monitoring purposes.

### Objectives:

- Analysis of heavy metals and antibiotic residue concentration in contaminated and exposed water, soil and fish body
- Determination of correlation of metal and antibiotic resistance genes expression levels and SNPs variation with metal-antibiotic residue
- Genetic analysis of metal and antibiotic resistance genes of those fish and their microbes to develop molecular biomarkers

### Work Progress:

- Antibiotic (Oxytetracycline) deposition in Tengra (*Mystus cavaseus*) fish muscle was detected in 53% of samples which showed increasing trend towards higher dose (Fig.1)
- Gut microbial diversity was decreased with clear taxonomic shifts at the phylum to species level along with increasing resistance profiles among isolates from the antibiotic treated fish (Fig. 2)
- Biochemical & haematological changes were observed in Koi fish (*Anabas testudineus*) due to heavy metal (Cr, Cd and Pb) accumulation toxicity along with its effect on gene expression (Metallothionine, Tnf and IL-1) levels

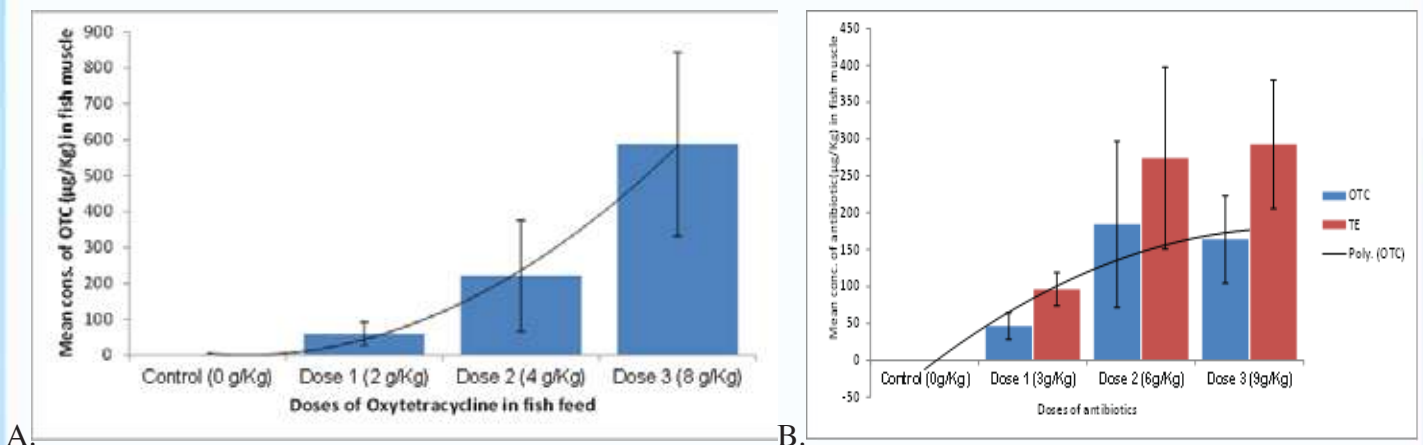


Fig. 1: Detection of antibiotic residue concentration (Mean ±SE) in Tengra fish muscle under exposure to 3 different doses of Tetracyclines for 90 days.

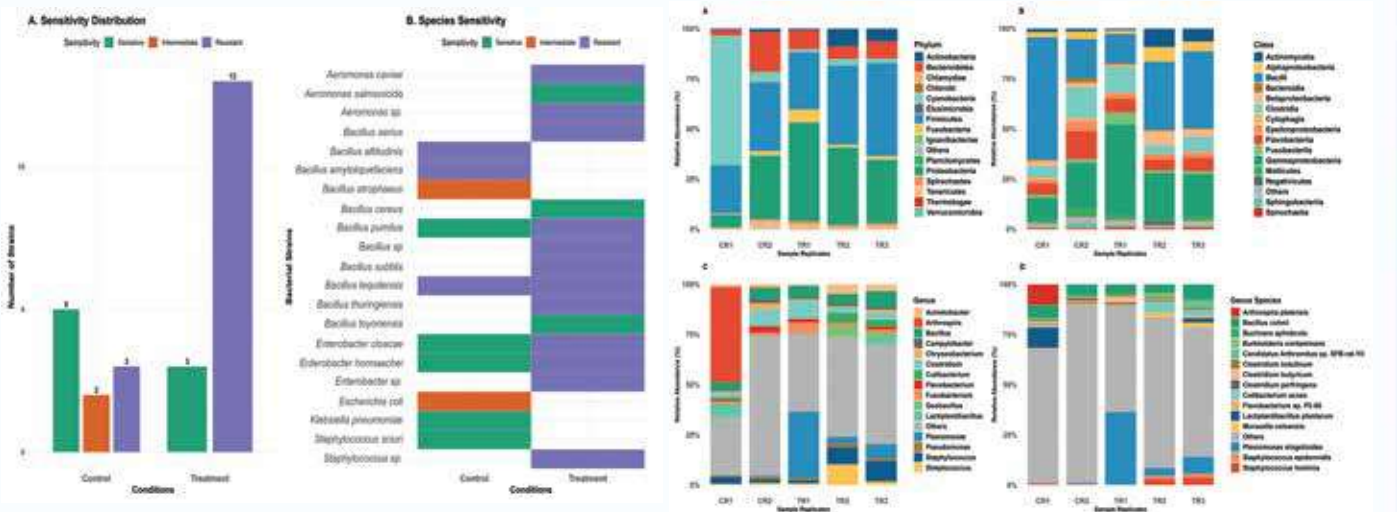


Fig. 2: A) Metagenomic analysis of gut microbiota showed the taxonomic shifts with a decline in Proteobacteria and Bacteroidetes but with an increase in Firmicutes and the enrichment of antibiotic-tolerant lineages. B) Antibiotic susceptibility test showed that resistant strains were significantly more prevalent in the treatment group, with 13 resistant isolates compared with only 3 in the control group.

## 07. Development of breeding line of a model fish for genotoxicity and biomedical research

Mahmuda Begum (PL), Nahid Sultana, Shanzida Islam, Saima Mollick and Md. Sakhawat Hossain

### Introduction:

A model organism is a non-human species that is suitable for studying specific biological phenomena (e.g., trait, disease, medicine etc.) due to its similarity to humans. Zebra fish (*Danio rerio*) is an excellent and useful vertebrate model organism in several arena of scientific research such as genetics, pharmaceutical, medical, environmental toxicology or aquaculture. Few studies on Zebra fish of Bangladesh focused on their habitat preferences and distribution pattern, observation of their diet, growth and recruitment and genetic diversity of wild-type fish. This study therefore, sets out to fill this gap by developing several zebra fish breeding lines to study genotoxicity and drug development for biomedical research.

### Objectives:

- To establish the facility equipped with large-scale breeding and standalone system for maintenance of different breeding lines
- To create mutant, transgenic and wild-type lines with F1, F2, F3 generations of Zebra fish model system
- To observe the effect of isolated active compound on Zebra fish embryos for the development and screening of drug in Bangladesh

### Work Progress:

- Capacity build-up with improved laboratory set-up with advanced facilities is going on for Zebra fish lines
- Method of breeding to create F1 and F2 generation from three wild sources has been established successfully in the laboratory condition (Fig.1)
- Exo-toxicity test by using Zebrafish embryo has been done with crude extracts of five anti-diabetic plants (Neem, Moringa, Ivy gourd, Fenugreek and Indian Black berry) targeting to develop diabetic drug (Fig. 2)

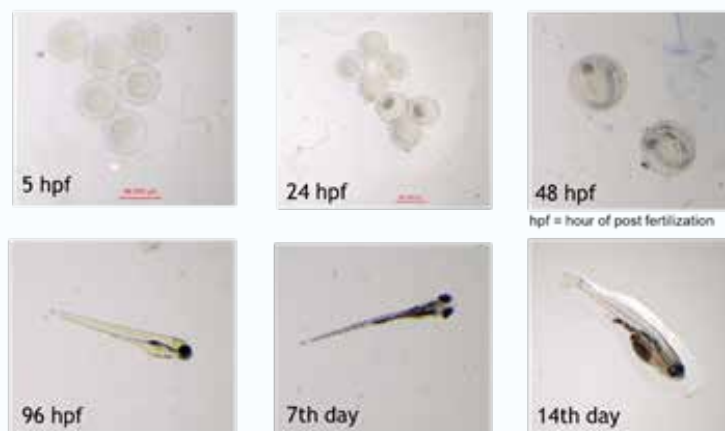


Fig. 1: Developmental stages of lab-raised Zebra fish for the creation of F1 generation from the wild fish.

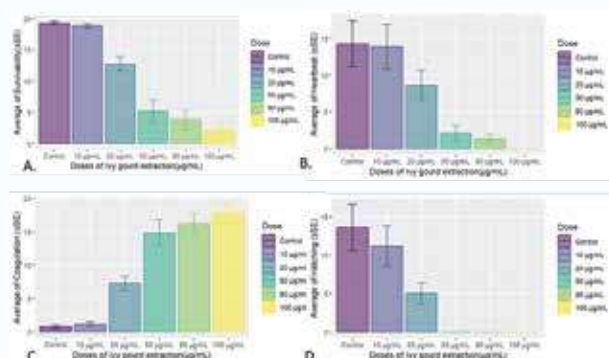


Fig. 2: Effect of Ivy gourd (*C. grandis*) extracts exposure on the survivability, coagulation, heartbeat and hatching of Zebra fish embryo for the period of 96 hours duration.

## 08. Formulation of fish feed using ZnO nanoparticles

Shanzida Islam (PL), Syed Farid Uddin Farhad, Nahid Sultana, Mahmuda Begum and Saima Mollick

### Introduction:

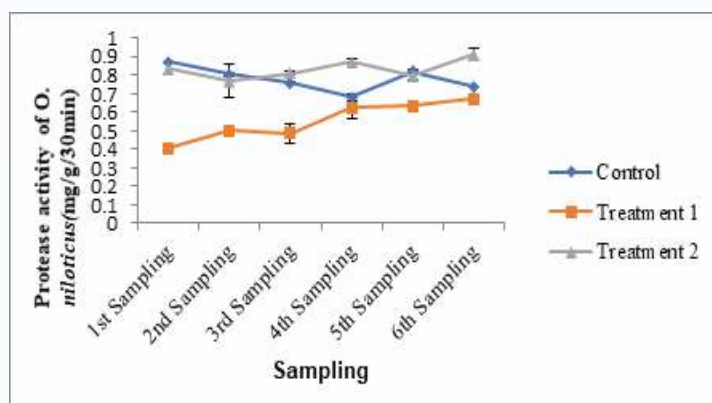
Nanotechnology is the study and manipulation of individual atoms and molecules. The core application in aquaculture of this technology is water treatment. Different nanoparticles (1-100nm in size) are used in aquaculture for different purposes, among them ZnO gained a special attention for its environment friendly characteristics. It influences the growth performances, behavior, blood biochemistry, immunity, hormones, antioxidant and enzymes of fish. In our experiment we used ZnO nanoparticles for evaluate the growth performance. We used synthesized and commercial ZnO nanoparticles. We prepared 3 types of fish feed, one was without ZnO NPs named Control, second one with chemically synthesized ZnONPs named Treatment 1 and third one was added with commercial ZnO named Treatment 2. Except the ZnO NPs, all ingredients of feed were same for these three fish feeds. This was a 90 days experiment. We used 6 semi natural culture pond.

### Objectives:

- Formulate a fish feed by using ZnONPs
- Evaluate the antibacterial activities of ZnO nano particles
- To observe the growth performance, enzymatic activities and histopathological changes of 2 selective species: Nile Tilapia (*Oreochromis niloticus*) and Tengra (*Mystus tengra*)

### Work Progress:

- Proximate composition of feed ingredients was done
- The size of ZnO nanoparticles was done by TEM analyzer. The antibacterial activities of ZnO nano particles were done
- Prepared two types of feed using ZnO nanoparticles, among them one ZnO NPs was synthesized in BCSIR Dhaka laboratories and another from commercial ZnO NPs, One control feed was also prepared
- Every 15 days sampling was done for check out the growth performance, hematological parameters, water quality parameters etc
- Feeding trail is ongoing on tilapia, 6th sampling was done



Name of Bacteria	Antimicrobial activity of ZnO nanoparticles						Standard Ciprofloxacin
	ZnO (Synthesized)			ZnO (Commercial)			
	250µg	150µg	100µg	250µg	150µg	100µg	
	zone of inhibition (mm)						
<i>Bacillus megaterium</i>	15±1.00	12.5±0.5	10.5±0.5	16±1.00	14.33±1.15	12.67±1.53	39±1.00
<i>S. aureus</i>	14.17±0.29	12.67±1.53	10.17±0.29	15.17±0.29	13.5±0.5	11.17±0.29	38.5±0.50
<i>E. coli</i>	-	-	-	-	-	-	37±1.00
<i>Salmonella typhi</i>	-	-	-	-	-	-	40.17±0.29

## 09. Extraction and standardization of phytochemicals from *Spirulina* sp.

Chapol Kumar Roy (PL), Natasha Nafisa Haque, Md. Hemayet Hossain, Md. Ahedul Akbor, Evana Parvin Lipy, Badhan Saha and Md. Hossain Sohrab

### Introduction:

Bioactive compounds are capable of modulating metabolic processes and demonstrate positive properties such as antioxidant effect, inhibition of receptor activities, inhibition or induction of enzymes, and induction and inhibition of gene expression. Therefore, bioactive compounds are important constituents of active pharmaceutical ingredients. As a result, we extracted phycocyanin from *Spirulina* sp. in our laboratory. As well as we are also identified phenolic compounds, protein concentration, and gamma-linolenic by HPLC.

## Objectives:

- Isolation and characterization of phytochemicals constituents
- Standardization of all phytochemicals constituents as an aspects of Bangladesh
- Evaluation its effects on human health in Bangladeshi populations

## Work Progress:

- Identified phenolic compounds, protein concentration, and gamma-linolenic by HPLC
- Extraction, purification and characterization of phycoyanin from Spirulina has been done
- Now, under review of manuscript to RSC Chemical Biology Journal

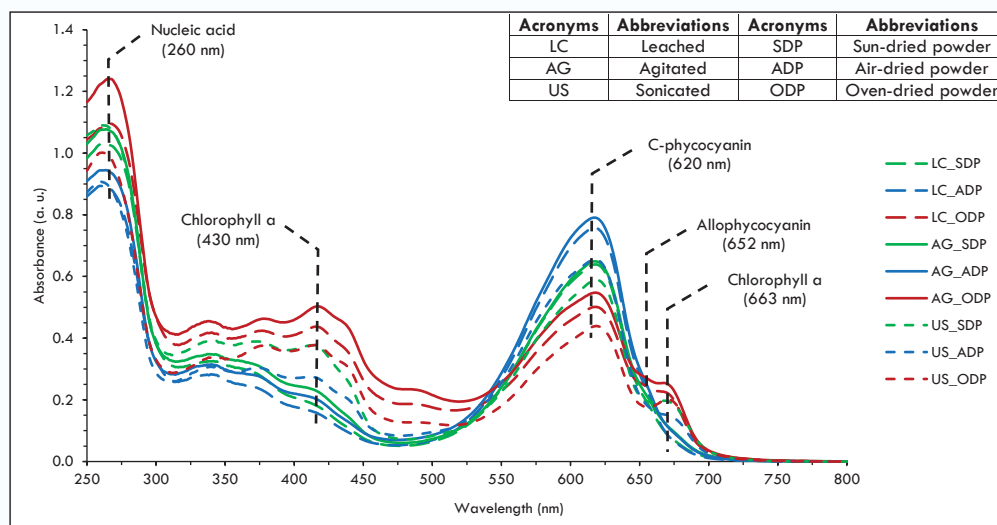


Fig. : UV-Vis Spectrum Analysis of Extracted C-PC

## 10. Formulation of aquatic macrophyte and marine algae based organic fertilizer and its comparative study on solanaceae vegetables

*Natasha Nafisa Haque (PL), Chapol Kumar Roy, Elina Akther Zinat, Mohammad Moniruzzaman, John Liton Munshi and Md. Rakibul Hasan*

### Introduction:

The excessive use of chemical fertilizers in modern agriculture has resulted in nutrient imbalance, soil degradation, and reduced microbial activity. To ensure sustainable crop production, there is an increasing need for eco-friendly organic fertilizers derived from natural and renewable resources. Aquatic macrophytes and marine algae are rich in organic carbon, macro- and micronutrients, and bioactive compounds that enhance plant growth. Utilizing these abundant aquatic biomasses for organic fertilizer formulation improves soil fertility, nutrient availability, and microbial activity while also supporting waste management and environmental conservation.

The Solanaceae family, including tomato, brinjal, and chili, demands balanced nutrient management for optimal yield. Hence, evaluating the effectiveness of aquatic macrophyte- and marine algae-based fertilizers on these crops is essential. This study focuses on formulating such biofertilizers and assessing their comparative effects on the growth and yield performance of Solanaceae vegetables to promote sustainable and low-cost agricultural practices

### Objectives:

- Isolation and characterization of phytochemicals constituents
- Standardization of all phytochemicals constituents as an aspects of Bangladesh
- Evaluation its effects on human health in Bangladeshi populations

## Work Progress:

- Identified phenolic compounds, protein concentration, and gamma-linolenic by HPLC
- Extraction of phycocyanin from *Spirulina* has been done
- Characterization of phycocyanin is ongoing

## 11. Identification and bioactive potential of endophytic fungi isolated from *Lantana camara* L.

*Mst. Nadira Begum (PL), Mst. Elina Akther Zenat, Kutub Uddin Ahamed, Md. Saiful Islam and Md. Hossain Sohrab*

### Introduction:

Endophytic fungi are microorganisms that live inside plant tissues without causing any deleterious symptoms. Fungal endophytes play a major role in plant growth-promoting activities, such as nitrogen fixation and the production of plant growth regulators. Recently, endophytes have gained attention from scientists as they are a good source of outstanding secondary metabolites that are useful to the plant for its survival. *Lantana camara* is a very important flowering plant under the family Verbenaceae, found in tropical areas. This is very notorious weed, harmful to natural and agroecosystems. Despite its tendency as invasive plant species, *Lantana camara* is known to be an important medicinal plant with several medicinal uses in the traditional medication system. This plant contains various chemical constituents such as alkaloids, glycosides, steroids, saponins, flavonoids, coumarins, tannins, carbohydrates, hydroxy anthraquinones, anthraquinone glycosides, proteins, phytosteroids, fixed oils, fats, and triterpenoids. Numerous pharmacological studies have demonstrated that this plant possesses diversified therapeutic properties, including antiparasitic, antimicrobial, antioxidant, anticancer, anti-inflammatory, analgesic, wound healing, hypoglycemic, hepatoprotective, anxiolytic antiurolithiatic, antihemorrhoidal, thrombin inhibition, and many other effects. Therefore, the present research work has been undertaken to isolate and characterize bioactive compounds from endophytic fungi associated with *Lantana camara* L.

### Objectives:

- Isolation and Identification of endophytic fungi from *Lantana camara* L.
- To screen the fungal strains based on their antioxidant, antimicrobial, and preliminary chemical properties
- Isolation, purification, structure elucidation and characterization of bioactive compounds from the fungi

### Work Progress:

- Plant ample collection and isolation of endophytic fungi
- A total of eight endophytic fungal isolates were obtained and morphologically characterized up to the species level. The identified taxa included *Xylaria* sp., *Fusarium* sp., *Colletotrichum* sp., *Diaporthe* sp., *Macrophomina* sp., *Apiospora* sp., *Nemania* sp., and *Nigrospora* sp. Small-scale culture and extraction were done
- Preliminary chemical screening of isolated endophytic fungi was done



Fig. 1: Isolation of Endophytic fungi from *Lantana camara* L.

## 12. *Agrobacterium*-mediated genetic transformation of PspA gene into *Lactuca sativa* L.

*Shahina Akter (PL), Md. Ahashan Habib, Tanjina Akhtar Banu, Md. Murshed Hasan Sarkar, Mousona Islam, Barna Goswami and Evana Parvin Lipy*

### Introduction:

This project pioneers the development of an edible vaccine against pneumococcal diseases by genetically engineering lettuce to express the Pneumococcal surface protein A (PspA). Building on our prior success in constructing an effective plasmid vector, *Agrobacterium*-mediated transformation has been employed to introduce the PspA gene into *Lactuca sativa* L. The core objective is to create a stable, transgenic lettuce line that produces the PspA antigen. This

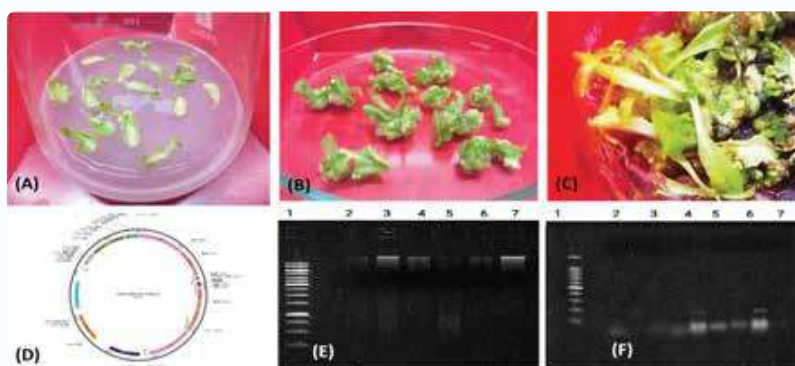
innovative, plant-based approach aims to provide a cost-effective, scalable, and easily administrable vaccine solution to combat a major global health challenge.

### Objectives:

- Introduce the constructed plasmid vector containing the PspA gene into lettuce using *Agrobacterium*-mediated transformation
- Validate the successful integration of the PspA gene into the lettuce genome through molecular techniques such as PCR
- Assess and quantify the expression levels of the PspA protein in transgenic lettuce plants using Western blotting and ELISA to ensure effective protein production

### Work Progress:

- Developed an in vitro regeneration protocol for lettuce cultivar Grand Rapids using cotyledons as explants
- Factors influencing transformation efficiency have been optimized, including optical density, incubation period, and co-cultivation period



**Fig. :** (A-C) Different stages of in vitro regeneration. (D) Plasmid construct containing the PspA gene. (E) Agarose gel electrophoresis confirming plasmid isolation from *A. tumefaciens*: Lanes 2-3 (ds-red zein), 4-5 (gamma zein), and 6-7 (alpha zein). (F) PCR confirmation of the target gene in *Agrobacterium* LBA4404: Lane 3 (alpha zein), Lanes 7-10 (ds-red zein primers).

## 13. Xanthan gum extraction from *Xanthomonas* spp. isolated from local plant source

*Tanjina Akhtar Banu (PL), Swapan Kumar Ray, Md. Murshed Hasan Sarkar, Barna Goswami, Sanjana Fatema Chowdhury and Nizam Uddin Bulbul*

### Introduction:

The project was carried out for the production and characterization of industrially demandable xanthan gum from *Xanthomonas* bacteria. Xanthan gum is a microbial high molecular weight exo-polysaccharide produced efficiently by Gram-negative bacteria of the genus *Xanthomonas*. In order to obtain the best configuration of gum it is important to identify the various strains of *Xanthomonas* and optimize the fermentation condition. . In the present study we will try to isolate and identify *Xanthomonas* Spp from different plants like rice, citrus fruits, cabbage, capsicum, brassica and evaluate its capacity to produce xanthan gum, etc.

### Objectives:

- Isolation and confirmation of xanthan gum producing *Xanthomonas* spp from various local plant source (Cabbage, Rice, Lemon)
- Selection of suitable media and evaluate the capacity to produce xanthan gum from *Xanthomonas* spp
- Fermentation process optimization

### Work progress:

- Xanthan gum producing strain *Xanthomonas oryzae* has been isolated and identified successfully
- Xanthan gum production was observed in three different carbon source media where maximum yields were recorded in whey (16.4 g/l) at pH 7, followed by carrot juice(6.8 g/l) and Ym media (2.8 g/l)
- Xanthan gum from three source was confirmed by FT-IR analysis



**Fig. :** (A-C) Different stages of in vitro regeneration. (D) Plasmid construct containing the PspA gene. (E) Agarose gel electrophoresis confirming plasmid isolation from *A. tumefaciens*: Lanes 2-3 (ds-red zein), 4-5 (gamma zein), and 6-7 (alpha zein). (F) PCR confirmation of the target gene in *Agrobacterium* LBA4404: Lane 3 (alpha zein), Lanes 7-10 (ds-red zein primers).

## 14. Enhancement of secondary metabolites in in vitro cultures of important medicinal plant *Withania somnifera* (L.) Dunal with methyl jasmonate elicitor

**Barna Goswami (PL), Md. Ahashan Habib, Shahina Akter, Tanjina Akhtar Banu, Md. Humayun Kobir, Fatema Moni, Sanjana Fatema Chowdhury and Muhammad Mohi Uddin**

### Introduction:

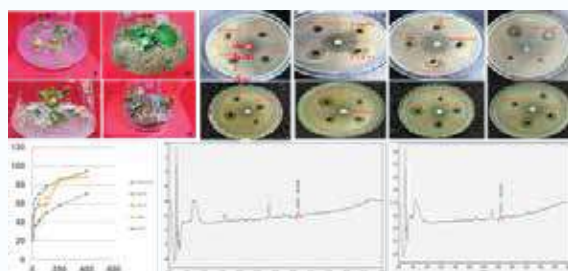
*Withania somnifera* L. an important medicinal plant is locally known as Ashwagandha. The leaves of this plant contain withanolides which are the active pharmaceutical ingredients like Withaferin-A that exhibits anti-bacterial and anti-tumor properties; roots contain a number of alkaloids like somniferine, withasomnine etc. which are prescribed for female disorders, rheumatism and dropsy. The development of plant tissue culture system can offer an opportunity for producing drugs from the leaves and roots of *W. somnifera* in the laboratory. Although earlier attempts have been made for the propagation of *W. somnifera* through tissue culture (Kulkarni et al. 2000; Manickam et al. 2000) but considerable effort is still required to conserve and also for commercial supply of the plant. Therefore, the present study was carried out to establish a suitable protocol for large scale in-vitro propagation of *W. somnifera* by direct and indirect shoot regeneration.

### Objectives:

- Establishment of suitable regeneration protocol for in vitro regeneration and callus culture from various explants like leaf and node
- Optimization of Elicitation conditions to improve the productivity of Withanolides in in vitro culture of *W. somnifera*
- Determination of Withanolides contents (Withanolide A) from field grown plants, in vitro grown plants, callus tissue and cultured roots elicited with Methyl Jasmonate

### Work progress:

- Regeneration of *W. somnifera* plants using elicitor-induced tissue culture techniques is completed
- Assessment of antioxidant activity of in vitro and elicitor-induced regenerated plant extracts using DPPH (2,2-Diphenyl-1-picrylhydrazyl) are completed
- Evaluation of total phenolic and total flavonoid content from in vitro and elicitor-induced regenerated plant extracts are done
- Examination of antimicrobial activity of in vitro and elicitor-induced regenerated plants against pathogenic microorganisms are conducted
- Quantification of major bioactive compounds specially withanolide A in the plant extracts using high-performance liquid chromatography (HPLC) against standard are completed



**Fig. :** In vitro root formation, assessment of antimicrobial activity, antioxidant activity of elicitor induced regenerated plants of *Withania somnifera* and quantification of Withanolide A using HPLC.

## 15. In vitro regeneration and agrobacterium-mediated genetic transformation of chili pepper (*Capsicum* spp.)

*Barna Goswami (PL), Shahina Akter, Tanjina Akhtar Banu, Mousona Islam Murshed Hasan Sarker and Muhammad MohiUddin*

### Introduction:

Chili pepper (*Capsicum* spp.) is an indispensable ingredient employed for food preparation in the world. The conventional method of chili plant propagation using seeds is restricted by the short span of viability and low germination rate of seeds. The production of chili pepper is also affected by biotic and abiotic factors that reduce its crop quality and yield. Every year in Bangladesh chili is imported from other countries. Plant tissue culture technique provides an alternative method of propagating novel genotypes in chili. Agrobacterium-mediated genetic transformation technique allows us to develop chili pepper with improved agronomic trait by inserting specific important gene like salinity tolerant, drought tolerant, antifungal protein gene etc.

### Objectives:

- Establishment of suitable protocol for in vitro plant regeneration of chili pepper from various explants like cotyledonary leaf, shoot tip, node etc.
- Development of a suitable protocol for Agrobacterium-mediated genetic transformation (optimization of different parameters, determination of selection pressure, selection of transformed shoots) with marker gene
- Characterization of putative transgenic plants using appropriate molecular techniques

### Work progress:

- In vitro seed germination protocol is established
- Surface sterilization protocol is established
- Establishment of In vitro regeneration protocol are ongoing
- Agrobacterium-mediated transformation experiments are on going

## 16. Prevalence of inapparent dengue virus infection in Bangladesh and development of Rt-PCR based dengue virus detection kit

*Sanjana Fatema Chowdhury (PL), Md Ahashan Habib, Tanjina Akhter Banu, Murshed Hasan Sarker, Mousona Islam and Showti Raheel Naser*

### Introduction:

Dengue virus infection is a major global health problem, with an estimated 390 million infections annually, of which approximately 300 million are subclinical. These inapparent infections, which lack typical clinical manifestations, contribute significantly to the overall burden of dengue, often going undetected by traditional surveillance programs that focus on symptomatic cases (Endy, T.P., 2011). Studies have shown that individuals with inapparent dengue can still transmit the virus to mosquitoes, thereby playing a crucial role in the ongoing transmission of dengue during non-epidemic periods.

Additionally, existing antibody-based detection kits for dengue often yield false negative results, particularly in NS1 negative cases, underscoring the need for more reliable diagnostic methods. RT-PCR has been identified as a superior alternative due to its higher sensitivity and specificity (Lai, Y.L., 2007).

### Objectives:

- To determine the Prevalence and Epidemiology of Inapparent Dengue Infections
- To develop and validate an RT-PCR Based Dengue Virus Detection Kit
- To compare its performance with existing antibody-based methods

### Progress Achieved:

- Sample collection is ongoing
- Primer design and validation is completed
- PCR conditions are optimized and qPCR condition optimization is ongoing

## 17. Isolation and characterization of biopolymer producing bacteria from soil

Showti Raheel Naser (PL), Md. Ahashan Habib, Tanjina Akhtar Banu, Md. Murshed Hasan Sarkar, Barna Gowsami and Sanjana Fatema Chowdhury

### Introduction:

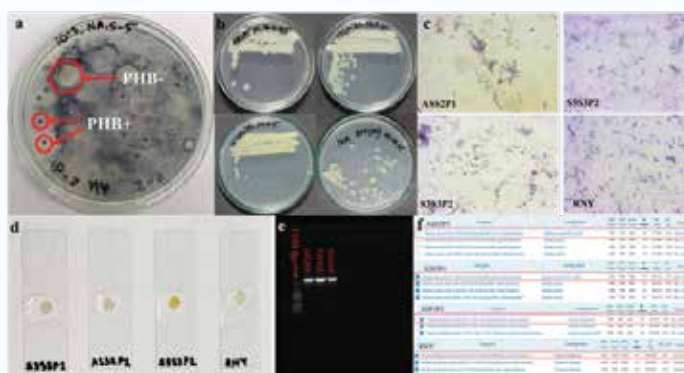
The immense use of petroleum-based synthetic plastics poses a negative impact on the environment as well as humanity due to their nonbiodegradable and non-recyclable property and increases the need of good alternatives to limit use of synthetic plastics. Polyhydroxybutyrate (PHB), an intracellular granule produced by bacteria, may act as an alternative biopolymer to synthetic nondegradable plastics as it has characteristics similar to other petroleum-based plastics. So this study involves isolating and screening for biopolymer-producing bacteria found locally in the environment of Bangladesh and characterizing and identifying the local species using different biochemical tests and molecular techniques to characterize its capacity to produce biopolymers especially Polyhydroxybutyrate (PHB).

### Objectives:

- To isolate bacteria from soil across different regions of Bangladesh
- To screen isolated bacteria for biopolymer production using staining techniques and biochemical assays
- To characterize isolated bacteria through morphological, physiological, and biochemical analyses
- To identify isolated bacteria at the species or genus level using molecular techniques such as PCR and DNA sequencing

### Work progress:

- Sample collection is completed
- Primary screening and isolation of PHB producing bacteria is completed
- Characterization and molecular identification of PHB producing bacteria is ongoing
- Sanger sequencing and 16sRNA PCR of the selected isolates is completed



**Fig. :** (a-f): a). Isolation of PHB+ bacteria b). Colony characterization of the PHB+ isolates c). Gram staining of the isolates d). Biochemical characterization of the isolates e). 16sRNA PCR run of selected isolates e). Identification of the isolates after Sanger Sequencing

## 18. AI-Driven development and validation of disease prediction and detection methods

Syed Muktadir Al Sium (PL), Md. Murshed Hasan Sarkar and Sanjana Fatema Chowdhury

### Introduction:

The escalating burden of lung cancer in Bangladesh necessitates innovative approaches for early detection, prevention, and treatment. The convergence of genomics, big data analytics, and advanced computational technologies offers unprecedented opportunities to revolutionize healthcare. This project is driven by the need to harness the power of genomic, environmental and clinical data to address the pressing healthcare challenges faced by the Bangladeshi population. Lung cancer poses a significant public health burden in Bangladesh. Despite international progress in genomics and AI, national-level research remains preliminary. This study proposes a comprehensive approach to identify genetic markers associated with lung cancer and validate them in the Bangladeshi population. The rationale is that integrating genomics with AI will allow for robust predictive models to facilitate early detection.

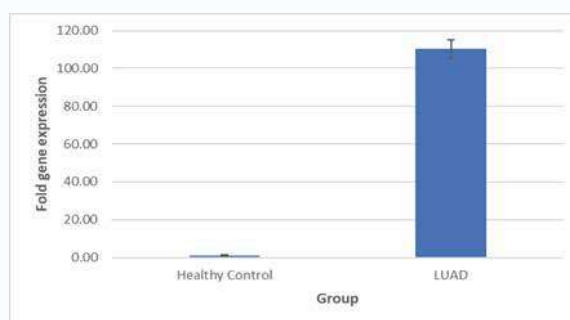
## Objectives:

- To identify genetic markers associated with lung cancer through comprehensive genomic, clinical & environmental data analysis
- To develop and validate predictive models for lung cancer using machine learning algorithms
- To establish a robust wet lab validation pipeline to confirm the clinical significance of the identified genetic markers
- To translate research findings into practical clinical applications for improved disease management

## Work progress:

**Completed:** Project Initiation and Planning, Genomic Data Retrieval and Preprocessing, Genomic Data Analysis and Marker Identification, Designing Primers for the Markers, Method Development, Protocol, Questionnaire & Consent form Preparation

**Ongoing:** Ethical Approval, Sample Collection, Validation of the Markers on Clinical Samples, Data Integration, Integration of Experimental, Epidemiological and Clinical data, Knowledge Translation and Dissemination



**Fig. :** A pilot experimental validation on a small number of samples showing >100-fold upregulation of the targeted marker in patient samples.

## 19. Molecular epidemiology and antimicrobial susceptibility of *Campylobacter* spp. isolated from human and poultry sources

*Nizam Uddin (PL), Shahina Akter, Tanjina Akhtar Banu, Mousona Islam and Sanjana Fatema Chowdhury*

### Introduction:

The threat to public health and food safety is increasing because of the emergence of antimicrobial resistance (AMR) in zoonotic pathogens, including *Campylobacter* spp. Global concern has been sparked by the escalating prevalence of resistant infections, which are particularly associated with poultry consumption. *Campylobacter jejuni* and *Campylobacter coli* are the most prevalent bacterial causes of foodborne illness worldwide. They are accountable for more than 95% of human *Campylobacteriosis* cases. In recent years, there has been a significant increase in the resistance of critical antimicrobials, including fluoroquinolones and macrolides, which were previously employed for treatment. The detection of specific resistance genes (e.g., *gyrA*, *tet(O)*) and the tracking of strain lineages are made possible by molecular epidemiological tools, which provide valuable insight into the dissemination of resistance and the transmission pathways. These insights are indispensable for the development of surveillance strategies and interventions that are both effective and efficient. Multilocus sequence typing (MLST) and whole genome sequencing (WGS) have facilitated a more comprehensive comprehension of resistance evolution and transmission dynamics. This proposal was formulated in response to the escalating incidence of *Campylobacter*-associated gastroenteritis and the escalating detection of resistant strains in both human and animal reservoirs. It aims to study the molecular epidemiology and antimicrobial susceptibility of *Campylobacter* spp. to comprehend their antibiotic resistance patterns and genotypic diversity.

### Objectives:

- To determine the prevalence of *Campylobacter* spp in poultry and human samples
- To assess antimicrobial resistance patterns
- Unveiling molecular cross-species transmission (horizontal gene transfer, insertion, mobile genetic elements etc)

## Progress Achieved:

- Poultry one site (Gazipur) sample is collected & processed
- 10 bacteria were singled out to be assumed *Campylobacter* spp. Biochemical test is ongoing
- Antimicrobial susceptibility test is performed following those isolates



Fig. : Some glimpses of presumptive *Campylobacter* spp isolation on mCCDA agar.

## 20. Genome analysis of PGPR to evaluate their role as growth promotor abiotic stress tolerance in plants

Mousona Islam (PL), Shahina Akter, Murshed Hasan Sarkar, Barna Goswami and Showti Raheel Naser

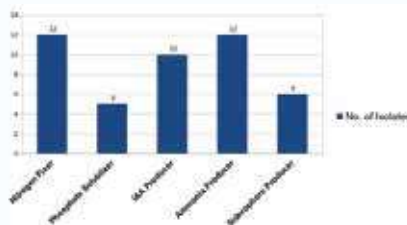
### Introduction:

Plant growth-promoting rhizobacteria (PGPR) or plant growth-promoting bacteria (PGPB) are well known plant associated bacteria which can enhance plant growth. Genera such as *Pseudomonas*, *Bacillus*, *Azospirillum*, *Azotobacter* and *Rhizobium* are some of the most prominent PGPR or PGPB. They are associated with the rhizospheric zone of plants. They improve plant growth through different mechanisms like increased nutrient levels in plants, improved soil quality, hormone production, changes in biochemical properties of plants etc. They play a crucial role in coping with biotic and abiotic stresses. Several studies have shown that plant's adaptation to local environmental stress is closely related to microbiota present in their surroundings. Next-generation sequencing (NGS) technology has greatly facilitated the whole genome sequencing of bacteria and other organism and generated data have helped in the better understanding of the molecular genetics of bacterial species isolated from plants and soil. Therefore, this current investigation has been undertaken to isolate, characterize PGPR from plants and in-depth genomic insight about their growth promoting mechanism in plants.

### Objectives:

- Isolation, molecular identification and characterization of PGPRs from plant roots
- Understand the plant- microbes interaction and evaluate the role of PGPR in growth promotion, stress tolerance
- Understand the plant- microbes interaction and evaluate the role of PGPR in growth promotion, stress tolerance

### Work progress:



- PGPR properties such as bacterial growth in a nitrogen free media has been done. Among 17 isolates, 12 were able to grow on nitrogen free media.
- Further experiments were carried out using these 12 rhizobacterial strains. All the 12 stains produced ammonia, 10 showed positive results for IAA production, 5 isolates were positive in phosphate solubilization using Pikovskaya's Agar medium and 6 isolates were siderophore producer in Chrome Azurol S agar assay.
- They are considered as Plant growth promoting Rhizobacteria and will be further use as producing potential biofertilizer.

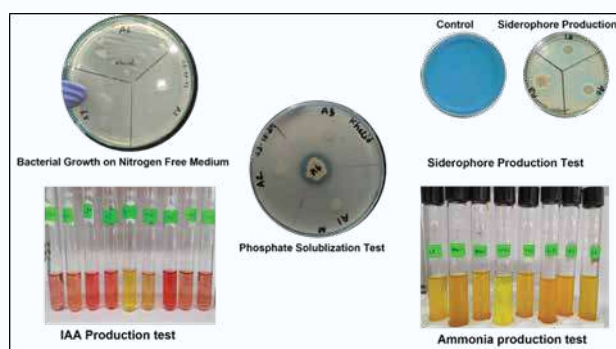


Fig. : PGPR Properties of selected isolates

## 21. CRISPR-Cas9 mediated genome editing in Tomato

Mousona Islam (PL), Tanjina Akhtar Banu, Barna Goswami and Syed Muktadir Al Sium

### Introduction:

People started to adapt plants to meet their purposes around 10,000 years ago. They selected and retained the phenotypically best performing plants that nature provided. Traditionally plant breeding has been done by crossing and selection. However, the traditional breeding methods are labor- and time-intensive. Genome editing allows targeting and modifying specific DNA sequences. Targeted genome engineering has emerged as an alternative to classical plant breeding and transgenic (GMO) methods to apply in both model and crop plants. Precise genome editing provides great advantages in plant functional genomics research and crop improvement by generating tailored modifications at a target genome sequence.

CRISPR/ Cas9 (clustered regularly interspaced short palindromic repeat (CRISPR) and CRISPR associated 9 protein) is a powerful and precise genome editing technology that allows trait-specific targeted mutants and functional characterization of genes [4,5]. CRISPR/Cas9 has been used to edit various traits in tomato. Recently, CRISPR-edited GABA-rich tomatoes first entered the food market. In this proposed research work, we will try to establish CRISPR-Cas9 mediated genome editing protocol in our Bangladeshi tomato variety advancement.

### Objectives:

- Create laboratory facilities for Genome editing
- Vector construction and CRISPR-Cas9 protocol optimization to develop climate resilient plant
- Plant transformation and mutant analysis

### Work progress:

- This is the first attempt for genome editing in plants in BCSIR
- Literature review and gRNA design has been done using CRISPR-P web based tool
- 2 vector plasmids have been collected from addgene.org. The plasmids are –pChimera and pCas-9TPC

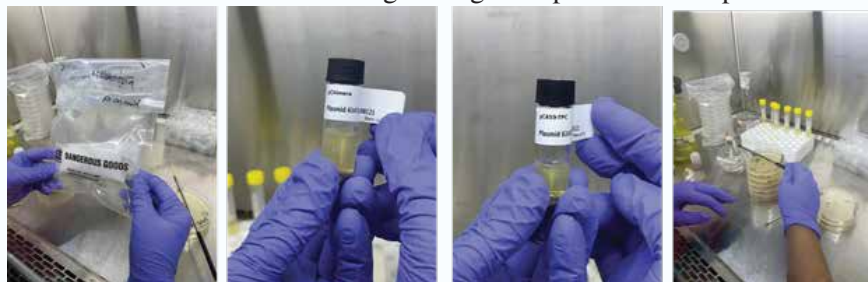


Fig. : pChimera and pCas-9TPC plasmid culture

## 22. Development of effective bioinsecticide for mosquito control

Md. Zamilur Rahman (PL), Md. Ashashan Habib, Md. Murshed Hasan Sarkar, Nahid Sultana, Ruhul Amin and Nasima Momtaz

### Introduction:

The proposed R&D project titled “Integrated Biocontrol of Mosquito” aims to develop an effective, eco-friendly strategy for mosquito population control. It integrates biological agents such as *Bacillus thuringiensis* var. *israelensis*

(Bti), phytotoxins, and larvivorous fish to minimize dependence on chemical insecticides that harm the environment and human health. The study will explore the compatibility and efficacy of immobilized biocontrol agents for sustained mosquito suppression. This project addresses Bangladesh's pressing public health challenge of mosquito-borne diseases through innovative, sustainable, and locally adaptable biocontrol solutions.

### Objectives :

- To develop an effective integrated biocontrol strategy for mosquito population control
- To investigate the compatibility of different biocontrol agents (e.g., Bti, phytotoxins, larvivorous fish) with each other
- To evaluate whether immobilized biocontrol agents enhance efficacy against mosquito populations
- To explore the controlled release potential of immobilized biotoxins for prolonged mosquito control
- To assess the overall effectiveness of the integrated biocontrol approach in reducing mosquito density and improving environmental safety

### Work Progress :

- A total of 16 bacteria were screened, and two isolates were successfully identified with significant mosquito larvicidal activities
  - A protocol is under trial for the isolation of bacterial protoxins
  - A culture medium is under trial for solid-state fermentation of the isolated bacteria
- 1) All data and pictures of respective R &D activities should be new one (Not from previous year) with good resolution

Table 1: Bioassay result of *L. sphericus* against different instars of *A. aegypti* larvae

Larval instars	LC <sub>50</sub> (mg/mL)	(LCL-UPL)	LC <sub>90</sub> (mg/mL)	(LCL-UPL)
1 <sup>st</sup>	0.13	(0.09-0.17)	0.33	(0.21-0.39)
2 <sup>nd</sup>	0.15	(0.07-0.19)	0.37	(0.32-0.46)
3 <sup>rd</sup>	0.19	(0.12-0.24)	0.43	(0.34-0.51)
4 <sup>th</sup>	0.27	(0.16-0.31)	0.59	(0.49-0.65)

Fig. 2: Geo-accumulation of metals in Cox's Bazar. Most metals apart from Pb and Zn do not display any signs of hazardous accumulation

Larval instars	LC <sub>50</sub> (mg/mL)	(LCL-UPL)	LC <sub>90</sub> (mg/mL)	(LCL-UPL)
1 <sup>st</sup>	0.026	(0.021-0.029)	0.051	(0.046-0.056)
2 <sup>nd</sup>	0.031	(0.028-0.035)	0.078	(0.065-0.081)
3 <sup>rd</sup>	0.037	(0.033-0.041)	0.099	(0.088-0.104)
4 <sup>th</sup>	0.045	(0.039-0.048)	0.103	(0.093-0.110)

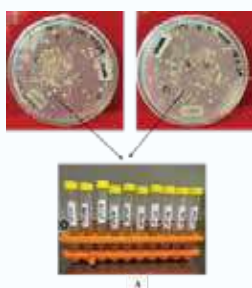


Fig. 1: Result of spread plating and selected bacterial colonies.

Fig. 2: Mosquito larvae treated with bacterial suspension.

## Special Allocation Projects

### 01. Developing a poultry feed using microalgae and -macrophytes

*Nahid Sultana and Elina Akhter Jenat*

#### Introduction :

The increasing demand for protein sources has led to the searching of alternative feed materials which provide a safe and healthy source of nutrition in poultry feed. In Bangladesh perspective some indigenous microalgae and macrophyte could be considered as reasonable and protein rich feed ingredients which also have other nutritional properties. Dried duckweeds contain crude protein up to 40% (Vandyke et al., 1977) and can be compared with soyabean meal as a source of plant protein. Duckweed was used as feed for poultry because of its high nutritional value (Abdullaev, 1969).

On the other hand, a freshwater blue green alga is also identified as prime alternative protein source for poultry feed. Several studies reveal the potentiality of *Spirulina* sp. as a noble protein ingredient for poultry feed, emphasizing its nutritional value, particularly its protein content, amino acid profile, protein solubility and protein digestibility. *Spirulina* contains a large amount of crude protein (up to 70% of its dry weight), and is a good source of calcium and phosphorus, useful for the bones and muscle tissue of poultry. Given its characteristics, research has shown that this cyanobacterium represents a promising alternative to soy and other feeds used in poultry farming.

Seaweed also has the potentiality to be used in poultry diet as it has been observed to increase the population of beneficial probiotic bacteria and reducing harmful bacteria at the same time as well as improving egg production and egg and meat quality by reducing lipid and cholesterol levels (Coudert et al., 2020; Michalak et al., 2020 and Borzoui et al., 2020).

In our coastal region sea weed are commercially cultivated for a couple of years to be utilized as human food. But no experiment was done regarding animal feed production. On the other hand, there is a *Spirulina* Plant in BCSIR continually producing this blue green alga which are being used in the production of different products e.g., supplements and food products. A fish feed was also produced by BCSIR using *Spirulina* which is a nutritious diet for ornamental fish. In urban area duckweeds are naturally cultured in most of the ponds which can be easily collected for the purpose of poultry feed production. Therefore, this project intends to develop a safe poultry feed to ensure better health and products i.e., egg and meat.

#### Objectives:

- To formulate nutrient-enriched poultry feed using microalgae and macrophytes
- To evaluate the quality of eggs and meat produced from poultry fed with the formulated feed in comparison to conventional market feeds
- To assess the feasibility and potential benefits of incorporating microalgae and macrophytes into poultry diets

#### Work Progress :

- *Spirulina* (SP): Slight increase in body weight and feed intake; long-term hepatoprotective benefits.
- Duckweed (DW): Neutral effect up to 10–15% inclusion; >20% leads to reduced intake and weight gain.
- Seaweed (SW): Minimal effect on body weight long-term; some early reduction in feed intake stabilizes over time.

#### Statistical outcomes (Body Weight):

- 12 weeks: No significant difference among groups.
- 30 weeks: Trend toward significance ( $p = 0.085$ ).
- 44 weeks: Significant difference ( $p = 0.0023$ ), showing long-term effects of treatments.

#### Key Insights :

- *Spirulina* improves laying duration and egg weight, with high protein and health benefits.
- Seaweed enhances total egg production and feed efficiency but provides lower amino acid density.
- Duckweed offers high amino acid richness but reduces overall productivity at high inclusion rates.
- Optimal use:
  - SP: 0.3–0.4% or 2–4 g/kg feed.
  - SW: 0.5–2% (up to 3%).
  - DW: 7.5–15% (avoid >20%).

Incorporating microalgae (*Spirulina*) and seaweed into poultry diets enhances growth, egg production, and quality traits, while duckweed provides superior amino acid enrichment but requires careful inclusion levels to avoid reduced performance.

## 02. Biofertilizer formulation with native *Azotobacter* strain for improved nitrogen supplementation

*John Liton munshi and Natasha Nafisa Haque*

### Introduction :

Biofertilizers are living microbial formulations (bacteria, fungi, or algae) that enhance nutrient availability and plant growth through natural processes like nitrogen fixation, phosphate solubilization, and hormone production. They improve soil health, fertility, and sustainability without chemical contamination, making them vital in organic farming. Unlike chemical fertilizers that directly supply nutrients but degrade soil, biofertilizers stimulate beneficial soil processes, boosting long-term fertility and crop resilience. Major types include nitrogen-fixing microbes (*Rhizobium*, *Azotobacter*, *Azospirillum*, cyanobacteria), phosphate-solubilizing bacteria (*Pseudomonas*, *Bacillus*), potassium and zinc solubilizers, and mycorrhizal fungi that enhance nutrient and water uptake. Applied via seed treatment, soil inoculation, or foliar spray, biofertilizers also promote hormone production and disease resistance, supporting eco-friendly and sustainable agriculture.

### Objectives :

- Isolation of *Azotobacter* sp. strains from cultivation field soil samples
- Morphological & biochemical identification of *Azotobacter* sp
- Mother culture preparation & growth optimization in small-scale
- Biomass stabilization in solid/liquid carrier and shelf-life improvement

### Work Progress :

- Soil sample was collected from two cultivation fields of Munshiganj district. These fields are used for cultivation of potato and corn. Isolation and characterization and biochemical activities work already done. Besides, on going of fertilizer preparation and manuscript preparation.

## Achievements and Activities

### Published Papers:

1. Ohana Leticia Tavares da Silva, Maria Karolayne da Silva, Joao Firmino Rodrigues-Neto, Joao Paulo Matos Santos Lima, Vinicius Manzon, Shopnil Akash, Umberto Laino Fulco, Mohammed Bourhia, Turki M. Dawoud, Hiba-Allah Nafidi, Baye Sitotaw, Shahina Akter & Jonas Ivan Nobre Oliveira, "Advancing molecular modeling and reverse vaccinology in broad-spectrum yellow fever virus vaccine development", *Scientific Reports*, 2024, 14, 10842.
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81. Syed Muktedir Al Sium, Barna Goswami, Sanjana Fatema Chowdhury, Showti, Raheel Naser, Mihir Kanti Sarkar, Md. Jobaid Faruq, Md. Ahashan Habib, Shahina Akter, Tanjina Akhtar Banu, Md. Murshed Hasan Sarkar, Md. Salim Khan, "An insight into the genome-wide analysis of bacterial defense mechanisms in a uropathogenic *Morganella morganii* isolate from Bangladesh", *PLoS ONE*, 2025, 20(1), e0313141.
82. Claudio Bruno Silva de Oliveira, Joelma Maria de Araújo Andrade, Shahina Akter, Maria Karolayne da Silva, Umberto Laino Fulco and Jonas Ivan Nobre Oliveira. "Investigating whether H5N1 is a risk to human populations in Brazil", *Journal of the Brazilian Society of Tropical Medicine*, 2024, 57, e01100.

### Scientist pursuing M.S/ M.Phil/ Ph.D courses in home or abroad:

- Iffat Jahan, pursuing Ph.D University of Texas, USA
- Nasima Momtaz, SO is pursuing her PhD at Murdoch University, Western Perth, Australia

### Scientist pursuing M.S/ M.Phil/ Ph.D courses in home or abroad:

- To develop an effective integrated biocontrol strategy for mosquito population control.
- To investigate the compatibility of different biocontrol agents (e.g., Bti, phytotoxins, larvivorous fish) with each other.

### Appropriate Technology/ Tutorial Dissemination:

Name and Designation	Name of the Institute	Date
Dr. Chapol Kumar Roy, SSO	Habigonj, Nabigonj	15-16 November, 2024
Natasha Nafisa Haque, SO	Damudya, Shariatpur	17-18 November, 2024
Dr. Chapol Kumar Roy, SSO	Gaibandha, Fulchori	20-21 November, 2024
Natasha Nafisa Haque, SO	Ashtogram, Kishoreganj	11-12 December, 2024
Dr. Chapol Kumar Roy	Lalmonirhat, Kaligonj	17-18 December, 2024
Dr. Chapol Kumar Roy, SSO	Bandorban, Lama	23-24 December, 2024
Natasha Nafisa Haque, SO	Hajigonj, Chandpur	26-27 December, 2024
Dr. Chapol Kumar Roy, SSO	Barisal, Agoiljhora	7-8 January, 2025
Dr. Chapol Kumar Roy, SSO	Pirojpur, Mothbariya	15-16 January, 2025
Natasha Nafisa Haque, SO	Kochua, Bagerhat	29-30 January, 2025
Natasha Nafisa Haque, SO	Daud Kandi, Comilla	19-20 February, 2025
Dr. Chapol Kumar Roy, SSO	Dinajpur Shador	28-29 June, 2025
Dr. Mousona Islam, SSO	Jhikargacha, Jashore	14-15 January, 2025
Dr. Mousona Islam, SSO	Meherpur Sadar, Meherpur	5-6 February, 2025
Dr. Mousona Islam, SSO	Baraigram, Natore	22-23 January, 2025
Syed Muktadir Al Sium, SO	Fatikchhari, Chattogram	28-29 November, 2025
Syed Muktadir Al Sium, SO	Department of Biochemistry and Molecular Biology, University of Dhaka	20nd February, 2025
Nizam Uddin, SO	Pathorghata, Barguna	11-12 December, 2024

### Guidance to Research Work (PhD/M.Phil /M.S/NCST & BCSIR Fellow):

Sl. No	Title of Research	Ph.D/ M.Phil/ M.S Category	Name of Student	Name of academic Institute	Name of Supervisors in BCSIR
01.	Functional and Genomic insights of isolated Plant Growth Promoting Rhizobacterial strains	MS	Redwana Rimi	Jagannath University	Dr. Mousona Islam, SSO
02.	Cytogenetic Assessment of Salinity and drought Induced Stress in Capsicum annum L.	MS	Suriyea Islam	Jagannath University	Dr. Mousona Islam, SSO
03.	Isolation, molecular characterization and evaluation of plant growth promoting properties of some rhizobacterial isolates	MS	Md. Khalid Hasan	Jashore University of Science and Technology	Dr. Mousona Islam, SSO
04.	Size variant spherical gold nanoparticles for in situ detection of trace contaminants by surface-enhanced Raman spectroscopy	MS Fellow	Saha Alam	Department of Chemistry, University of Dhaka	Dr. Mohammad Moniruzzaman, PSO

05.	Isolation, molecular characterization and evaluation of plant growth promoting properties of some rhizobacterial isolates	MS	Md. Khalid Hasan	Jashore University of Science and Technology	Dr. Mousona Islam, SSO
06.	Airborne microplastic concentrations in the urban road side of Dhaka city	Post-Doc Fellow	Dr. Yasin Arafat	University of Malaysia	Dr. Mohammad Moniruzzaman, PSO
07.	Cytogenetic Assessment of Salinity and drought Induced Stress in <i>Capsicum annum</i> L.	MS	Suriyea Islam	Jagannath University	Dr. Mousona Islam, SSO
08.	Characterization of Microbial Communities in Particulate Matter in Some Hot Spots in and around Dhaka City	PhD	Jahan-E-Gulshan	Department of Soil, Water and Environment, University of Dhaka	Dr. Mohammad Moniruzzaman, PSO
09.	Health risk assessment and environmental impacts of heavy metals on informal e-waste recycling shops in Chattogram city, Bangladesh	PhD	Jainal Abedin	Thammasat University, Thailand	Dr. Mohammad Moniruzzaman, PSO
10.	Precipitation of lignin-based hydrogel for the removal of dyes and heavy metal ions from aqueous solution	MS	Umme Toufika Jannat	Department of Chemistry, University of Dhaka	Dr. Mohammad Moniruzzaman, PSO
11.	Identification and quantification of heavy metals in the urine samples of tannery workers at Hemayetpur in Bangladesh: a biomonitoring approach to mitigate occupational hazard	MS	Saikat Reza	Department of Public health and informatics, Jahangirnagar University	Dr. Mohammad Moniruzzaman, PSO
12.	Assessment of heavy metal and metalloid contaminants, PM <sub>2.5</sub> emitted during the combustion and ash produced in mosquito repellent coils commonly sold in Chittagong, Bangladesh	MS	Showrav Nandan Shil	Department of Chemistry, Chittagong College, National University	Dr. Mohammad Moniruzzaman, PSO
13.	Potential of different parts of Jackfruit ( <i>Artocarpus heterophyllus</i> ) as biosorbents for the removal lead from the industrial effluents and contaminated soils.	MS	Bushra Rahman	Department of Soil, Water and Environment, University of Dhaka	Dr. Mohammad Moniruzzaman, PSO
14.	Assessing the implications of heavy metal pollution and microplastic contamination from plastic recycling factories on environment and human exposure in Kamrangirchar, Dhaka	MS	Md. Tarequl Islam	Department of Chemistry, University of Dhaka	Dr. Mohammad Moniruzzaman, PSO
15.	Taking stock of soil and water contamination from unmanaged cigarette butts and associated public awareness	MS	Minhazur Rahman	Institute of forestry and environmental sciences, University of Chittagong	Dr. Mohammad Moniruzzaman, PSO
16.	Surface characterization, source investigation, and health risk assement of ambient fine particulate matter (PM <sub>2.5</sub> ) in distinct indoor environment of Dhaka, Bangladesh	MS	Jubair Ahemmed Akash	Department of Chemistry, University of Dhaka	Dr. Mohammad Moniruzzaman, PSO
17.	Evaluation of airborne bacterial quality in different wards of a tertiary medical college in Dhaka, Bangladesh	MS	Mst. Sharmin Sultana	Department of Soil, Water and Environment, University of Dhaka	Dr. Mohammad Moniruzzaman, PSO
18.	How do toxic metals in indoor dust impact children's health in Dhaka city	MS	Farjana Akter Akhi	Department of Environmental science and management, North South University	Dr. Mohammad Moniruzzaman, PSO

18.	Chemical characterization and health impact studies of mosquito coils burning in different experimental conditions	MS	Fatima Marzan	Department of Chemistry, University of Dhaka	Dr. Mohammad Moniruzzaman, PSO
19.	Assessment of heavy metal concentration in hair and nail of tannery workers in Bangladesh	MS	Sumaya Yasmin	Department of Public health and informatics, Jahangirnagar University	Dr. Mohammad Moniruzzaman, PSO
20.	Determination of silica and heavy metal concentrations and their morphology analysis in the total suspended particulate at various locations in Dhaka.	MS	Mishuk Biswas	Department of Chemistry, University of Dhaka	Dr. Mohammad Moniruzzaman, PSO
21.	Air pollution tolerance index, anticipated performance index, and particulate matter removal efficiency of some selected plant species in Rajshahi, Bangladesh	MS	Sadman Sakib Arnob	Department of Soil, Water and Environment, University of Dhaka	Dr. Mohammad Moniruzzaman, PSO
22.	Assessment of health risk of heavy metal concentration in inhalable tannery dust in tannery industry, Savar	MS	Sadia Sultana Mim	Department of Public health and informatics, Jahangirnagar University	Dr. Mohammad Moniruzzaman, PSO
23.	Comprehensive study on seawater and sediments of sitakunda ship recycling yards: an environmental pollution perspective	MS	Md. Arman Hossain	Department of oceanography and hydrography, Bangabandhu Sheikh Mujibur Rahman Maritime University	Dr. Mohammad Moniruzzaman, PSO
24.	Abundance, Distribution, and Characteristics of Microplastic Present in a Coastal Region of Cox's Bazar, Bangladesh	MS Fellow	Anika Nawar	Department of Soil, Water and Environment, University of Dhaka	Dr. Mohammad Moniruzzaman, PSO
25.	Effect of elicitor on micropropagation and biological activity of <i>Bacopa monnieri</i>	MS	Nadia Sultana Prity	Bangladesh University of Professionals	Dr. Mousona Islam, SSO
26.	Functional and Genomic insights of isolated Plant Growth Promoting Rhizobacterial strains	MS	Redwana Rimi	Jagannath University	Dr. Mousona Islam, SSO
27.	Distribution and retention efficiency of micro- and mesoplastics and heavy metals in mangrove, saltmarsh and cordgrass habitats along a subtropical coast	MS Thesis	Maheen Mahmud Bappy	Department of Fisheries and Marine Science Faculty of Science Noakhali Science and Technology University,	Dr Md Kamal Hossain, PSO
28.	Spatial Dynamics and Ecological Risks of Sediment-Bound Metal(loid)s in a Heavily Industrialized Subtropical Estuary	MS Thesis	Khadijatul Kubra Riya	Department of Fisheries and Marine Science Faculty of Science Noakhali Science and Technology University	Dr Md Kamal Hossain, PSO
29.	Heavy metal pollution in the sundarbans mangrove ecosystem: a growing environmental concern	MS Thesis	Arnob Ghosh	Department of Oceanography, University of Dhaka, Dhaka-1000, Bangladesh	Dr. Md Kamal Hossain, PSO
30.	Rare earth elements in a highly industrialized South Asian estuary: Enrichment patterns, geochemical behaviors, contamination status and multi-index risk evaluation	MS Thesis	Sanjida Jahan Farjana	Department of Fisheries and Marine Science, Noakhali Science and Technology University, Noakhali, 3814, Bangladesh	Dr Md Kamal Hossain, PSO

31.	Rare earth elements in a highly industrialized South Asian estuary: Enrichment patterns, geochemical behaviors, contamination status and multi-index risk evaluation	MS Thesis	Salma Sultana	Department of Fisheries and Marine Science, Noakhali Science and Technology University, Noakhali, 3814, Bangladesh	Dr. Md. Kamal Hossain, PSO
32.	Larvicidal activity against <i>Ae. aegypti</i> larva from <i>L. camara</i> crude extract	M.Sc	Ayesha Siddika	Jagannath University	Dr. Md. Zamilur Rahman, SSO
33.	Characterization of Nutrient Mobilizing and Biostimulating Traits of Native Soil Azotobacter Isolates Unraveling their Potential for Biofertilizer Formulation	M.S	Narmin Nawer	Department of Microbiology, Jagannath University	Dr. Chapol Kumar Roy, SSO
34.	Assessment of seed priming & Growth stimulating potential of indigenous seaweeds growing in South-Eastern coastal area of Bangladesh.	MS	Rafat Ara Meem	Department of Botany, Jahangirnagar University	Natasha Nafisa Haque, SO
35.	Biological features of economically crucial non-marine mollusks from Bangladesh	MS Thesis	Hajbun Tasneem	University of Dhaka	Dr. Nahid Sultana, SSO
36.	Feeding Ecology and dietary preferences of <i>Glossogobius giurus</i> from Bhairab river system	MS Thesis	Sanjida Rahman	University of Dhaka	Dr. Nahid Sultana, SSO
37.	Microplastic contamination in sea food of coastal Bangladesh	MS Thesis	Razowana Rashid	University of Dhaka	Dr. Nahid Sultana, SSO
38.	Analysis of heavy metal in squid and fish meal	MS Thesis	Shagata Sarkar	University of Dhaka	Dr. Nahid Sultana, SSO and Badhan Saha, PSO
39.	Effects of the Zinc Oxide Nanoparticles on <i>Mystus vittatus</i> (Bloch, 1794)	MS Thesis	Keya Dash	Jagannath University	Dr. Nahid Sultana, SSO
40.	Molecular Identification through DNA barcoding and proximate analysis of available trash fish of coast of Bangladesh	MS Thesis	Sadia Sultana	Jagannath University	Dr. Mahmuda Begum, SSO & Dr. Nahid Sultana, SSO
41.	Development of transgenic Zebra fish as Diabetic disease model	Research Fellow under Dr. Abdullah Al-Muti Shorfuddin memorial Fellowship	Shanchita Bhowmik	University of Dhaka	Dr. Mahmuda Begum, SSO
42.	Effect of Multiple antibiotics exposure on gene expression of Koi ( <i>Anabas testudineus</i> ) and Tengra fish ( <i>Mystus cavasius</i> )	MS Thesis	Mosaddik Al Haque	University of Dhaka	Dr. Mahmuda Begum, SSO & Dr. Md. Nurul Huda Bhuiyan PSO, IFST
43.	Effect of Multiple heavy metals exposure on gene expression of Koi ( <i>Anabas testudineus</i> ) fish	MS Thesis	Md. Al Amin Bul Bul	University of Dhaka	Dr. Mahmuda Begum, SSO & Badhan Saha SSO
44.	Evaluation of enzyme activity on antibiotic and heavy metal exposed edible fish	MS Thesis	Jahenur Akhter	Jagannath University	Dr. Mahmuda Begum, SSO & Umma Fatema Shahjadee, PSO
45.	Effectiveness of chemical fogging on <i>Aedes aegypti</i> mosquitoes in residential area of Dhaka city	MS Thesis	Jannatul Ferdous Kushum	Jagannath University	Dr. Mahmuda Begum, SSO
46.	Nutritional and gut microbial diversity of Mullet ( <i>Mugil cephalus</i> ) from different locations of Bangladesh	MS Thesis	Bisal Kumar Sarker	University of Dhaka	Dr. Mahmuda Begum, SSO

47.	Microbial changes in skin and gut microbiome of scaleless and scaled fish exposed to hazardous heavy metals (Cu, Cd and Pb)	MS Thesis	Md. Ashir Intishar Mathin	University of Dhaka	Dr. Mahmuda Begum, SSO
48.	Assessing the toxicological impact of microplastic contaminated food on animal health using mice model	MS Thesis	Mahzabin Muzahid Labi	University of Dhaka	Dr. Mahmuda Begum, SSO
49.	Evaluation of the toxicity of microplastic-contaminated feed in a freshwater fish, <i>Anabas testudineus</i>	MS Thesis	Fatematuz Zuhura	University of Dhaka	Dr. Mahmuda Begum, SSO
50.	Assessing transcriptomic and genotoxic responses of stinging catfish, <i>Heteropneustes fossilis</i> to an organophosphate insecticide exposure	MS Thesis	Nadia Nasrin Kripa	University of Dhaka	Dr. Mahmuda Begum, SSO
51.	Effects of Zinc Oxide Nanoparticles on the Growth and Development of <i>Zea mays</i>	M.S.	Sun Jarin Juthi	Bangladesh University of Professionals	Barna Goswami, SSO
52.	Construction of Plasmid of PspA to develop an edible vaccine using <i>Agrobacterium tumefaciens</i> through Banana plant	M.S.	Tilottama Roy	Jagannath University	Dr. Shahina Akter, PSO
53.	Detection of Antibiotic Resistance in Uropathogens from Young Women Using Raman Spectroscopy	M.S.	Sohana Parveen Meem	Jagannath University	Dr. Shahina Akter, PSO
54.	Establishment of an efficient regeneration system for Lotus ( <i>Nelumbo nucifera gaertn.</i> ) and observed their genetic diversity using SSR marker	M.S.	Lubaba Mushsarat Khanom	Jagannath University	Dr. Tanjina Akhtar Banu, PSO
55.	Evaluation of cytotoxic and genotoxic effects of two abiotic stresses and mitigation of salinity stress in <i>Allium cepa</i> L	M.S.	Samiya Rahman	Jagannath University	Dr. Tanjina Akhtar Banu, PSO and Dr. Mousona Islam, SSO
56.	Micro-propagation of date palm ( <i>Phoenix dactylifera</i> L.)	M.S.	Fatema tuj Johra	University of Barishal	Dr. Tanjina Akhtar Banu, PSO
57.	Development of a universal qRT-PCR Based Dengue Virus detection method	MS	Md. Eashanul Karim Moon	Jashore University of Science and Technology	Sanjana Fatema Chowdhury, SO
58.	Development of Molecular Detection Method for Bacterial Species and their Resistance Genes, GMOs and Porcine Ingredients	MS	Ziaul Hoque	Noakhali Science & Technology University	Syed Muktedir Al Sium, SO
59.	Development and Clinical Validation of a Novel Lung Cancer Biomarker with Diagnostic and Prognostic Potential	MS	Fatema Tuz Zohra	Shahjalal University of Science & Technology	Syed Muktedir Al Sium, SO

### Participation in Training /Conference:

#### Training:

- Dr. Nahid Sultana (SSO) participated in a training program on “Basic principle, maintenance and troubleshooting of XRD, FTIR and Raman Spectroscopy” held on 21 May, 2025 at BCSIR Laboratories, Dhaka.
- Dr. Nahid Sultana (SSO) participated in a training program on “PPA-2006 and PPr-2008 in scientific Procurement” held on 22 May, 2025 at BCSIR Laboratories, Dhaka.
- Dr. Nahid Sultana (SSO) participated in a training program on “Understanding of ISO 17025:2017-for

Laboratory Accreditation” held on 27 May, 2025 at BCSIR Laboratories, Dhaka.

- Dr. Mahmuda Begum (SSO) participated as Trainer on a training program: Getting acquainted with R-An introduction for smart scientist held in Dhaka Laboratories, BCSIR, Dhaka on 12th February, 2024.
- Dr. Mahmuda Begum (SSO) participated in a workshop on CRISPR-Cas9 Gene Editing Mechanism: A new era in molecular biology held in Department of Botany, University of Dhaka from 10th -14th November, 2024.
- Dr. Mahmuda Begum (SSO) participated in a training on Introduction to Python: Basic Programming and Data Analysis held in Dhaka Laboratories, BCSIR, Dhaka on 5th November, 2024.
- Dr. Mahmuda Begum (SSO) participated in a training program on “Understanding of ISO 17025:2017-for Laboratory Accreditation” held on 27 May, 2025 at BCSIR Laboratories, Dhaka.
- Dr. Mahmuda Begum (SSO) participated in a training program on “PPA-2006 and PPr-2008 in scientific Procurement” held on 22 May, 2025 at BCSIR Laboratories, Dhaka.
- Dr. Mahmuda Begum (SSO) participated in a training program on “National Integrity Strategy” held on 18 May, 2025 at BCSIR Laboratories, Dhaka.
- Dr. Tanjina Akhtar Banu participated in In-house training as a trainer on “Operation and maintenance of MiniSeq Sequencing Platform” organized by P&D, BCSIR from 20-24th April, 2025.
- Dr. Mousona Islam participated in In-house training as a trainer on “Operation and maintenance of MiniSeq Sequencing Platform” organized by P&D, BCSIR from 20-24th April, 2025.
- Barna Goswami participated in In house training on High performance liquid chromatography(HPLC) organized by P&D , BCSIR from 16 th March to 21 March, 2025.
- Sanjana Fatema Chowdhury participated in a training on “Alpha Fold Education Summit” organized by Google DeepMind and EMBL-EBI from 13-16th January 2025 at EMBL-EBI, Hinxton, UK.
- Sanjana Fatema Chowdhury organized the “2nd ISCB RSG Bangladesh CompBio Symposium” as the chair on 22nd February 2025 at the Department of Biochemistry and Molecular Biology, University of Dhaka.
- Sanjana Fatema Chowdhury participated in a training on “Understanding of ISO 17025:2017- for Laboratory Accreditation” organized by BCSIR Dhaka Laboratories on 27 May, 2025.
- Sanjana Fatema Chowdhury participated in a training on “PPA-2006 and PPR-2008 in Scientific Procurement” organized by BCSIR Dhaka Laboratories on 22 May, 2025.
- Sanjana Fatema Chowdhury participated in a training on “National Strategy Integrity” organized by BCSIR Dhaka Laboratories on 18 May, 2025.
- Sanjana Fatema Chowdhury participated in In-house training as a trainer on “Operation and maintenance of MiniSeq Sequencing Platform” organized by P&D, BCSIR from 20-24th April, 2025.
- Sanjana Fatema Chowdhury participated in In-house training on “Operation and maintenance of LC-MS/MS” organized by P&D, BCSIR from 9-13th March, 2025.
- Showti Raheel Naser participated in In house training on “Operation and maintenance of HPLC” organized by P&D , BCSIR from 16 th March to 21 March, 2025.
- Showti Raheel Naser participated in a training on “Understanding of ISO 17025:2017- for Laboratory Accreditation” organized by BCSIR Dhaka Laboratories on 27 May, 2025.
- Showti Raheel Naser participated in a training on “Research Methodology and Publication” organized by BCSIR Dhaka Laboratories on 26 May, 2025.
- Showti Raheel Naser participated in a training on “PPA-2006 and PPR-2008 in Scientific Procurement” organized by BCSIR Dhaka Laboratories on 22 May, 2025.
- Showti Raheel Naser participated in a training on “National Strategy Integrity” organized by BCSIR Dhaka Laboratories on 18 May, 2025.
- Syed Muktadir Al Sium completed his foundation training titled “31st Special Foundation Training for officers of BCSIR” from 27th April, 2025 to 25th June, 2025 at NAPD.
- Syed Muktadir Al Sium participated in a training on “AlphaFold Education Summit” organized by Google DeepMind and EMBL-EBI from 13-16th January 2025 at EMBL-EBI, Hinxton, UK.
- Syed Muktadir Al Sium delivered a presymposium workshop titled “Tutorial on Alphafold” at the “2nd ISCB RSG Bangladesh CompBio Symposium” on 20nd February 2025 at the Department of Biochemistry and Molecular Biology, University of Dhaka.
- Nizam Uddin participated in a training on “Research Methodology and Publication” organized by BCSIR

Dhaka Laboratories on 26 May, 2025.

- Nizam Uddin participated in a training on “R Programming Learning the basics of statistical computing” organized by BCSIR Dhaka Laboratories on 27 November, 2024.
- Nizam Uddin participated in a training on “Polymerase Chain Reaction” organized by BCSIR Chattogram Laboratories on 22 May, 2025.
- Nizam Uddin participated in a training on “Principle, Application, Troubleshooting, and Maintenance of HPLC” organized by BCSIR Dhaka Laboratories on 12 November, 2024
- Badhan Saha, Ph.D., PSO, participated in the training program on “Operation and maintenance of Gas Chromatography Mass Spectrometer (GC-MS)” held on 09-13 February, 2025 at BCSIR Chattogram Laboratories, Bangladesh Council of Scientific and Industrial Research (BCSIR).
- Badhan Saha, Ph.D., PSO, participated in the national training program on “Data quality on air quality management” held on 14-15 July, 2025 at Pan Pacific Sonargaon Hotel, Dhaka, organized by International Centre for Integrated Mountain Development, ICIMOD.
- Afroza Parvin, SSO, performed training on Nanoparticle Size Analyzer with Zeta Potential at Bangladesh Council of Scientific and Industrial Research (BCSIR), Dhaka from 19-23 January, 2025.
- Afroza Parvin, SSO, Performed National Training in Air Quality Monitoring and data analysis for air quality management at Pan Pacific Sonargaon Hotel, Dhaka from 14-15 July, 2025 organized by International Centre for Integrated Mountain Development, ICIMOD.
- Priyanka Dey Suchi (SO), participated in the training program on “AAS (Atomic Absorption Spectrometer)” held on 05 January, 2025 at Bangladesh Council of Scientific and Industrial Research.

## Conference:

- Dr. Mahmuda Begum (SSO), attended the 38th BSM Annual International Conference 2024, organized by the Bangladesh Society of Microbiologists (BSM), held on 28-29th of December 2024 at BRAC University, Dhaka, Bangladesh.
- Dr. Mahmuda Begum (SSO), attended and acted as a Judge on the Poster presentation session in the International Biotechnology Conference 2025 held on 20-21th of June 2025 at BRAC University, Dhaka, Bangladesh.
- Shanzida Islam (SSO), attended in the International Biotechnology Conference 2025 held on 20-21th of June 2025 at BRAC University, Dhaka, Bangladesh.
- Dr. Shahina Akter made significant contributions to the International Biotechnology Conference 2025, organized by BRAC University. She expertly chaired the session on "Environmental Biotechnology (Session I)" and later served as a judge for the Medical Biotechnology poster session, lending her discerning expertise to both roles.
- Dr. Tanjina Akhtar Banu attended the International Biotechnology Conference 2025, as a session chair on "Marine Biotechnology", organized by BRAC University which was held on 21-22 June 2025. Also served as a judge for the "Environmental Biotechnology" poster session at the same conference.
- Barna Goswami(SSO), participated in Annual Plant Tissue Culture & Biotechnology Conference organized by Bangladesh Association for Plant Tissue Culture & Biotechnology(BAPTC&B), 01 February, 2025 and presented an poster presentation entitled "Antioxidant and Antimicrobial Activity of In Vitro and Elicitor Induced Regenerated Plants of *Withania somnifera* (L.) Dunal"
- Dr. Mousona Islam (SSO), attended the 38th BSM Annual International Conference 2024, organized by the Bangladesh Society of Microbiologists (BSM), held on 28-29th of December 2024 at BRAC University, Dhaka, Bangladesh.
- Dr. Mousona Islan attended the International Biotechnology Conference 2025 organized by BRAC University which was held on 21-22 June 2015. Also served as a judge for the "Environmental Biotechnology" poster session at the same conference.
- Barna Goswami (SSO), participated in Annual Plant Tissue Culture & Biotechnology Conference organized by Bangladesh Association for Plant Tissue Culture & Biotechnology(BAPTC&B), 01 February,2025 and presented an poster presentation entitled "Antioxidant and Antimicrobial Activity of In Vitro and Elicitor Induced Regenerated Plants of *Withania somnifera* (L.) Dunal"

**Award/Honors:**

- Dr. Shahina Akter achieved CAS-ANSO Visiting Fellowship 2024 in Beijing, China.
- Dr. Md. Kamal Hossain elected and inducted as Associate Fellow of BAS for the year 2024
- Syed Muktadir Al Sium and Sanjana Fatema Chowdhury received AlphaFold Education Summit Travel Fellowship

**Number of Analytical (Ad-Hoc) Problem Solved:**

Name of the Division	Routine Type	Research Type	
Biological Research Division	1021	25	

**Scientists of BRD**

Members of Biological Research Division



Dr. Shahina Akter with a member of Professor Fu Vincent Yu's laboratory at the Institute of Microbiology, Chinese Academy of Sciences (CAS), Beijing, China.



Induction Ceremony of Dr. Mahmuda Begum as a Newly Elected Associate Fellow of the Bangladesh Academy of Sciences (BAS), 2024



Inducted and elected Fellows of the BAS for the year 2024 (from left to right: Dr. Md. Kamal Hossain, Prof. Dr. Sumon Saha, Prof. Dr. Abu Bin Imran, Dr. S M Yasir Arafat, Prof. Dr. Rokshana Parvin and Dr. Abdul Mannan)



Syed Muktadir Al Sium &amp; Sanjana Fatema Chowdhury presented as the part of the symposium "AlphaFold Education Summit" organized by Google DeepMind and EMBL-EBI at EMBL-EBI, Hinxton, UK

## Short Biography of BRD Scientists

### Dr. Mohammad Moniruzzaman (June, 2006 - Present)



Office	Soil and Environment Research Section, Biological Research Division		Blood Group	B+
Position	Principal Scientific Officer		Degree Obtained	PhD (Environment, 2018)
Contact	monirbcsir@gmail.com monir-swe@bcsir.gov.bd		Mobile	01816702021
Citation	1970	h index 23	i10 index 54	

Dr Mohammad Moniruzzaman was awarded a Ph.D. from the University of Dhaka in 2018. He received a fellowship from the Ministry of Science and ICT for his doctoral research. He has been serving as the Chief Coordinator (Officer In-charge) of the Central Analytical and Research Facilities (CARF) at BCSIR since February 2020. He worked as a program director for the Annual Development Program (ADP), funded by the Ministry of Science and Technology in 2010. Dr Moniruzzaman worked as a consultant for the Clean Air and Sustainable Environment (CASE) Project, Department of Environment, funded by the World Bank from 2017 to 2019. He is now working as the Head of the Independent Monitoring Group for the environmental monitoring and mitigation measures of the Dhaka Mass Rapid Transit Development Project (DMRT) and the Hazrat Shahjalal International Airport Expansion Project. He has published over 150 peer-reviewed research articles and three industrial processes. Additionally, he serves as a reviewer for numerous prestigious journals and has completed several notable training courses on ISO/IEC 17025:2017. His current research mainly focuses on GIS, air quality modelling, microplastic pollution, and environmental impact assessments (EIA).

### Dr. Md Kamal Hossain (June, 2006 - Present)



Office	Biological Research Division		Blood Group	A+
Position	Principal Scientific Officer		Degree obtained	Ph.D. (Chemistry, 2015)
Contact	kamalbcsir@gmail.com		Mobile	01799590184
Citation 1319	H - index 20		i10 - index 35	

Md. Kamal Hossain earned his Bachelor of Science (Hons) and a Master of Science (MS) degree in Soil, Water, and Environment from the University of Dhaka and his Ph.D. in Chemistry from Sogang University in Seoul, South Korea, with professor Kyung Byung Yoon (KB Yoon). Dr. Hossain's Ph.D. dissertation is titled "Order Uniformly Crystalline Mesoporous TiO<sub>2</sub> Polymorphs and Periodic Mesoporous Organosilicas (PMOs): Novel Synthesis, Characterization, and Photocatalytic Activity. He is credited with publishing more than 45 peer-reviewed papers, four patents, and four industrial processes, serving as a reviewer for the prestigious journals Nature Scientific Report, Environmental Science and Pollution Research, Environmental Geochemistry and Health, and MDPI (Biology, Land, and Sustainability), as well as completing some prestigious training courses on ISO/IEC 17025:2017: Understanding the Course of Lab Accreditation for ISO/IEC 17025:2017. His credits go to the operation and maintenance of AAS, BET, XRD, UV-VIS, NIR, AQMS, FESEM, WD-XRF, PL, and HR-TEM. From August 2019 to November 2019, he had been working as a visiting scientist at CSIRO, Melbourne, Australia, with Prof. Miao Chen (a professor at RMIT University and principal investigator at CSIRO, Melbourne, Australia). He has been working in the Bangladesh Council of Scientific and Industrial Research since June 2006 as a Scientific Officer; in August 2011, he was promoted to Senior Scientific Officer; and in 2019, he was promoted to Principal Scientific Officer. His research interests are in material chemistry, climate change, the blue economy, solar cells, wastewater treatment, homogeneous catalysis, lithium-ion batteries, nanomaterials, and pollution. Dr. Hossain is also a member of the environmental air pollution control independent monitoring group (IMG) of the Dhaka Mass Rapid Transport Authority (DMRTA) and Hazrat Shajalal International Airport extension projects, and he has completed four special grant projects from the Ministry of Science and Technology, Government of Bangladesh. Dr. Hossain is also a professional member of the American Chemical Society (3224699), the Dhaka University Alumni Association (LM-15578), a life member of the Dhaka University registered graduate (LM-2017033595), EDAPHOS, LM-313, the Chinese Chemical Society, INGSA, the BCSIR Scientist Association, the Bangladesh Crystallographic Association, and the Bangladesh Academy of Science.

**Dr. Shahina Akter (June 2006 - Present)**

Office	Biological Research Division	Blood Group	O+
Position	Principal Scientific Officer	Degree Obtained	PhD (2018)
Contact	shupty2010@gmail.com	Mobile	01724096941

Dr. Shahina Akter has passed his BSc and MS degree from Department of Botany, University of Dhaka. She obtained her PhD degree from Department of Microbiology, University of Dhaka. She had the opportunity to work at Plant Biotechnology in UAS Bangalore, Karnataka, India. She has attended on many training program national and internationally. She got a training program on "Bioinformatics Training Course" at Senate Building, University of London, UK. She attended a training program on Molecular Biotechnology, jointly organized by University of Texas at Austin and the City University of New York, USA and Department of Botany, University of Dhaka. She has achieved RTFDCS fellowship, given by CCSTDS, Chennai, India and Bangabandhu Fellowship on Science and Technology. Dr. Shahina has more than 17 years research experience on Biotechnology, Genomics and Bioinformatics (Human Whole Genome, Metagenomics, Covid 19, Dengue whole genome sequencing), Microbiology, Molecular Biology, and Cytogenetics. Till now she has supervised 10 MS thesis research and has published 59 scientific articles in many national and international journal of repute. She has been appointed as a member of ASM communication committee and achieved CAS-ANSO Visiting Fellowship, Beijing, China.

**Dr. Tanjina Akhtar Banu (2006 - Present)**

Office	Biological Research Division	Blood Group	B+
Position	Principal Scientific Officer	Degree Obtained	PhD (2018)
Contact	tanzinabcsir@yahoo.com	Mobile	01847161626

Dr. Tanjina Akhtar Banu has completed her BSc and MS degree from Department of Botany, University of Dhaka. She obtained her PhD degree from Department of Botany, University of Dhaka in 2018. She has several years of experience in plant biotechnology especially on recombinant DNA technology and genetic transformation, Genomics and Bioinformatics. She had opportunity to attend a training program on "Bioinformatics Training Course" at Senate Building, University of London, UK. She has joined in BCSIR in 2006 as Scientific officer. Now she is working in Genomics Research Laboratories, BCSIR as a Principal Scientific Officer. Till now she has supervised 8 MS thesis student and has published 45 scientific articles in many national and international journals.

**Badhan Saha (December, 2009 - present)**

Office	Biological Research Division	Blood Group	AB+
Position	Senior Scientific Officer	Degree obtained	MS, PhD (On going)
Contact	badhan_swe@yahoo.com	Mobile	01911102565

Badhan Saha earned his BSc and MS degree in Soil, Water & Environment from the University of Dhaka. He worked as a research assistant at Bangladesh-Australia Centre for Environmental Research (BACER-DU) from 2006 to March 2008 and worked as a Program associate of an Annual Development Program (ADP) from July 2009 to June 2010. Now he is doing his PhD program at the University of Dhaka. The main research interest is the assessment and mitigation process of contaminants in the environment (soil, water, and air) as well as in the food chain. He has authored or co-authored 42 publications and gets 558 citations (h-index: 11, i10-index: 12). He has three accepted processes. He is a life member of EDAPHOS, NITUB, BAAS, SSSB, and NAPD.

**Ruhul Amin (December 2009 - Present)**

Office	Biological Research Division	Blood Group	AB+
Position	Senior Scientific Officer	Degree obtained	MS (2008)
Contact	ruhulamin.bcsir@gmail.com	Mobile	01711368143
Paper	17	Process	1

Ruhul Amin earned his BSc and MS degree in Zoology from the University of Dhaka. He is specialized in molecular biology, skin care, and natural products research. He is working in Zoology Section of Biological Research Division. Currently, he is doing doctoral study in the Department of Dermatology, Venereology and Allergology in Charité – Universitätsmedizin Berlin, Germany.

**Dr. Nahid Sultana (December, 2009 - Present)**

Office	Zoology Section, Biological Research Division	Blood Group	A+
Position	Senior Scientific Officer	Degree obtained	PhD (2021)
Contact	nahid.bcsir@gmail.com	Mobile	01847235694
Paper	23	Process	3

Dr. Nahid Sultana earned her both BSc and MS degree in Zoology from the Department of Zoology, University of Dhaka. She obtained PhD Degree on "Relationship between plankton population and the survival of epidemic *Vibrio cholerae* in Bangladesh" from the Department of Zoology, University of Dhaka. She was awarded Bangabandhu Fellowship on Science and Technology for conducting her PhD work. She had experiences for working in Infectious Disease Division, ICDDR'B with a joint program of Maryland University, USA and University of Dhaka. She had published 23 research articles in different National and International Journals. Her research interest on Applied Zoology, Molecular Ecology and Environmental Biology. She is a life member of Bangladesh Association for the Advancement of Sciences (BAAS) and Zoological Society of Bangladesh (ZSB).

**Dr. Chapol Kumar Roy (2009 - Present)**

Office	Biological Research Division	Blood Group	A+
Position	Senior Scientific Officer	Degree obtained	MS, PhD (On going)
Contact	chapolbcsir2012@gmail.com	Mobile	01714219710

Dr. Chapol Kumar Roy passed his BSc and MS degree in botany (Plant biotechnology) from the University of Rajshahi. He obtained his PhD degree from Department of Biological Functions and Engineering, Graduate School of Life Science and Systems Engineering, Kyushu Institute of Technology, Japan. His research is mainly focused on bio-energy production from bio-solid, analysis of microbial community and function. He had the opportunity to work at microbial community analysis in KIT, Fukuoka, Japan. He has attended on many trainings program national and internationally. Dr. Roy has more than 15 years research experience on Biotechnology, Microbiology, Growth analysis of Microalgae and Fungi, and Molecular Biology. Till now he has supervised 7 MS thesis research and has published 20 scientific articles in many national and international reputed journals.

**Mst. Nadira Begum (2006-Present)**

Office	Biological Research Division		Blood Group	O+	
Position	Senior Scientific Officer		Degree obtained	M.S. (2002)	
Contact	nbegum470@gmail.com		Mobile	01679259177	
Paper	27	Process	02	Patent	--

Mst. Nadira Begum earned her both BSc and MS degree in from Department of Botany, University Of Dhaka. Currently she is pursuing her PhD in Department of Botany, University Of Dhaka .She is specialized in Mycology, Plant Pathology , Microbiology, Natural product research and Algae culture. She has authored and coauthored 27 publications.

**Dr. Md. Zamilur Rahman (July, 2006 - Present)**

Office	Biological Research Division		Blood Group	O+	
Position	Senior Scientific Officer		Degree obtained	PhD (2018)	
Contact	jewel.haidar@gmail.com		Mobile	01913465003	
Paper	21	Process	03	Patent	--

Dr. Md. Zamilur Rahman earned his PhD in Biological Sciences from University of Rajshahi. His research is mainly focused on Industrial Micropropagation & Bioprocessing. He is a life member of Bangladesh Botanical Society, BAPTC and BAS. At present, he is working in Plant Physiology of Biological Research Division.

**Dr. Mahmuda Begum (June, 2011 - Present)**

Office	Zoology Section, Biological Research Division		Blood Group	A+
Position	Senior Scientific Officer		Degree obtained	PhD (2021)
Contact	mahmudabegum.bcsir@gmail.com		Mobile	01721313869
Paper	24 + 2 book chapters	Process	2	

Dr. Mahmuda Begum is a Senior Scientific Officer at the Zoology Section of Biological Research Division, BCSIR Dhaka Laboratories since 2020. She joined as a Scientific officer in the same section in 2011. She obtained her BSc (Hons.) and MS degree in Zoology (Fisheries) from the University of Dhaka. She received her PhD in Life Science from the University of Nottingham, UK in 2021. She was awarded the University of Nottingham Vice-Chancellor's Scholarship, UK and Bangabandhu S & T Fellowship, Bangladesh to accomplish her PhD degree. Dr. Mahmuda's research interest focuses on diverse field of biology such as evolutionary genetics, molecular ecology, genotoxicity, developmental biology (Zebra fish) and biotechnology including aquaculture, fish microbiology and nutrition. Her current research projects concern the breeding line development of a model fish using CRISPR-Cas9 gene editing method. She is the life member of BAAS, BSM and ZSB. Recently, Dr. Mahmuda has been elected as an Associate Fellow of Bangladesh Academy of Science (BAS) in 2024.

**Dr. Mousona Islam (2011-Present)**

Office	Biological Research Division	Blood Group	A+
Position	Senior Scientific Officer	Degree obtained	PhD (2022)
Contact	mousonaislam@yahoo.com	Mobile	01711450332

Mousona Islam completed her BSc and MS degree from Department of Botany, University of Dhaka. She obtained her PhD from Saitama University, Japan specialization on Plant Stress Physiology. She has 14 years of experience in plant biotechnology especially on molecular biology, CRISPR-Cas9 genome editing, plant tissue culture, recombinant DNA technology and genetic transformation, cytogenetics and bioinformatics. She has co-supervised 5 MS thesis students and has published 19 scientific articles in many national and international journals.

**Mst. Elina Akther Zenat (February, 2013 - Present)**

Office	Biological Research Division	Blood Group	O+
Position	Senior Scientific Officer	Degree obtained	M.S. (2011)
Contact	elinazenat@gmail.com	Mobile	01710181071

Mst. Elina Akther Zenat earned her both BSc and MS degree in Botany from the National University. She is specialized in Microbiology and Algae Culture. She has coauthored 10 publications.

**Afroza Parvin (July, 2015- Present)**

Office	Biological Research Division	Blood Group	B+
Position	Senior Scientific Officer	Degree obtained	MS
Contact	afrozaparvinbcsir@gmail.com	Mobile	01727270015

Afroza Parvin earned her BSc and MS degree in Soil, Water and Environment from the University of Dhaka. She has joined in BCSIR in 2015 as Scientific officer and promoted to Senior Scientific officer in 2020. Her research interest is mainly focused on environmental chemistry, environmental remediation technologies, waste management and mitigation, air pollution monitoring and mitigation measure, environmental impact assessment etc.

She has authored or coauthored 23 research articles in peer reviewed journals, two accepted process and one submitted patent. She is a life member of Registered Graduate University of Dhaka (Reg No. 2022041889), EDAPHOS. Registered Graduate University of Dhaka (Reg No. 2022041889), EDAPHOS.

**Barna Goswami (2015 - Present)**

Office	Biological Research Division	Blood Group	A+
Position	Senior Scientific Officer	Degree obtained	M.S.
Contact	barnagdu@gmail.com	Mobile	01725577063

Barna Goswami has passed her BSc and MS degree from Department of Botany, University of Dhaka (Plant Biotechnology group). She has joined in BCSIR in 2015 as Scientific officer. Her research interest is focused on Genomics, Bioinformatics, Plant Genetic Transformation (biotic stress tolerant crop), Molecular Biology and Plant Tissue Culture (specially rare and endangered plant). She got a training program on "Bioinformatics Training Course" at Senate Building, University of London, UK. She has experience on various molecular techniques like PCR, Real Time PCR and Next generation sequencing (NGS). Till now she has published 48 scientific articles in many national and international journal of repute.

**Iffat Jahan (2015 - Present)**

Office	Biological Research Division	Blood Group	AB+
Position	Senior Scientific Officer	Degree obtained	PhD (On going)
Contact	iffatjahan.ifst@bcsir.gov.bd	Mobile	

Iffat Jahan has earned both BSc and MS degree in Biochemistry and Molecular Biology from the University of Dhaka. She has works as Research Assistant (2013) in Molecular Biology Lab of University of Dhaka under Prof. Haseena Khan. She has also worked as Research fellow (2014-2015) in Centre for Advanced Research in Sciences (CARS), University of Dhaka. She has joined in BCSIR in 2015 as Scientific officer of regarding field. She has research experience in molecular biology and skilled in basic molecular techniques like Sanger's sequencing, Real Time PCR, Cloning and Next generation sequencing (NGS). Her research focus is understanding the molecular mechanism of tumorigenesis. She has authored or coauthored 8 publications. She is a life time member of BSBMB (Bangladesh Society of Biochemistry and Molecular Biology), National Young Academy of Bangladesh (NYAB).

**Afsana Parvin (October, 2018 - Present)**

Office	Biological Research Division	Blood Group	A+
Position	Scientific Officer	Degree obtained	MS
Contact	afsanajamy@gmail.com	Mobile	01521203840

Afsana Parvin earned her BSc and MS degree in Soil, Water and Environment from the University of Dhaka. Throughout her academic life, she achieved several awards and scholarships e.g., Dean's Award-2012, Abdus Salam Memorial Gold Medal-2012, The Gold Medal Award-2014, etc. Her research is mainly focused on environmental remediation technologies, air pollution monitoring, and mitigation measures, environmental impact assessment, waste management approaches, etc. Currently, she is working on three R & D projects. She has submitted one patent. She has authored or co-authored 2 publications in scopus indexed international journals. She has one accepted industrial process. She is a life member of EDAPHOS.

**Shanzida Islam (December, 2018 - Present)**

Office	Zoology Section, Biological Research Division	Blood Group	A+
Position	Scientific Officer	Degree obtained	MS
Contact	shanzida.shanzi@gmail.com	Mobile	01815005733
Paper	10	Process	0

Shanzida Islam earned her both BSc and MS degree in Zoology from the Jagannath University. She is specialized in Fisheries. She has authored or co-authored 10 publications in different National and International Journals. Her research interest on Fish Biology and Applied Zoology. She is a life member of NITUB, Zoological Society of Bangladesh.

**Nasima Momtaz (October, 2016 - Present)**

Office	Biological Research Division	Blood Group	O+
Position	Scientific Officer	Degree obtained	M.S. (2016)
Contact	nmlucky05@gmail.com	Mobile	01922920642

Nasima Momtaz earned his both BSc and MS degree in Botany from National University. She has 5+ years of experience assisting and overseeing research project involving plant physiology & biochemistry, Mycology and Biotechnology. She has authored or coauthored of 04 publications. She is a life member of Bangladesh Botanical Society (BBS).

**Sanjana Fatema Chowdhury (2021 - Present)**

Office	Biological Research Division	Blood Group	B+
Position	Scientific Officer	Degree obtained	M.S.
Contact	sanjanafatema@bcsir.gov.bd	Mobile	01517162172

I hold a B.Sc. and an MS degree in Genetic Engineering and Biotechnology, complemented by a concurrent second major in CSE from Shahjalal University of Science and Technology. My academic journey also includes serving as a RA on a UGC-funded project within my department. Currently, I lead as the president of the ISCB RSG-Bangladesh and hold memberships in International Society for Computational Biology (ISCB) and American Society of Microbiology. My skill set encompasses bioinformatics, microbial genomics, molecular biology techniques, etc. I've enriched my knowledge through offline and online training programs, covering programming languages, drug design, and AMR. Moreover, I've contributed to 7 publications in esteemed international and national journals.

**Showti Raheel Naser (2021-Present)**

Office	Biological Research Division	Blood Group	B+
Position	Scientific Officer	Degree obtained	M.S.
Contact	showtirnaser@gmail.com	Mobile	01914207437

I have completed my BS and MS degree from Department of Genetic Engineering and Biotechnology, University of Dhaka. I have started my journey in Bangladesh Council of scientific and Industrial Research (BCSIR) as Scientific Officer from 15th November, 2021. I have research experience in molecular biology, genetics, microbial techniques and skilled in several basic molecular techniques. Moreover, I've published 8 articles in peer reviewed international journals.

**Syed Muktadir Al Sium (2021 - Present)**

Office	Biological Research Division	Blood Group	A+
Position	Scientific Officer	Degree obtained	M.S.
Contact	Sium.muktadir@bcsir.gov.bd	Mobile	01521459998

Syed is a biotechnologist and globally recognized trainer with in-depth knowledge and training in NGS, omics & bioinformatics, molecular biology, molecular diagnostics and genomic & sero epidemiology. With a unique background in Biotechnology and Computer Science, and experience from prestigious institutions worldwide, Syed is dedicated to advancing the understanding of life sciences and enlightening others through knowledge sharing.

**Natasha Nafisa Haque (November, 2018 - present)**

Office	Biological Research Division	Blood Group	O+
Position	Scientific Officer	Degree obtained	M.S. (2014)
Contact	Natashahaque86@gmail.com	Mobile	01768442798
Paper	09	Process	-
		Patent	-

Natasha Nafisa Haque has completed his BSc and MS degree from Department of Botany, from the National University. Her research interest on Applied Botany, Phycology, Mycology, Plant Physiology, Biotechnology, Environmental science and Agriculture. She has authored or coauthored of 09 publications.

**Nizam Uddin (January, 2023 - Present)**

Office	Biological Research Division	Blood Group	O+
Position	Scientific Officer	Degree obtained	M.S.
Contact	nijam1997@gmail.com	Mobile	01818796087

I am Nizam Uddin, completed a BSc and an MS degree from Department of Microbiology, University of Dhaka. In 2023, I joined in BCSIR as Scientific officer. My research exposure was commenced in M.Sc thesis & especially on the entitled topic 'Characterization of Oil Degrading Bacteria Isolated from Oil Contaminated Soil, Dhaka city, Bangladesh'. Alongside with that, I gathered a bit of experience on conventional PCR, growth optimization, biofilm, biosurfactant study & WGS library preparation.

**Fida Chowdhury (March, 2024 - Present)**

Office	Zoology Section, Biological Research Division	Blood Group	B+
Position	Scientific Officer	Degree obtained	M.S.
Contact	chowdhuryfida@gmail.com	Mobile	01610841469

Fida Chowdhury has completed her both BSc and MS in Zoology from the Department of Zoology, University of Rajshahi. She has started her journey in Bangladesh Council of Scientific and Industrial Research (BCSIR) as Scientific Officer from 3rd March, 2024. Her research interest focuses on diverse field of biology such as fish microbiology, developmental biology and aquaculture. Furthermore, she has gained a basic experience on conventional PCR, Real Time PCR and Sanger's sequencing.

## Scientists of CRD



### CHEMICAL RESEARCH DIVISION

Chemical Research Division (CRD) is one of the major research divisions of BCSIR Dhaka Laboratories. The main purposes of this division are to explore the natural resources of the country. Production of chemicals, both organic & inorganic, synthesis (organic & inorganic), herbs processing's & herbal products, waste management from chemicals and other industries as well as development of processes of products from industrial wastes, production of different kinds of gum and adhesives from indigenous sources raw materials are also the objectives of this division. A Synthesis Laboratory is started in this division. Synthesis is creating new substances with diverse biological applications, such as anti-bacterial and anti-fungal activities, anti-tumor, anti-cancer, anti-oxidant, anti-inflammatory activities and other therapeutic and medicinal properties. Chemical research division is now focusing on synthesis of different types compounds for industrial uses.

- Number of Scientists: 13
- Total ongoing R&D: Nine (9)
- Analytical Services: 450

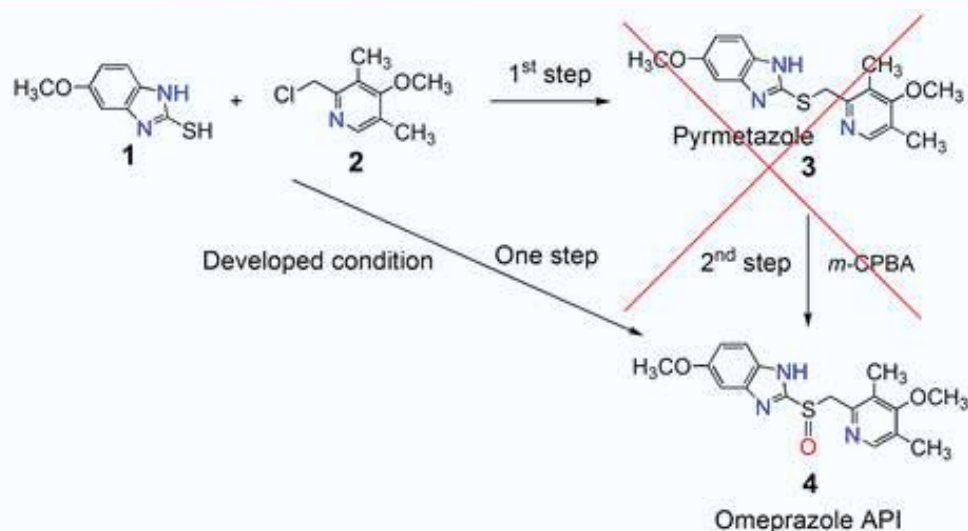
**Research Areas & Short Description on R&D:** The R&D activities of CRD are being carried out on production of chemicals from indigenous natural sources, industrial chemicals, gum and adhesives, production of sugars from various natural resources, production of various industry essentials (OLED materials and API synthesis) through organic synthesis. Important methods development from this category such as: Phosphate and carbonate-based fire extinguishing powder, production of chitin and chitosan from shrimp waste shell, production of curcumin from turmeric, methyl and ethyl salicylate, liquid detergent, liquid hand wash, Ultrasound gel, Zinc Acetate, Lead Acetate etc.

#### R&D projects:

##### 01. Process development of active pharmaceutical ingredients for industrial uses

*Md. Monarul Islam, Md. Hossain Sohrab, Md. Sakhawat Hossain, Taslima Akter, Md. Hasan Ali and Md. Nazrul Islam Bhuiyan*

The production of active pharmaceutical ingredients (APIs) generally involves very high costs due to the large number of synthetic steps often involved and also due to the very stringent purity requirements imposed by regulatory agencies. The pharmaceutical industry is one of the most emerging sectors in current Bangladesh. The industry consists of about 275 pharmaceutical companies which are providing more than 97 percent of the local demand for drugs. Drastic developments in the pharmaceutical sector have enabled Bangladesh to export medicine to global markets. The pharmaceutical companies are successful in local market with huge import substitutions (APIs) and now flourishing in the international market mostly due to the opportunity of patent exemption by the TRIP still 2033.



However, compared to large local demand, more API industries are needed to be set up. The API raw materials, which are mostly imported from China, South Korea and India, are not always of the requisite quality. The API can save at least 70 per cent of the cost of import of pharmaceutical raw materials from abroad.

### Objectives :

- Design and method development of Omeprazole API as Proton Pump Inhibitor (PPI).

### Work Progress :

- Omeprazole has synthesized on one step from the reactants.
- Optimization of the reaction is in progress.

## 02. Exploring the nutritional and chemico-biological potential of marine algae: Advancing towards a sustainable blue economy

**Safaet Alam, Hemayet Hossain, Md. Hossain Sohrab, Md. Farhad Sarker, Khondoker Shahin Ahmed and Md. Sakhawat Hossain**

Global demand for macroalgal and microalgal foods is growing, and algae are increasingly being consumed for functional benefits beyond the traditional considerations of nutrition and health. There is substantial evidence for the health benefits of algal-derived food products, but there remain considerable challenges in quantifying these benefits, as well as possible adverse effects as there is a limited understanding of nutritional composition across algal species, geographical regions, and seasons, all of which can substantially affect their dietary value. Marine algae is also a potential source of nutrition and commercialized algae-derived functional foods. Besides, due to high protein content they can also be used as protein supplements even can be utilized as poultry or fish feeds. Algae, often overlooked, hold immense nutritional value and potential for human health. Bursting with essential vitamins, minerals, and bioactive compounds, these aquatic organisms offer a sustainable and nutrient-rich source of food and supplements. Rich in protein, algae provide an excellent alternative for meeting dietary protein needs, especially for vegetarians and vegans. Moreover, they are abundant in omega-3 fatty acids, crucial for heart health and cognitive function. Not only do algae boast high levels of vitamins A, C, and E, but they also contain an array of B vitamins, including B12, which is typically scarce in plant-based diets. Additionally, minerals like calcium, magnesium, and iron are abundant in certain algae species, supporting bone health and energy metabolism.

Phytocompounds from these sources also show promise in managing blood sugar levels and supporting weight management. Incorporating algae into our diets, whether through whole foods, extracts, or supplements, can diversify our nutrient intake and contribute to overall health and well-being. As we delve deeper into the nutritional and chemico-biological potential of algae, we take a significant step towards harnessing the blue economy for sustainable food and nutrition solutions. Thus, our study focused on the determination of macro and micronutrient contents along with amino acid profiling for assessing new protein supplements, isolation of bioactive phytochemicals and determination of their therapeutic application through in vitro, in vivo and in silico protocols.

## Objectives :

- To isolate and characterize the pure compounds employing NMR/GC-MS technique.
- To investigate the pharmacological actions of that compound that leads the plant as potential drug candidate.
- To evaluate the micro and macro nutrient along with amino acid profiling to propose a protein supplement and/or functional foods.

## Work Progress :

- Isolation of bioactive phytochemicals
- Evaluation of bioactivities through wet and dry lab studies

### 03. Synthesis and computational studies of Aroylhydrazinato metal complex Based Liquid Crystals

*Taslima Akter, Md. Monarul Islam, Md. Hasan Ali, Mohammad Mahbubur Rahman, Md. Nur Hossain, Md. Hossain Sohrab and Md. Farid Ahmed*

Liquid crystals are partially ordered, anisotropic fluids situated between crystalline solids and isotropic liquids, with wide applications in electro-optical display systems. Metal-containing liquid crystals are especially attractive due to their magnetic, electrical, optical, and electro-optical properties, arising from the synergy between organic frameworks and metal centers. Hydrazone, hydrazone, and carbazone derivatives offer structural flexibility, chemosensor ability for selective detection of metal ions and biomolecules, and significant biological activities including antitumor, anticancer, and antimicrobial effects. The proposed work aims to synthesize and characterize such derivatives by UV, FT-IR, and NMR, while liquid crystallinity will be evaluated using POM, DSC, and XRD.

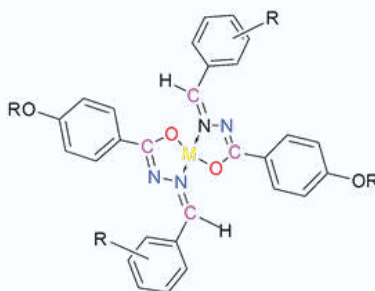


Fig. : 1: Aroylhydrazinatometal (II) complexes

## Objectives:

- Synthesis and characterization of Aroylhydrazone derivatives and their metal complexes
- To explore potential liquid crystal properties of synthesized compounds
- To study the antimicrobial and anti-oxidant activity of the synthesized derivatives
- DFT computational study and molecular docking

## Work Progress :

- Hydrazone ligands and metal complexes were synthesized
- Spectroscopic characterization were conducted
- Evaluation of Biological activities
- Chemosensor properties were explored

### 04. Synthesis, molecular docking and DFT computational studies of diamine and pyrimidine-based Schiff-base derivatives

*Md. Monarul Islam, Taslima Akter, Md. Hasan Ali, Mohammad Mahbubur Rahman, A. H. M. Shofiful Islam Molla Jamal, Abhijit Chowdhury, Dipa Islam and Md. Hossain Sohrab*

Schiff-bases are important class of organic compounds which have wide applications in many biological aspects. Schiff-bases have been reported to play very important role in many biological and chemical reactions, due to the presence of the imine linkage. Schiff bases are of significant attention because of their chemistry and potentially of assistance biological activity, such as antitumor, anticancer, antifungal, and antimicrobial activity. As an electrophile, the Schiff-bases group is widely used in many types of organic reactions such as reduction, addition, condensation, and cycloaddition and also in multicomponent reactions.

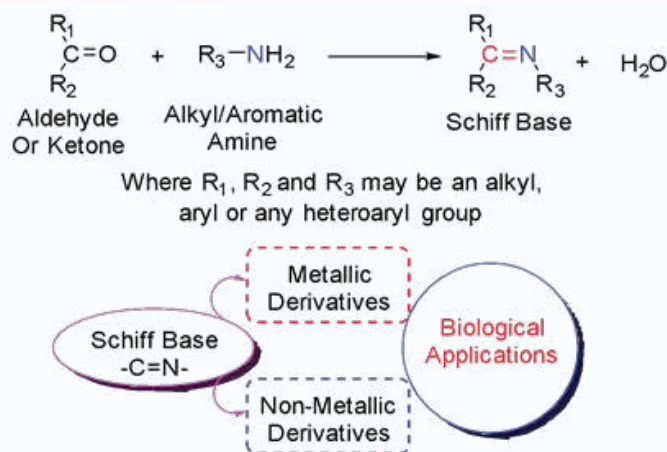


Fig. : Schematic illustration of the formation of Schiff-bases.

DFT computational studies are carried out to investigate the HOMO-LUMO and optimized energy, structure using Gaussian 09 program package.

### Objectives :

- Synthesis and optimization of Schiff-base derivatives
- To study the antimicrobial and anti-oxidant activity of the synthesized Schiff-base derivatives
- DFT computational study and molecular docking

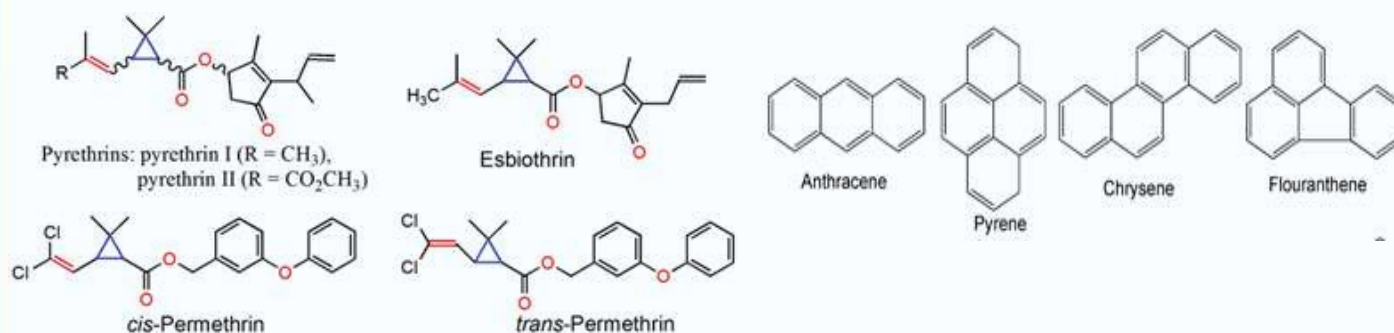
### Work Progress :

- Pyrimidines derivatives were synthesized
- Two research articles published
- Four processes and one patent submitted
- One process accepted by BCSIR office

## 05. UV and GC methods for detecting synthetic pyrethroid insecticide and polyaromatic hydrocarbons residues in environmental samples

*Md. Monarul Islam, Fajilatun Nesa, Md. Hasan Ali, Taslima Akter, S M Mahmudul Hassan and Md. Hemayet Hossain*

Synthetic pyrethroids are developed as commercial repellent product and insecticide used to repel mosquitoes, are also using in grain storing. They are toxic, caused skin irritant and has given rise to environmental concern. Some of the most well-known polyaromatic hydrocarbons (PAHs) include naphthalene, anthracene, phenanthrene, pyrene, and benzo[a]pyrene are used in a variety of industrial and commercial products, such as solvents, dyes, and insecticides. However, due to their potential health and environmental impacts, many countries regulate their use and emissions.



## Objectives :

- To develop method for the analysis of insecticides by GC method
- To develop method for the analysis of insecticides PAHs by UV-Vis method

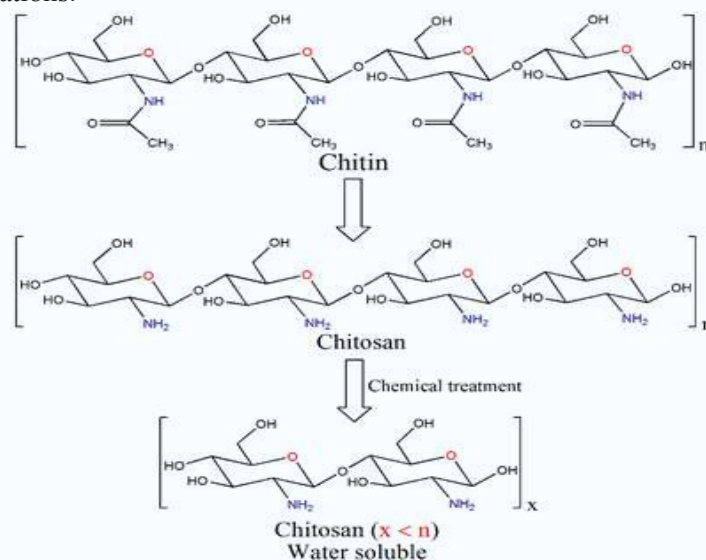
## Work Progress :

- Two methods have developed
- Two research articles submitted

### 06. Synthesis of water-soluble chitosan from shrimp processing waste

*Md. Monarul Islam, Fajilatun Nesa, S M Mahmudul Hassan, Mohammad Mahbubur Rahman, Abhijit Chowdhury and Trisha Paul*

Water soluble chitosan has gained much attention because of its satisfying properties as non-toxic, biocompatible and biodegradable. In chitosan structure predominates the glucosamine residues whose free amino groups at C-2 position permits be substituted to biopolymers with a large spectrum of applications. Water soluble chitosan can be easily obtained by the fragmentation of D-glucosamine units of chitosan by chemical treatment. Water soluble chitosan (WSC) provide several possible applications, such as protection of chitosan C-2 amino groups, enhancing the adsorption/complexation properties of the biopolymer yielding a material with potential analytical and environmental applications.



## Objectives :

- Production of water soluble chitosan from local shrimp processing waste
- To study the antimicrobial and anti-oxidant activity of the prepared chitosan

## Work Progress :

- Water soluble chitosan (WSC) was synthesized and characterized
- Two research articles published

### 07. Preparation of analytical research grade laboratory chemicals from commercial grade raw materials

*Nushrat Jahan Ethane(PL), Md. Hemayet Hossain, Khondoker Shahin Ahmed, Anjum Zerin Rupa, Badhan Shaha and Nazia Khatun*

Research organizations, pharmaceuticals, industries and educational institutes in our country spend a lot of foreign currencies to get proper laboratory grade chemicals. It is our view to develop the process for the production of most essentially chemicals like,  $\text{CH}_3\text{COONa}$ ,  $\text{Na}_2\text{C}_2\text{O}_4$ ,  $\text{CH}_3\text{COOK}$ ,  $\text{K}_2\text{C}_2\text{O}_4$  using commercial grade raw materials. Development of the process will help us to make the chemicals available not only in proper grade but also in very reasonable price. Successful completion of this research, the technology can be transferred to industrialization and reduce the dependency of foreign countries thus save millions of foreign currencies and will also create job opportunity for our unemployed men and women and to contribute in poverty alleviation.

### Objectives :

- To develop the process for the preparation of analytical grade chemicals (Sodium Acetate, Sodium Oxalate, Potassium Oxalate, Potassium Acetate) from commercial grade raw materials.

### Work Progress :

- Production of Analytical Grade Sodium oxalate has been accepted as Process by BCSIR authority
- Production of Analytical Grade Sodium acetate has been accepted as Process by BCSIR authority
- Production of Potassium oxalate has been successfully completed and analysis is underway
- Production of Potassium acetate is going on

## 08. Formulation of skin care cosmetics products by using *Citrus sinensis* (orange) peel extract

*Ferdoushi Jahan, Rakibul Hasan, Safaet Alam, Md. Hemayet Hossain, S.M. Mahmudul Hasan and Evena Parvin Lipy*

The discarded orange peel from the citrus fruit industry has recently been found to have potential benefits for skin health. Orange peel contains flavonoids, limonoids, and carotenoids, which possess antioxidant and anti-inflammatory properties. These compounds protect the skin from oxidative stress and inflammation caused by environmental factors like Ultraviolet (UV) radiation and pollution. This peel is also observed as a rich source of vitamin C which is beneficial in maintaining collagen synthesis, a protein that maintains skin elasticity and firmness. Using orange peel extract or essential oil in cosmetics reduces the appearance of wrinkles, fine lines, and age spots. The compounds present in orange peel also possess antimicrobial properties, which are beneficial for treating acne and other skin infections. Additionally, the extracts of orange peel can lighten the skin, and have potential to treat hyperpigmentation and uneven skin tone. Overall, orange peel is considered a valuable source of bioactive compounds that can improve skin health. Its antioxidant, anti-inflammatory, collagen-stimulating, antimicrobial, and skin lightening properties make it a potential ingredient in skincare products.

### Objectives :

- To develop cost effective and quality cosmetics products with locally available raw materials as citrus peel
- Formulated and developed products analysis and standardization
- Comparative study with marketed products

### Work Progress:

Orange peel extract contained flavonoids, phenolics, alkaloids, tannins, and saponins – confirming strong potential for skincare formulations. Orange peel extracts exhibit potent antimicrobial activity, effectively inhibiting the growth of various bacterial specieses. Studies have shown orange peel extracts can inhibit pathogens like *S. aureus*, *B. subtilis*, *E. coli* and *S. typhi*. Ethanol & methanol extracts showed clear inhibition zones. Chloroform & n-hexane extracts had no inhibition. All orange peel extracts exhibited antioxidant potential. Chloroform extract is the most efficient in isolating antioxidant compounds and proves strong antioxidant property. Vitamin C Content: Orange peel extract confirmed high ascorbic acid levels that effective for collagen synthesis, anti-aging, and skin-brightening applications.

## 09. Preparation of activated carbon from *Albizia lebbeck* for the removal of antibiotics in wastewater

*Shyama Prosad Moulick (PL), Nahid Sharmin, Shahin Aziz, Md. Hemayet Hossain, Md. Sahadat Hossain, Fajilatunnessa and S. M. Mahamudul Hasan*

### Introduction :

The presence of antibiotics in wastewater has become a major environmental concern due to their persistence and contribution to antibiotic resistance. Effective removal of these contaminants is essential to protect ecosystems and public health. Activated carbon adsorption is a widely used method for wastewater treatment, but its high cost limits large-scale application. *Albizia lebbeck*, a fast-growing and abundant tree species, offers a low-cost and sustainable source for activated carbon production. This study aims to prepare activated carbon from *Albizia lebbeck* and evaluate its efficiency in removing antibiotics, providing an eco-friendly solution for wastewater treatment.

## Objective of the Proposed R&D Project:

- Preparation of activated carbon from the stem of *Albizia lebbbeck*
- Removal of Antibiotics in wastewater

## Progress of the Project :

- Albizia lebbbeck biomass was successfully collected, cleaned, dried, and crushed
- Biomass was carbonized at the optimized temperature
- Biochar yield was satisfactory and stored for further processing
- Activated carbon was produced using chemical activation
- Neutralization and drying were done; product ready for testing
- FTIR, FE-SEM, and XRD analysis completed
- Initial batch experiments completed for two antibiotics
- Optimization of pH, contact time, and dose in progress

## Achievements and Activities

### Published Papers :

1. Rabeya Akter, Md. Monarul Islam, Md. Wahidul Islam, Taslima Akter, Trisha Paul, Mohammad Mahbubur Rahman, Md. Tushar Uddin, Shofur Rahman, Abdullah N. Alodhayb and Paris E. Georghiou, "Extraction procedure and theoretical studies of chitin from black soldier fly" J. Polym. Res., 2025, 32, 48.
2. Md. Elius Hosen Pk., Md. Monarul Islam, Rabeya Akter, Fajilatun Nesa, Mohammad Mahbubur Rahman, Trisha Paul, Sonjida Mustafi, Md. Rezaul Karim, Shofiur Rahman, Abdullah N. Alodhayb, Erick S. Vasquez-Guardado and Hamad Albrithen, "Carboxymethyl Chitosan-based Biodegradable Films Preparation and Prospects for Food Preservation" ChemistrySelect, 2025, 10, e202404675.
3. Md. Monarul Islam, Bigyan Sharma, Chuan-Zeng Wang, Shofiur Rahman, Abdullah N. Alodhayb, Paris E. Georghiou, Mark R. J. Elsegood and Takehiko Yamato, "Synthesis, Conformational Properties and DFT Computational Studies of [3] Metacyclo [3](1, 3) pyrenophanes" ChemistrySelect, 2024, 9, e202401809.
4. Fahmida Tasnim Richi, Safaet Alam, "From Hidden Hunger to Double Burden: Bangladesh's Urgent Need to Prioritize Diet Quality," Lancet Reg. Health – Southeast Asia 2025, 41, 100673–100673.
5. Mahathir Mohammad, Jahirul Islam, Mst. Maya Khatun, Md. Hossain Rasel, Al Masum, Khurshida Jahan Suma, Mohammad Rashedul Haque, Safaet Alam, "A Multifaceted Exploration of *Shirakiopsis indica* (Willd) Fruit: Insights into the Neuropharmacological, Antipyretic, Thrombolytic, and Anthelmintic Attributes of a Mangrove Species," Drugs Drug Candidates 2025, 4(3), 31–31.
6. Safaet Alam, Fahmida Tasnim Richi, Nazim Uddin Emon, Md. Jasim Uddin, Nazim Uddin Ahmed, Md. Salim Khan, Abdullah Al Mamun, "Chemico-pharmacological Evaluations of the Dwarf Elephant Ear (*Colocasia affinis Schott*) Plant Metabolites and Extracts: Health Benefits from Vegetable Source," Front. Pharmacol. 2024, 15, 1428341.
7. Safaet Alam, Md. Nafees Rahman Chowdhury, Md. Abir Hossain, Fahmida Tasnim Richi, Nazim Uddin Emon, "Antifungal Potentials of Asian Plants: Ethnobotanical Insights and Phytochemical Investigations," Chem. Biodivers. 2025, 22(5), e202402867.
8. Safaet Alam, Fahmida Tasnim Richi, Nazim Uddin Emon, Abu Asad Chowdhury, Choudhury Mahmood Hasan, Mohammad Rashedul Haque, "First-Time Report on Compound Isolation from Two *Colocasia Species*: Vegetable-Derived Bioactive Metabolites and Their Medicinal Potential," Front. Pharmacol. 2024, 15, 1474706.
9. Safaet Alam, Fahmida Tasnim Richi, Bakul Akter, Md. Hemayet Hossain, Satyajit Roy Rony, Abdullah Hridoy, Mahathir Mohammad, Sayema Khanum, Md. Sadman Hasib, Ferdoushi Jahan, "An Integrated Investigation on Taro Vegetable (*Colocasia gigantea Hook.f.*) to Ascertain Its Ethnomedicinal Importance: Insights into Prospective Phytochemicals Regulating Analgesic, Antidiabetic, and Cytotoxic Actions," Food Chem. Adv. 2025, 9, 101099–101099.
10. Samia Sharmin, Ali Ahsan Muzahid, Md. Mohibul Islam, Mst. Sarmina Yeasmin, Amit Kumar Dey, Md. Jasim Uddin, G. M. Masud Rana, "Preliminary Investigation of GC–MS Profiling and Antibacterial Activities of Different Solvent Extracts from *Litchi chinensis* Sonn. Seed," Scientifica 2025, 2025(1), 7644558.
11. Mahathir Mohammad, Md. Hossain Rasel, Fahmida Tasnim Richi, Md. Amzad Hasan, Md. Farhad Sarker, Safaet Alam, "Neuropharmacological, Cytotoxic, and Anthelmintic Potentials of *Lasia spinosa* (L.) *Thwaites* Rhizome: In Vivo, In Vitro, and Computational Approach," Pharmacol. Res. Nat. Prod. 2025, 7, 100254.
12. Md. Sadman Hasib, Fahmida Tasnim Richi, Safaet Alam, Md. Sazzadul Bari, Mohammad A. Rashid, Md. Aslam Hossain, "Isolation, Structure Elucidation, and Bioactivity Evaluation of Secondary Metabolites from *Vachellia farnesiana* (L.) Wight & Arn.," Chem. Biodivers. 2025, e00553.
13. Anik Molla, Md. Minhazul Hoque, Fahmida Tasnim Richi, M. Humayan Kabir, Safaet Alam, Nazim Uddin Ahmed, Nazim Uddin Emon, "Biosynthesis and Characterization of ZnO Nanoparticles Using *Citrus reticulata* Peel Followed by

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14. Mahathir Mohammad, Md. Rabiul Hossain, Md. Mahmudul Hasan, Fahmida Tasnim Richi, Abdul Motaleb Bhuiya, Shantu Chowdhury, Rajia Sultana, Safaet Alam, Rashadul Hossain, "A Novel Insight into the Anti-Diabetic and Diuretic Potentials of the *Colocasia esculenta* L. (Taro) Vegetable Flower Extract Accentuating Its Ethnobotanical Importance," *Pharmacol. Res. Nat. Prod.* 2025, 6, 100177.
  15. Sharmin Shahjahan, Khondoker Shahin Ahmed, Sayema Khanum, Anjum Zerine Rupa, Nushrat Jahan Ethane, Pritam Kundu, Mst. Maya Khatun, "Bioactivity and Phytochemical Characterization of *Ceriops decandra* (Griff.) Ding Hou. Leaves: HPLC-DAD Profiling, Antioxidant, Antimicrobial, and Antidiarrheal Potentials," *Chem. Biodivers.* 2025, e01015.
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  17. Pair Ahmed Jiko, Mahathir Mohammad, Fahmida Tasnim Richi, Md. Anisul Islam, Safaet Alam, Mohammad Abdullah Taher, Chuxiao Shao, Shuanghu Wang, Peiwu Geng, Abdullah Al Mamun, "Anti-inflammatory, Analgesic and Antioxidant Effects of *Shirakiopsis indica* (Willd) Fruit Extract: A Mangrove Species in the Field of Inflammation Research," *J. Inflamm. Res.* 2024, 5821–5854.
  18. Hasin Hasnat, Safaet Alam, Suriya Akter Shompa, Tanoy Saha, Fahmida Tasnim Richi, Md. Hemayet Hossain, Anika Zaman, "Phyto-Pharmacological Wonders of Genus Ficus: Ethnopharmacological Insights and Phytochemical Treasures from Natural Products," *Saudi Pharm. J.* 2024, 102211.
  19. Mst. Maya Khatun, Md. Farhad Sarker, Md. Hemayet Hossain, Md. Tariqul Islam, Barun Kanti Saha, Safaet Alam, A. S. M. Golam Kibria, "Assessment of the Protective Effect of Vitamin E Supplementation on Oxidative Damage of Diabetic Rat Spleen Induced by Streptozotocin," *Tissue Cell* 2024, 91, 102605.
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  21. Mirza Alimullah, Ishrat Jahan, Md. Mizanur Rahman, Ferdous Khan, Khondoker Shahin Ahmed, Md. Hemayet Hossain, Hesamoddin Arabnozari, Md. Ashraf Alam, Satyajit D. Sarker, Lutfun Nahar, Nusrat Subhan, "*Camellia sinensis* Powder Rich in Epicatechin and Polyphenols Attenuates Isoprenaline Induced Cardiac Injury by Activating the Nrf2 HO-1 Antioxidant Pathway in Rats," *Sci. Rep.* 2025, 15, 20859.
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  29. Zhixin Xie, Shaoling Li, Wei Liu, Kai Yan, Tao Jiang, Yiwei Liu, Md. Monarul Islam, Xing Feng, "An Efficient Approach to Narrow the Emission Band of Pyrene-based Emitters" *Chin. J. Org. Chem.* 2024, 44, 2504–2512.
  30. Mabiya S Samapti, Shahela Ahmed, Farhana Kishoara, Taslima Akter, Sheikh F U Ahmed, "Secondary Metabolites Isolation from Endophytic Fungi Diaporthe Arecae and Colletotrichum Gloeosporioides Isolated from *Syzygium cumini*

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  32. Md Zia Uddin Al Mamun, Tamanna Haque, Md Sagir Ahmed, Mohammed A. Satter, Mohajira Begum, Md Sujan Hossen, Shyama Prosad Moulick, Farhana Jahan, Rahima Akter Sathee, and Md Shohel Rana. "Nutritional evaluation of edible swimming crabs *Portunus pelagicus* (Linnaeus, 1758) and *Portunus sanguinolentus* (Herbst, 1783) from coastal area of Bangladesh." Journal of Agriculture and Food Research 15 (2024): 100972.
  33. Shyama Prosad Moulick, Farhana Jahan, Md Zia Uddin Al Mamun, Md Imam Sohel Hossain, Khondoker Shahin Ahmed, Md Alamgir Kabir, Md Mamunur Rashid, Rahima Akter Sathee, and Muhammad Mahfuz Hasan. "Boerhavia diffusa and Coccinia grandis: Two indigenous vegetables as a source of essential minerals, vitamins, amino acids, and fatty acids." Applied Food Research 4, no. 2 (2024): 100494.
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  35. Mahci Al Bashera, Shyama Prosad Moulick, Md Badrul Islam, Farhana Jahan, Md Najem Uddin, GM Masud Rana, Md Sabbir Hasan et al. "Antimicrobial and antioxidant properties of *Oldenlandia corymbosa* L. ethanolic extract: A comprehensive study with molecular docking and GC-MS analysis." Heliyon 11, no. 5 (2025).
  36. Tamanna Fariha mitu, Saiful Islam, Shamima Akther, AHM Shofiul Islam Molla Jamal, Shyama Prosad Moulick, Md Najem Uddin, Md Aftab Ali Shaikh, and Pradip K. Bakshi. "Synthesis and Characterization of Mn (II), Ni (II), and Cu (II) Complexes Derived From Sulfonamide and o-Vanillin-Based Schiff Base and Their Antimicrobial, Antioxidant, and Cytotoxic Properties." Applied Organometallic Chemistry 39, no. 6 (2025): e70203.
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### Process Accepted:

1. Nushrat Jahan Ethane, Md. Hemayet Hossain, Khondoker Shahin Ahmed, Anjum Zerine Rupa, Badhan Shaha, Nazia Khatun "Production of Analytical Grade Sodium Oxalate" accepted by the, BCSIR, Dhaka. Ref No. :39.02.0000.043.38.003.24/852; Date: 29.12.2024
2. Nushrat Jahan Ethane, Md. Hemayet Hossain, Khondoker Shahin Ahmed, Anjum Zerine Rupa, Badhan Shaha, Nazia Khatun "Production of Analytical Grade Sodium Acetate" accepted by the, BCSIR, Dhaka. Ref No. :39.02.0000.043.38.013.24/405; Date: 26.05.2025
3. Md. Monarul Islam, Fatema Tuz Zohora, A. H. M. Shofiul Islam Molla Jamal and Mohammad Mahbubur Rahman "Production of 2-Nitrochalcone" Ref. 39.02.0000.043.37.993,24/27; Date: 26/01/2025.
4. Shyama Prosad Moulick "Production of Nutritious Beetroot Powder" accepted on 19.01.2025, ref. no., 39.02.0000.043.38.012.24/1209.
5. Shyama Prosad Moulick "Production of Nutritious Beetroot Sauce" accepted on 19.02.2025, ref. no., 39.02.0000.043.37.985.24.391.
6. Shyama Prosad Moulick "Production of Nutritious Beetroot Murabba" accepted on 18.04.2025, ref. no., 39.02.0000.043.37.986.24.375.

### Patent Submitted:

1. Md. Monarul Islam, Fatema Tuz Zohora, A. H. M. Shofiul Islam Molla Jamal, Abhijit Chowdhury, "Green synthesis of 3-(2-hydroxyphenyl)-1-phenylprop-2-en-1-one", submitted by the office of the Patents and Design and Trademarks, Motijheel, Dhaka. Ref: 39.02.0000.043.37.984.24/675 Date: 05/03/2024.

### Guidance to research work (PhD/M.Phil/ M.Phil/ M.S/ NCST & BCSIR Fellow)

Sl. No	Title of Research	Ph.D/ M.Phil/ M.S Category	Name of the Student	Name of the Institution	Name of Supervisors
01.	Theoretical study on chalcone & chitin derivatives based on DFT calculation	Postgraduate Fellow	Rabeya Akter	BCSIR	Dr. Md. Monarul Islam
02.	Synthesis and Spectroscopic Analysis of Thiazine Derivatives: Biological and DFT Study	MS	Md. Fuad Mahamud	University of Dhaka	Dr. Md. Monarul Islam Dr. Ahsan Habib (DU)

## Training:

1. Nushrat Jahan Ethane (SSO), participated training program on “Basic Principle, Maintenance and troubleshooting of XRD, FTIR and Raman Spectroscopy” of HPLC” held on 21 May, 2025 at BCSIR Laboratories Dhaka, Bangladesh Council of Scientific and Industrial Research (BCSIR)
2. Nushrat Jahan Ethane (SSO), participated training program on “Research Methodology and Publication” held on 26 May, 2025 at BCSIR Laboratories Dhaka, Bangladesh Council of Scientific and Industrial Research (BCSIR)
3. Dr. Md. Monarul Islam (SSO), worked as trainer on a program entitled “Training on Research Methodology and Publication” organized by BCSIR Dhaka Laboratories, May 21, 2025. Taslima Akter participated in house training on “Operation and Maintenance of Nuclear Magnetic Resonance (NMR) Spectrometer” from 8–12 December 2024.
4. Taslima Akter (SSO), participated in house training on “Operation and Maintenance of Simultaneous Thermal Analyzer (STA)” from 4–8 May 2025.
5. Taslima Akter (SSO), participated as trainee on a program entitled “Training on Research Methodology and Publication” organized by BCSIR Dhaka Laboratories, May 26, 2025.
6. Taslima Akter (SSO), participated as trainee on a program entitled “Basic principle, maintenance and troubleshooting of XRD, FTIR and Raman Spectroscopy” organized by BCSIR Dhaka Laboratories, May 21, 2025.
7. Taslima Akter (SSO), participated as trainee on a program entitled “Introduction to Python: Basic programming and Data Analysis” organized by BCSIR Dhaka Laboratories, November 05, 2024.
8. Taslima Akter (SSO), participated as trainee on a program entitled “Principle, Application, troubleshooting and maintenance of HPLC” organized by BCSIR Dhaka Laboratories, November 12, 2024.
9. Taslima Akter (SSO), participated as trainee on a program entitled “PPA-2006 AND PPR-2008 in Scientific Procurement” organized by BCSIR Dhaka Laboratories, May 22, 2025.
10. Md. Hasan Ali (SSO), participated on a training program entitled “Basic principle, maintenance and troubleshooting of XRD, FT--IR and Raman Spectroscopy” organized by BCSIR Dhaka Laboratories, May 21, 2025.
11. Md. Hasan Ali (SSO), participated on a training program entitled “Training on Research Methodology and Publication” organized by BCSIR Dhaka Laboratories, May 21, 2025.
12. Shyama Prosad Moulick (SSO), participated in a training program on “Understanding of ISO 17025:2017-for Laboratory Accreditation” held on 27 May 2025 at BCSIR Dhaka Laboratories, Bangladesh Council of Scientific and Industrial Research (BCSIR).
13. Shyama Prosad Moulick (SSO), participated in a training program on “Research Methodology and Publication” held on 26 May 2025 at BCSIR Dhaka Laboratories, Bangladesh Council of Scientific and Industrial Research (BCSIR).
14. Shyama Prosad Moulick (SSO), participated in a training program on “BET Sorpometer” held on 18-22 May 2025 at CARF, Bangladesh Council of Scientific and Industrial Research (BCSIR).

## Number of Analytical (Ad-Hoc) Problem Solved:

Name and Designation	Routine Type	Research Type	Total
Chemical Research Division	360	450	810

## Product Photo:



Moisturizing Hand Wash



Skin Care Gel



Mouth Wash Powder



Octyl Acetate

## Short Biography of CRD Scientists

### Md. Hemayet Hossain (June, 2006 - Present)



Office	Chemical Research Division	Blood Group	B+
Job Title	Principal Scientific Officer	Degree Obtained	M.Pharm
Contact	hemayet.hossain02@gmail.com	Mobile	01728805884

Md. Hemayet Hossain earned his both B. Pharm. and M. Pharm. degree from Khulna University and University of Development Alternative, Dhaka. His research is mainly focused on the phytochemical and pharmacological activities of medicinal plants. He also works on structure elucidation of pure compounds. He has authored or coauthored 160 publications and gets 4158 citation (h-index: 35) and one book chapter according to ResearchGate database. He has 7 accepted processes. He is a 'A' grade Pharmacist having registration number: A-2625 (Bangladesh Pharmacy Council) and life member of Bangladesh Pharmaceutical Society (BPS) & Bangladesh Academy of Science (BAS).

### Shakar Mohammad Mahamudul Hassan (June, 2006 - Present)



Office	Chemical Research Division	Blood Group	O+
Job Title	Principal Scientific Officer	Degree Obtained	M.Sc. (2002)
Contact	mahmud311279@yahoo.com	Mobile	01711027714

Sharkar Mohammad Mahamudul Hassan earned his both B.Sc and M.Sc degree in Chemistry (Organic Chemistry) from the National University. His research is mainly focused on the Conduct research on Chemical investigation, Natural product Chemistry, Waste management, Synthesis Chemistry. He has authored or coauthored 12 publications. He has 14 accepted processes. He is a member of BCS and BSTI (Chemical). Working as senior scientific officer, Chemical Research Division, BCSIR, Dhaka.

### Dr. Md. Monarul Islam (December, 2009 - Present)



Office	Chemical Research Division	Blood Group	B+
Job Title	Senior Scientific Officer	Degree Obtained	Ph.D (2015)
Contact	mmipavel@yahoo.com	Mobile	01730599827

Dr. Md. Monarul Islam earned his both BSc and MS degree in Chemistry (Organic Synthesis) from the University of Dhaka. He obtained Ph.D in Chemistry (Advanced Organic Materials) from Saga University, Japan under the supervision of Professor Takehiko Yamato. His research is mainly focused on the design, synthesis and development of new functional organic molecules for optoelectronics uses and pharmaceutical industries (API). He also worked as a Post. Doc Fellow of Talented Young Scientist Program (TYSP) at GDUT, Guangzhou, P R China (2018–2019). He has over 49 research articles in peer-reviewed journals and four review articles in a wide range of chemistry and get 1237 citation (h-index: 16). He has three accepted process. He is a life member of BCS, BAAS, NITUB, JUAAB, DUCCA; and Founding Member of National Young Academy of Bangladesh (NYAB). He also served as a treasurer of NYAB (2022–2024).

**Nushrat Jahan Ethane (June, 2006 - Present)**

Office	Chemical Research Division	Blood Group	O-
Job Title	Senior Scientific Officer	Degree Obtained	MSc (2000)
Contact	nushrat_je@yahoo.com	Mobile	01552338938

Nushrat Jahan Ethane completed her both B.Sc. and M.S. degree in Chemistry from National University. Her research is mainly focused on Industrial Process development, Natural Product and Phytochemistry. She has participated in 03 international conferences. She is a life member of BAAS. She has 14 accepted process and 05 published paper.

**Ferdoushi Jahan (June, 2006 - Present)**

Office	Chemical Research Division	Blood Group	A+ (ve)
Job Title	Senior Scientific Officer	Degree Obtained	MS (2004)
Contact	ferdoushi.bcsir@gmail.com	Mobile	01913071452

Ferdoushi Jahan completed her B.Sc. (Hon's) and M.S. degree in Applied Chemistry and Chemical Engineering from University of Dhaka. Her research is mainly focused on Essential Oil, Cosmetics and Toiletries. She has authored or coauthored 14 publications and one book chapter. She has 25 accepted processes and 20 leased out process. She is a member of Cosmetics and Toiletries Products Committee of BSTI and BCS (Bangladesh Chemical Society).

**Shyama Prosad Moulick (October, 2018 - Present)**

Office	Chemical Research Division	Blood Group	AB+
Job Title	Senior Scientific Officer	Degree Obtained	MS (2014)
Contact	moulik.shyama@gmail.com	Mobile	01923722052
Published Paper No.	22	Submitted Patent No.	04

Shyama Prosad Moulick completed his B.S. (Hon's) and M.S. degree in Chemistry from the University of Dhaka. His research is mainly focused on Synthesis, Natural and Environmental Chemistry.

**Safaet Alam (May, 2022 - Present)**

Office	Chemical Research Division	Blood Group	B+
Job Title	Scientific Officer	Degree Obtained	M. Pharm (2018)
Contact	safaet.du@gmail.com	Mobile	01533078521

Mr. Safaet Alam is a young Bangladeshi scientist in natural product chemistry and phytochemistry field. He is currently working at the Chemical Research Division, BCSIR Dhaka Laboratories as a "Scientific Officer". He has obtained his B. Pharm Professional and M. Pharm degrees from the University of Dhaka. Previously, He served one year in a pharmaceutical company as a product executive and two and a half years as a lecturer at another private university. His core interest resides in drug discovery employing natural product chemistry. His most recent works are focused on the isolation of secondary metabolites from plant sources as well as the assessment of the safety and pharmacological efficacy profiles of traditional medicines employing in vitro, in vivo, and in silico studies. He has authored more than 40 research publications in several international peer-reviewed journals published by renowned publishers including Elsevier, Cell Press, Springer Nature, Wiley, Frontiers, and Biomed Central etc. He has over 2000 citations with an h-index of 21 to date.

**Taslima Akter (May, 2022 - Present)**

Office	Chemical Research Division	Blood Group	O+
Position	Scientific Officer	Degree obtained	MS (2017)
Contact	taslimatasu01@gmail.com	Mobile	01754760836

Taslima Akter has completed her B.Sc. (Hon's) and M.S. degrees in Chemistry from Jahangirnagar University. Her research mainly focused on the design, synthesis and development of new molecules for liquid crystal display and pharmaceutical industries (API). Additionally, she has gained experience with GC-FID, GC-ECD, UV-visible spectrophotometry and fluorescence spectrometry.

**Md. Farhad Sarker (May, 2022 - Present)**

Office	Chemical Research Division	Blood Group	O+
Position	Research Pharmacologist	Degree obtained	M.Pharm (2019)
Contact	fsarker2014@gmail.com	Mobile	01748554657

Md. Farhad Sarker completed both his B.Pharm and M.Pharm degree in Pharmacy from University of Rajshahi. His M. Pharm thesis was based on Phytochemistry and Molecular biology. He has also worked on animal model studies. He is a registered 'A' grade Pharmacist. He has authored or coauthored 08 publications.

**Md. Hasan Ali (August, 2023 -----)**

Office	Chemical Research Division	Blood Group	B+
Position	Research Chemist	Degree Obtained	MS (2022)
Contact	hasanchemistry33@gmail.com	Mobile	01516195024

Md Hasan Ali passed his BS in Chemistry and MS in Organic Chemistry from the Department of Chemistry, University of Dhaka. He worked as a research fellow (2022-2023) at the Bose Centre for Advanced Research in Natural Science. He has research experience in organic synthesis, natural product, and analytical chemistry.

Additionally, he has gained experience with GC-FID, HPLC, UV-visible spectrophotometry, and ATR-FTIR. Currently, he focuses on synthesis to develop new compounds that can interact with biological systems to produce therapeutic effects.

**FajilatunNesa (February, 2023 - Present)**

Office	Chemical Research Division	Blood Group	B+
Job Title	Research Chemist	Degree Obtained	MS (Chemistry)
Contact	fajilatunnesa07@gmail.com	Mobile	01744280823

Fajilatun Nesa earned her both BSc and MS degree in Chemistry (Organic) from the University of Dhaka. Her research is mainly focused on synthesis chemistry and application of the products in pharmaceutical sector. She is also working on Gas Chromatography to develop a rapid analytical procedure to carry out routine analysis of pesticides, solvents etc.

## FIBRE & POLYMER RESEARCH DIVISION (F&PRD)



### Introduction:

The Fibre & Polymer Research Division (F&PRD) is one of the largest divisions of BCSIR Laboratories, Dhaka. It is a specialized research facility focused on advanced R&D in polymer chemistry and on providing technical support to Bangladesh's polymer-based industries. The division's research emphasizes modification of natural fibers and their structural components (i.e., cellulose, hemicellulose & lignin); nanotechnology; plastic, rubber- and resin-based composites; rubberization of bitumen; natural polymer-based binders and additives for paint industry; dyes and pigments; plastic and rubber waste management & utilization, and treatment of industrial effluents, etc. Its primary objective is to create modern, sustainable, and locally adaptable technologies that foster industrialization through the utilization of available raw materials. Currently, 11 scientists are engaged in 10 ongoing R&D projects. Beside these, there are 05 special allocation and 02 sponsored R&D projects are being implemented in this financial year. The division has analyzed around 1000 different polymeric samples as the part of its analytical services. The division consists of seven specialized research sections:

- Cellulosic Fibre Research
- Plastic Technology Research
- Rubber Research
- Dyes & Pigment Research
- Resin Research
- Paint, Varnish & Lacquer Research &
- Fibre & Polymer Testing Sections

## 01. Development of polymer based molded products

*Shahin Sultana (PL), Zahidul Islam, Md. Khabir Uddin Sarker and Mohammad Amirul Haque*

### Introduction :

In Bangladesh, plastic pollution is a serious social, environmental, and national issue. Using proper technologies, particularly mechanical recycling with modifications of thermoplastics, can save the world from the threat that thermoplastic wastes may cause. Another strategy to lessen plastic pollution is to replace commercial plastics made from petroleum with more biodegradable polymers made from biological and renewable resources. The proposed project will concentrate on the recycling of waste plastics into new materials as well as the synthesis of thermoset polyester molding powder and biocomposites. The project's successful completion will definitely have a positive impact on our economy and environment sectors.

### Objectives :

- To produce injection molded/ compression molded plastic/ composites from mechanically recycled thermoplastic polymers
- To produce compression molded plastic/ composites from synthesized thermoset polymers
- To produce biocomposites using thermoplastic and natural polymers

### Work Progress :

- Waste high density polyethylene (HDPE) was recycled and jute fiber reinforced waste HDPE based composites have been developed and characterized
- Biopolymer reinforced biocomposites have been developed and characterized
- Three papers have been published

## 02. Waste lignocellulosic biomass-derived hydrogel for slow-release NPK fertilizer production

*Swapan Kumer Ray (PL), Riyadh Hossen Bhuiyan, Md. Shahriar Bashar and Engr. Nahid Sharmin*

### Introduction :

In Bangladesh, lignocellulosic biomass from residues like rice straw, wheat straw, coconut husk, and bagasse is largely wasted, often burned or left to decompose, causing pollution and greenhouse gas emissions. Recognized as a renewable resource, it holds potential for bioenergy, biocomposites, and soil amendments. Recent initiatives explore conversion into biofuels, biochemicals, and eco-materials, though challenges remain due to limited infrastructure, technology, and incentives. Policy support and research investment are vital. Notably, biomass-derived hydrogels show promise for slow-release NPK fertilizers, offering sustainable, eco-friendly solutions to agricultural and environmental challenges.

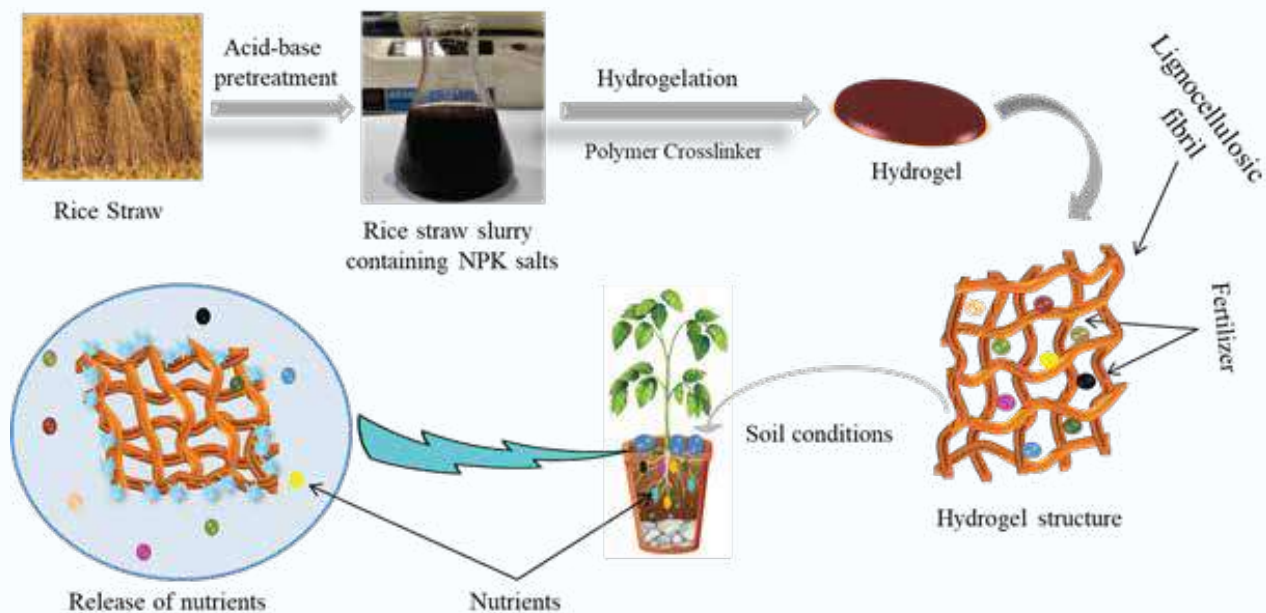
### Objectives :

- Preparation of waste lignocellulosic biomass-derived hydrogel for slow-release NPK fertilizer formulation
- To evaluate the nutrients-release efficiency through pot experiment and field trial
- To establish a life cycle assessment of the product for detail exergoenvironmental analysis

### Work Progress :

- Synthesis of Rice straw-derived hydrogel incorporating NPK (Nitrogen, Phosphorus, and Potassium) nutrients into the hydrogel matrix for slow-release NPK fertilizer is done
- Analyzed the hydrogel's physical and chemical properties, including water absorption, spectroscopic, microscopic, and nutrient release behaviors
- An article has been published in a peer-reviewed journal

A diagram illustrating the research process is presented below:



### 03. Dynamic adsorption of heavy metals from tannery effluents using renewable resource-based low-cost packed column

Swapan Kumer Ray (PL), Riyadh Hossen Bhuiyan, Shamima Akhter Eti, Md. Shahriar Bashar and Engr. Nahid Sharmin

#### Introduction :

Tannery effluents in Bangladesh, especially in Savar, pose major environmental and health risks due to high chromium content, notably carcinogenic Cr(VI) along with Pb(II) and others. Conventional treatment methods like chemical precipitation, membrane filtration, and adsorption face drawbacks such as high cost, secondary pollution, or declining efficiency. Adsorption using activated carbon, resins, or natural materials is effective but often expensive. Sustainable, low-cost alternatives, including waste lignocellulosic biomass and clay-based adsorbents, show promise for packed-column systems to efficiently remove chromium and other heavy metals from tannery wastewater, offering an eco-friendly solution to this pressing issue.

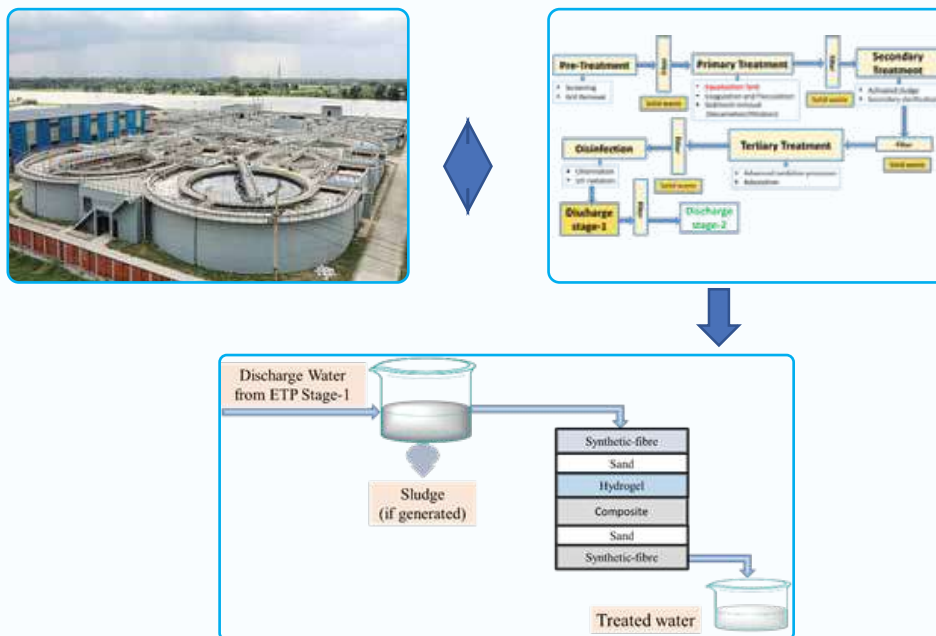
#### Objectives :

- Development of adsorbent(s) for removing heavy metals, particularly Chromium and Lead and evaluation of adsorption efficiencies
- To design and optimize the operational parameters of packed-column
- To conduct a comprehensive economic and environmental assessment to compare the cost-effectiveness and sustainability of the packed column against conventional methods

#### Work Progress :

- Adsorbent materials, i.e., lignin-based hydrogel and fuller's earth-based composite are synthesized and characterized by different instrumental methods
- A packed column has been constructed using the synthesized adsorbents with the support of cost-effective sand and synthetic fibres
- Optimized the column parameters such as flow rate, influent concentration, pH, etc. to maximize adsorption efficiency. Analyzed the breakthrough curves to determine the adsorbent capacity and predict the column's operational lifespan
- An article has been published in a peer-reviewed journal

A diagram illustrating the research process is presented below:

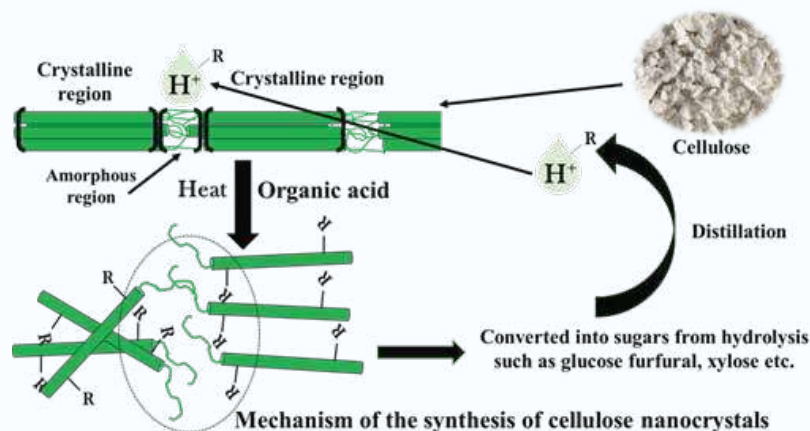


#### 04. Synthesis of organic acid hydrolyzed cellulose nanocrystals and its Applications

Mohammad Mahbubur Rahman (PL), Riyadh Hossen Bhuiyan, Mustafizur Rahman Naim, Mostafizur Rahman, Syed Farid Uddin Farhad, Shirin Akter Jahan, Md. Hossain Sohrab, and Md. Sarwar Jahan

##### Introduction:

Recent research on cellulose, the most abundant and environmentally benign polymer, has expanded into a variety of sectors. While cotton, hemp, and wood are abundant sources of cellulose, their efficacy depends on how it is modified for specific applications. Nanocellulose, particularly cellulose nanocrystals (CNCs), is widely regarded for its large surface area and outstanding features such as biocompatibility, biodegradability, and recyclability, making CNCs attractive "green" nanomaterials for a wide range of applications.

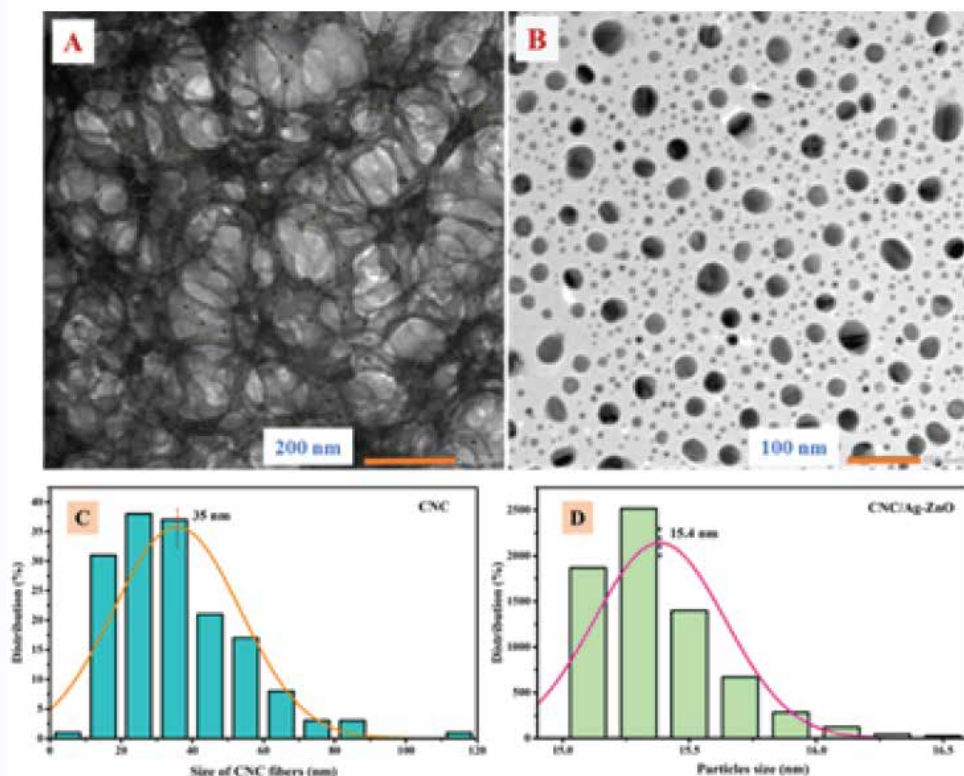


##### Objectives:

- Synthesis of cellulose nanocrystals (CNCs)
- Preparation of CNCs/Ag-ZnO nanocomposite and visible light assisted photocatalytic degradation of organic pollutants
- Synthesis of CNC/rGo nanocomposites for high energy supercapacitor application
- Synthesis of CNC/ZVI nanocomposites for wastewater treatment
- Development of CNCs-based drug delivery system (DDS)

## Work progress:

- Synthesis of cellulose nanocrystals (CNCs) has been completed
- Preparation of CNCs/Ag-ZnO nanocomposite has been completed and visible light assisted photocatalytic degradation of methylene blue has. A manuscript under review
- Synthesis of CNC/rGo nanocomposites for high energy supercapacitor application. A manuscript is ready for submission
- Synthesis of CNC/ZVI nanocomposites for the removal of heavy metals from wastewater treatment



— TEM images of (A) CNC (B) CNC/Ag-ZnO nanocomposites, and Histogram of (C) CNC, and (D) CNC/Ag-ZnO nanocomposites

## 05. Production and characterization of functionalized composites from waste PVC materials

*S.M. Asaduzzaman Sujan PL, Shahin Sultana, Mohammad Amirul Hoque, Md. Khabir Uddin Sarker, Shabiba Parvin Shandhi and Swapan Kumer Ray*

### Introduction:

The project focused on developing a sustainable method for recycling waste PVC banners, a major source of plastic pollution. Banners were collected, pretreated, and processed through solvent-based extraction and mechanical separation, yielding 34.3% extracted PVC (ePVC) with minimal material loss. Characterization by FTIR, DSC, TGA, viscosity, and tensile tests confirmed structural and thermal properties comparable to virgin PVC. The findings highlight improved stability and reusability of ePVC, underscoring its potential for producing functional composites and supporting Bangladesh's transition toward a circular economy.

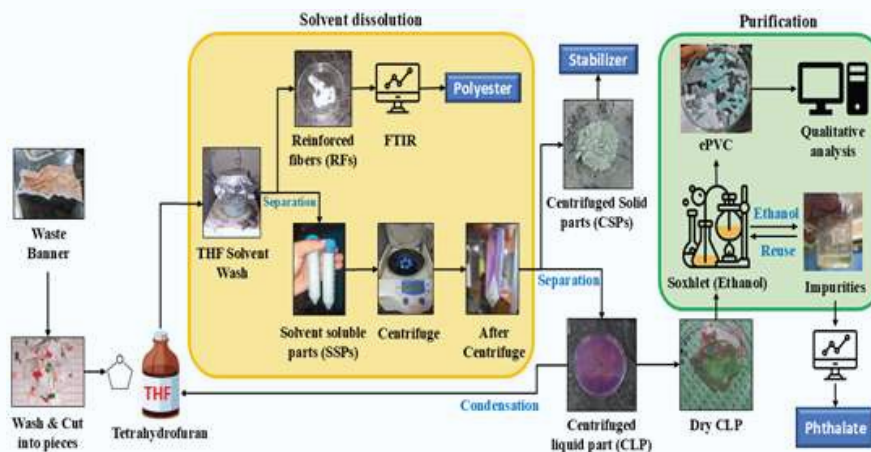
### Objectives:

- To develop a recycling methodology to make PVC recycling more efficient and scalable
- To optimize process parameters for preparing composite materials from waste PVC materials
- To characterize the prepared composite material

## Work Progress:

- The banner was collected from a seminar held at the Bangladesh Council of Scientific and Industrial Research (BCSIR), Dhaka 1205. Polyvinyl chloride (PVC) was extracted and subsequently purified from the banner
- The extracted PVC was then characterized using various analytical techniques
- Approximately 60% of the experimental work has been completed
- One research article has already been submitted

A diagram illustrating the research process is presented below.



## 06. Removal of textile dyes and heavy metals using microwave exfoliated graphene

Mohammad Amirul Hoque (PL), Shahin Sultana, Syed Farid Uddin Farhad, Mohammad Mahbubur Rahman, Md. Khabir Uddin Sarkar, Md. Saiful Quddus, Shamima Akter Eti and Riyadh Hossen Bhuiyan

### Introduction:

Graphene poses a supreme area of interest in research due to its extreme physicochemical properties and diversified field of applications. A monolayer Graphene form of graphite has more significant interest due to its extended properties. It exhibits exceptionally high mechanical strength, superconductivity, and an extremely large surface area. Due to these superior properties, graphene explores its application areas, such as super capacitors, energy storage/conversion, drug delivery, nanocomposite materials, field emission applications, advanced biosensors, nanoscale components of electronic, etc. To facilitate Graphite exfoliation to graphene, microwave (MW) irradiation techniques have been enabled to bust up the graphene synthesis.

### Objectives:

- Microwave Exfoliation of Graphene from Graphite
- Removal of textile dyes using Graphene
- Removal of heavy metals using Graphene

### Work Progress:

- One research article was published in 2025
- The Project is closed by submitting a closing report

## 07. Cellulose-clay nanocomposite for the effective removal of heavy metals from industrial wastewater

Shamima Akter Eti (PL), Riyadh Hossen Bhuiyan, Md. Amirul Hoque, Mohammad Mahbubur Rahman and Swapan Kumer Ray

## Introduction:

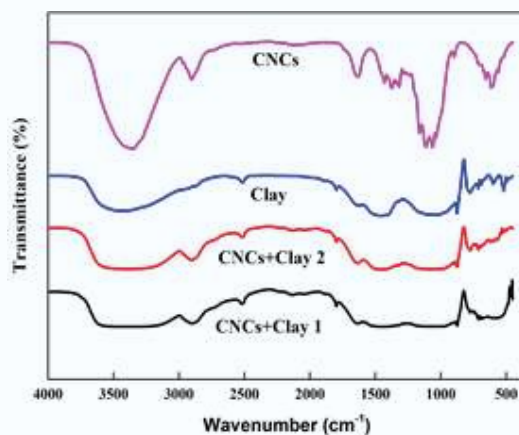
Water pollution is a serious concern. Adsorption is a very efficient technique for removing toxic heavy metals from wastewater. Cellulose is such a material that possesses inherent adsorption capability as well, and it is the most abundant biopolymer in the environment, making it the most cost-effective choice for adsorbent. Naturally acquired cellulose needs to be modified by introducing nanoclay in the cellulose matrix. Clay minerals are naturally charged negatively, which is good for the adsorption of cations of toxic heavy metals. Hence, nanocomposites of cellulose and nanoclay have the potential to be superior adsorbents to remove heavy metals from the wastewater.

## Objectives:

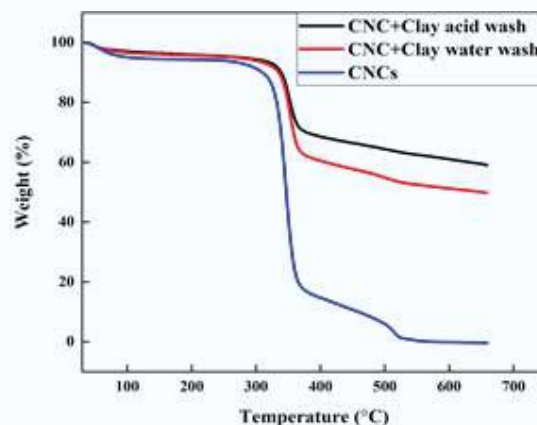
- Preparation of cellulose-clay nanocomposites from cellulose pulp
- Characterization of the cellulose, nanoclay and cellulose-clay nanocomposites with state-of-the-art techniques
- Removal of heavy metal ions from wastewater using cellulose-clay nanocomposites as adsorbent
- Investigation of the adsorption kinetics of the cellulose-clay nanocomposites

## Work Progress:

- Several batches of Cellulose-clay nanocomposites have been developed and characterized.



FTIR Analysis



TGA Analysis

## 08. Synthesis of bio-adsorbent from lignocellulosic biomass for wastewater treatment

*Riyadh Hossen Bhuiyan (PL), Satyajit Roy Rony, Md. Amirul Haque, Md. Khabir Uddin Sarkar, Mohammad Mahbubur Rahman and Swapan Kumer Ray*

## Introduction:

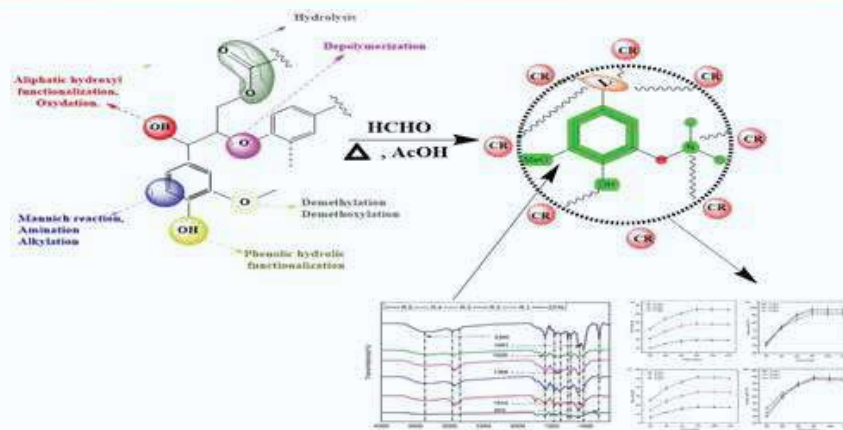
The demand for clean water is rising due to urbanization and industrialization. The textile and other industries release wastewater containing toxic organic dyes and heavy metals. Chemical processes like oxidation, reduction, hydrolysis, acylation, and amination can convert lignin into value-added products. Lignin amination via the Mannich reaction produces aminated lignin, useful as cationic surfactants, dispersants, adsorbents for As(V), Cu(II), and azo dyes, and asphalt emulsifiers. In this study, alkali lignin will be used to prepare a lignin-based cationic surfactant through the Mannich reaction with different amines and formaldehyde using flow chemistry, with potential applications as an emulsifier in various emulsions.

## Objectives:

- Bio-adsorbent is an emerging material, which uses in textile industry for azo-dye treatment
- Bio-adsorbent are still popular because of their affinity to adhere and modify the surface properties of solid surfaces

## Work Progress:

- Three manuscripts were recently submitted to RSC Advances and ACS Bio & Chem



## 09. Development of deep eutectic solvents (DES) based biorefinery system

*Md. Rashed Hasan (PL), Swapan Kumer Ray, S. M. Asaduzzaman Sujan and Mohammad Majedul Haque*

### Introduction:

In recent years, researchers have shown great interest in working with deep eutectic solvents for the fractionation of biomass, considering their green nature and high extraction efficiency. Lignin, an aromatic biopolymer with cross-linked three-dimensional networks, is one of the major constituents of plant cell walls. Lignin imparts rigidity to the cell wall and acts as a binder between wood cells, as well as plays a vital role in the internal transport of water, nutrients, and metabolites. This work involves the preparation of three different types of choline chloride-based deep eutectic solvents and their application to prepare nano-lignin from bagasse.

### Objectives:

- Development of biorefinery system by deep eutectic solvents
- Utilization of indigenous renewable resources for value-added import-substitute product formulation
- Establishment of eco-friendly technology for sustainable development

### Work progress :

- Characterization of isolated nano-lignin from bagasse has been done
- One manuscript has been written

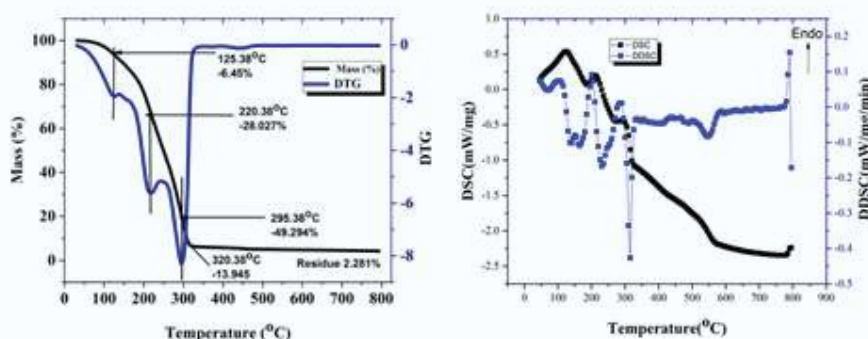


Fig. 1: STA of Choline chloride-Lactic Acid Based DES

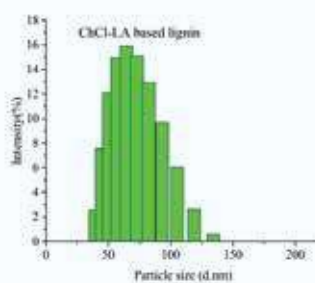


Fig. 2: Particle size of DES-extracted nano-lignin

## 10. Synthesis of non-ionic emulsifiers from fatty acids and polyhydroxy alcohols

*Shabiba Parvin Shandhi (PL), Mohammad Amirul Hoque, Mohammad Mahbubur Rahman, Md. Sakhawat Hossain and Trisha Paul*

### Introduction:

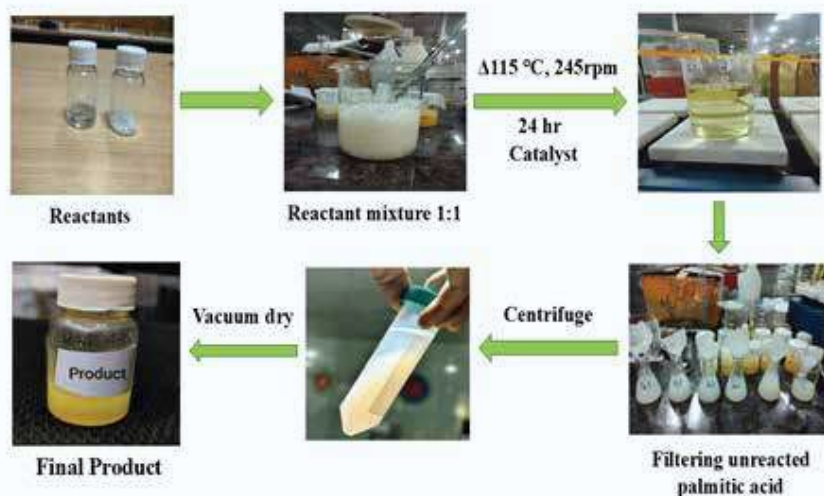
Nonionic emulsifiers, specifically surfactants, have grown their market share over the past 35 years to account for over 40% of global surfactant production. The market for non-ionic surfactants is also based on amphiphilic compounds with lipophilic moieties derived from fatty acids and polar moieties from polyols. Every year large number of nonionic emulsifiers are imported into our country for the needs of different industries. We aim to develop a synthetic root to minimize importing. In this study, we have synthesized an antimicrobial biobased nonionic surfactant that has prominent surface activity and other properties.

### Objectives:

- To synthesize poly-functional ester from fatty acids and polyhydroxy alcohols
- To determine the properties of the synthesized product
- To search for their diversified industrial applications

### Work Progress :

- The product is synthesized and characterized
- Different properties of the synthesized product are analyzed
- One manuscript is ready to submit



### Special Allocation Project:

## 01. Development of biopolymer based green biocomposite materials

*Shahin Sultana (PL) and Md. Khabir Uddin Sarkar*

### Introduction :

A lot of study has been done on the use of biodegradable polymers obtained from renewable resources to replace commercial plastics derived from petroleum. Polyvinyl alcohol (PVA) is the most widely produced synthetic, water-soluble, and biodegradable polymer. The low cost, low density, biodegradability, availability, and energy recovery of natural fiber and synthetic or natural polymer matrix biocomposites have attracted a lot of interest recently. The goal of the project is to use tamarind kernel powder (TKP) as reinforcing agents to produce PVA based biocomposites that may be used in biomedical and packaging applications.

### Objectives :

- To modify tamarind kernel powder (TKP) chemically to make it compatible with PVA
- To produce green biocomposites using PVA matrix and TKP as a reinforcing ingredient

## Work progress:

- PVA biocomposites based on waste TKP and carboxymethylated CMTKP have been produced and characterized.
- TKP and CMTKP enhanced PVA's biodegradability, according to a biodegradability test. So, biodegradable biocomposites could be a good alternative to nonbiodegradable plastic pollution.

## 02. Development of agricultural residue-based hydrogel as NPK containing slow release fertilizer

Swapan Kumer Ray (PL) and Zahidul Islam

### Introduction:

Lignin, the second most abundant renewable biopolymer after cellulose, is an inexpensive byproduct of pulping and biorefinery industries, with an annual global yield of about 70 million tons. Rich in phenolic and aliphatic hydroxyl groups, lignin, isolated from agricultural residue, offers great potential for synthesizing value-added materials such as hydrogels. Their ability to control nutrient release, improve soil water retention, and support microbial activity aligns with sustainable agricultural practices. Thus, lignin-derived slow-release fertilizers represent a promising green technology for enhancing crop productivity while reducing environmental impact.

### Objectives :

- Sustainable resource utilization: To develop an eco-friendly hydrogel production technology from waste agricultural residues.
- Enhanced fertilizer efficiency: To create a slow-release NPK fertilizer system that minimizes nutrient leaching to water bodies.
- Environmental protection and sustainability: To mitigate the environmental impact of traditional fertilizers and reduce the pollution generated from different uncontrolled agricultural residues

### Work Progress :

- Sample collection, preparation of submicron-sized lignin particles & characterization were done
- Preparations of lignin-based hydrogels containing NPK-fertilizer were completed
- Effect of cross-linker amount on grafting percentage, swelling ratio, release behaviors of NPK-fertilizer from the hydrogel matrices were done
- A manuscript is accepted for publication in a peer-reviewed journal

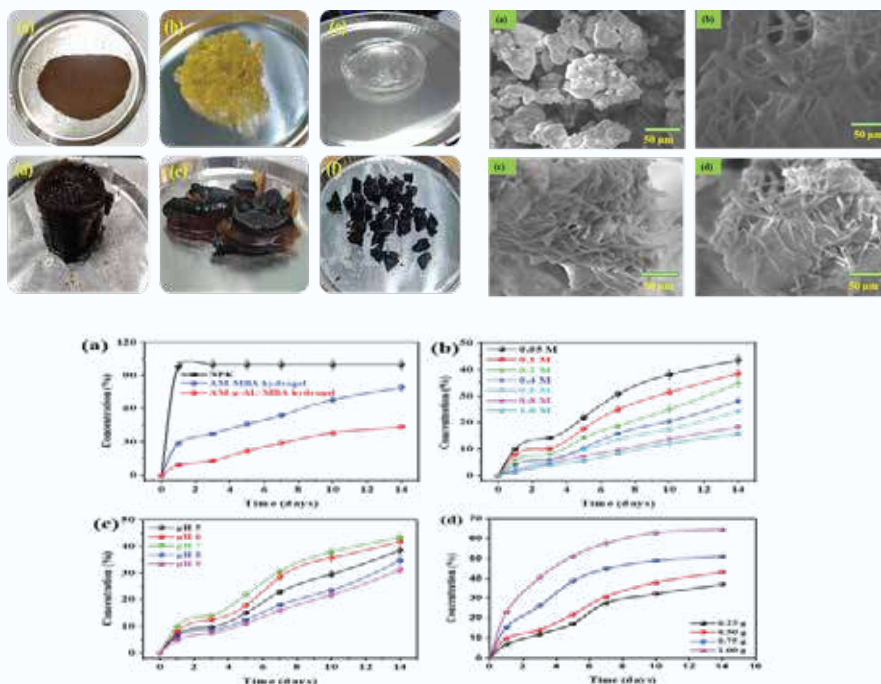


Fig: Synthesized lignin-based hydrogels, SEM images and NPK-fertilizer release behaviors

### 03. Recycling of waste PVC banner: Production of innovative nano-composite materials and value-added products

S.M. Asaduzzaman Sujon (PL) and Md. Rashed Hasan

#### Introduction :

This project addressed the growing challenge of PVC banner waste in Bangladesh by developing efficient recycling methods to produce nano-composites and value-added products. Using solvent-based and mechanical separation, extracted PVC (ePVC) was recovered and purified with high yield and minimal loss. Comprehensive characterization (FTIR, DSC, TGA, viscosity, and tensile analysis) confirmed retention of essential properties comparable to virgin PVC. The initiative demonstrates the feasibility of transforming waste banners into innovative, high-performance composites, contributing to pollution reduction and advancing circular economy practices.

#### Objectives :

- To innovate recycling technologies and methodologies, improving sorting, cleaning, and processing techniques to make PVC recycling more efficient and scalable
- To create innovative high-performance nano-composite materials from waste PVC banner
- To reduce the environmental impact of waste PVC banners by developing effective recycling processes that minimize landfill use and pollution
- To establish cost-effective recycling and production methods for composites

#### Work Progress :

- Waste PVC banners were collected, cleaned, dried, and cut into smaller pieces for processing
- Solvent-based extraction with tetrahydrofuran (THF) was applied, followed by separation of fibers, additives, and solvent-soluble fractions
- Soxhlet extraction with ethanol removed residual stabilizers and plasticizers, ensuring higher purity of extracted PVC
- Comprehensive characterization (FTIR, DSC, TGA, viscosity, tensile, and EDX analyses) confirmed structural and thermal stability
- The project achieved a 34.3% recovery yield with minimal material loss, confirming industrial reuse potential

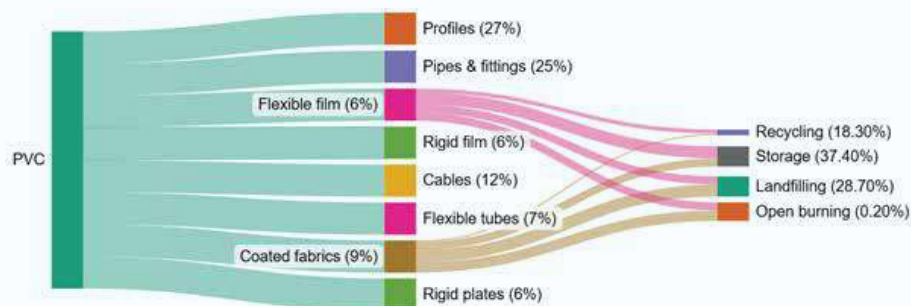


Fig: Materials flow of PVC.

### 04. Green synthesis of nanocellulose-zero valent iron adsorbent for heavy metal removal from wastewater

Mohammad Mahbubur Rahman (PL) and Shamima Akhter Eti

#### Introduction :

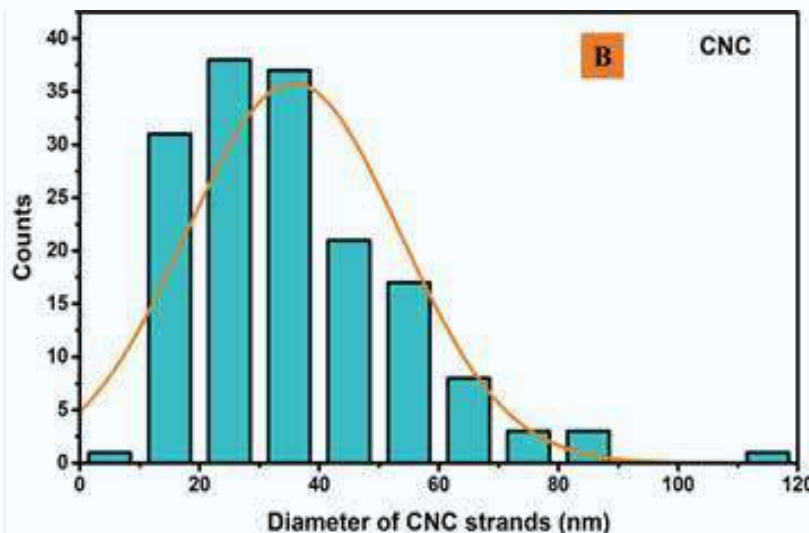
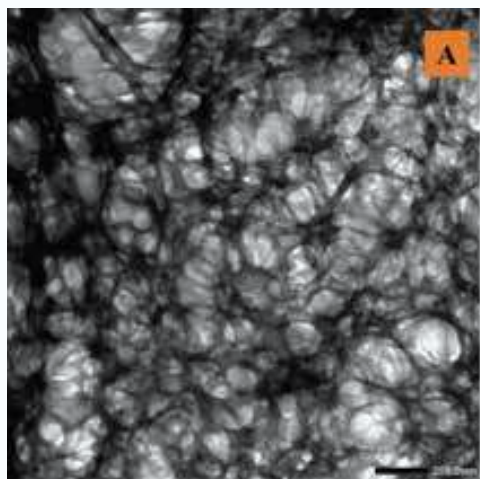
In this study, cellulose nanocrystals (CNCs) will be synthesized using acetic acid hydrolysis. Nanocellulose-based composites loaded with zero-valent iron (ZVI) will be prepared using a liquid phase reduction method. The CNC-ZVI composites will be immersed in Fe<sup>2+</sup> to prevent agglomeration of zero-valent iron and reduce the adsorbent cost. SEM, TEM, SEM-EDX mapping, XRD, FT-IR spectroscopy, and XPS will be used to examine the structure and properties of CNC-ZVI. Various factors influencing metal ion adsorption, such as ion concentration, pH, time, and temperature, will be evaluated. The adsorption mechanism of CNC-ZVI on metal ions in water will be proposed and discussed.

### Objectives :

- Synthesis of CNCs via weak acid hydrolysis of cellulosic pulp
- Preparation of hybrid composites of CNC and zero valent iron (ZVI) via liquid phase reduction method
- Characterizations of single and nanocomposite materials via state-of-the-art techniques
- Adsorption of harmful heavy metal ions from wastewater via the prepared nanocomposites

### Work Progress :

- Synthesis of CNCs via weak acid hydrolysis is done.
- Hybrid composites of CNC and zero-valent iron (ZVI) have been prepared via a liquid-phase reduction method.
- Single and nanocomposite materials have been characterized via state-of-the-art techniques



## 05. Microwave exfoliation of graphene and its application for the removal of textile dyes and heavy metals from water

*Md. Amirul Hoque (PL) and Shabiba Parvin Shandhi*

### Introduction :

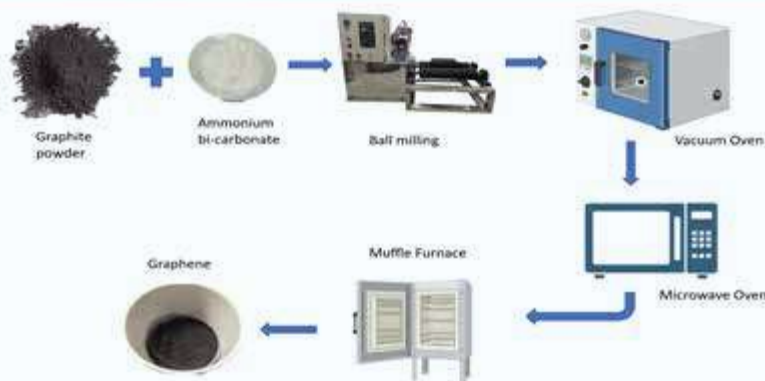
The study provides key knowledge needed to create inexpensive, future-oriented water purification systems. MG (1:1) and MG (1:2) graphene were produced through varying ammonium bicarbonate intercalation levels, which resulted in a high yield percentage of 98.5% of few-layer graphene with improved porosity and reduced structural defects. The graphene sample underwent investigation using FTIR, SEM, TGA, and XRD tests to verify its structural composition, together with a high internal surface area and stable thermal properties. Microwave-activated graphene presents an effective, sustainable solution for water purification. It demonstrates excellent performance and environmental responsibility toward solving the immediate water contamination challenge with lead.

### Objectives :

- To synthesize and evaluate two distinct compositions of microwave-activated graphene
- To conduct a comparative analysis of these compositions in terms of structural characteristics, adsorption capacity, and efficiency in lead removal
- To develop a scalable and effective material for water purification

### Work Progress :

- MG (1:1) and MG (1:2) graphene were produced through varying ammonium bicarbonate intercalation levels
- The graphene sample underwent investigation using FTIR, SEM, TGA, and XRD tests
- Excellent performance has been shown in the water contamination challenge with lead
- One manuscript is published in the Q1 journal of Elsevier



### Sponsorship Project

## 01. (a) Production of rubber seed oil and its application, (b) Development of rubber waste water treatment technology

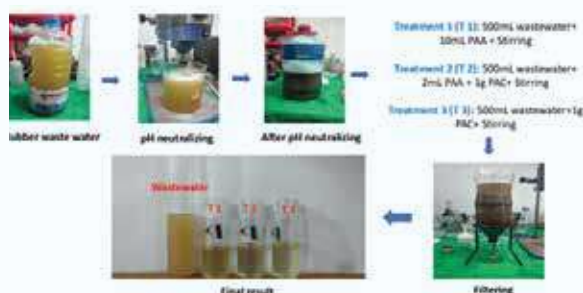
*Khabor Uddin Sarkar (PL), Shahin Sultana, Swapan Kumer Ray, Mohammad Mahbubur Rahman, S. M. Asaduzzaman Sujon, Mohammad Majedul Haque, Md. Amirul Hoque, Riyadh Hossen Bhuiyan, Rashed Hasan, Shabiba Parvin Shandhi and Mirza Nusrat Sweety*

### Introduction :

The Rubber Wastewater Treatment focuses on treating wastewater generated from rubber processing, which contains high levels of organic pollutants, suspended solids, and chemicals. If not properly managed, this wastewater can harm the environment and public health. The project aims to implement effective treatment methods such as anaerobic and aerobic processes, followed by filtration, to reduce pollutants and meet environmental standards. It supports sustainable water management by enabling water reuse or safe discharge, contributing to cleaner production in the rubber industry, and minimizing its environmental impact.

### Objectives :

- Treat rubber industry wastewater to remove harmful pollutants and protect the environment
- Ensure the treated water meets legal discharge and environmental standards
- Promote water reuse and support sustainable industrial practices



### Achievements and Activities

### Papers Published :

1. Shahin Sultana, Zahidul Islam, Swapan Kumer Ray, Md Khabir Uddin Sarker, Mohammad Majedul Haque, Shamima Akther Eti, Samia Tabassum, "Development and evaluation of urea formaldehyde resin-modified poly (vinyl alcohol)-based biocomposites reinforced with Corchorus olitorius cellulose microfibril", Smart Materials in Manufacturing, 2025, 3, 1–11, 100074.
2. Kaniz Fatema, Taslima Akter, Zahidul Islam, Mohammad Shahriar Bashar, Shahin Sultana, and M. Saiful Islam, "Physico-mechanical characterization and DFT studies of benzoyl peroxide treated water hyacinth reinforced polypropylene composites", Heliyon, 2024, 10, e39412.
3. Swapan Kumer Ray, Riyadh Hossen Bhuiyan, Tanvir Muslim, and Md. Qamrul. Ehsan. "Development of a material-driven phase III lignocellulosic feedstock biorefinery system." ACS Sustainable Resource Management, 2024, 1 (9), 1994-2013.
4. Sarna Khanam, Swapan Kumer Ray, Riyadh Hossen Bhuiyan, Shahin Sultana, Nahid Sharmin & Md. Qamrul Ehsan. "Advancing nutrient management in agriculture: Rice straw to nitrogen, phosphorus and potassium-containing hydrogel as slow-release fertilizer." Industrial Crops and Products, 2025, 224, 120380

5. Sarna Khanam, Shamima Akther Eti, Md Shahriar Bashar, S M Asaduzzaman Sujan, Nahid Sharmin, and Swapan Kumer Ray. "Dynamic absorption of heavy metal from aqueous solution using lignin-hydrogel and natural filter materials in a packed column system." *International Journal of Biological Macromolecules*, 2025, 302, 140356.
6. Swapan Kumer Ray, Riyadh Hossen Bhuiyan, Sarna Khanam, Tanvir Muslim, and Md. Qamrul Ehsan. "The acetobromination of alkali-lignin through a flow chemistry approach." *International Journal of Biological Macromolecules*, 2025, 145451.
7. Mohammad Mahbubur Rahman, Md. Abu Bin Hasan Susan, Md. Mominul Islam and M. Sarwar Jahan, "Effect of pre-hydrolysis on the dissolution of hardwood pulp in double salt ionic liquid", *Nordic Pulp & Paper Research Journal*, 2024, 39(4), 709–718.
8. Mohammad Abul Hasan Shibly, Md. Ikramul Islam, Mohammad Mohsin Ul Hoque, Marat Sabit, Mohammad Mahbubur Rahman, Zahidul Islam, Mohammad Junaebur Rashid, "Hylocereus undatus plant's stem agro-waste: A potential source of natural cellulosic fiber for polymer composites", *Sustainable Chemistry and Pharmacy*, 2024, 41, 101692.
9. Mohammad Mahbubur Rahman, Anupom Mondol, Md Kamrul Hasan, Md Shakhawoat Hossain, Md Fardin Ehsan, Nazmul Islam Tanvir, Mustafizur Rahman Naim, M Sarwar Jahan, "Cellulose acetate from fast-growing hardwood–*Trema orientalis*: investigating acetylation parameters and viscosity", *International Wood Products Journal*, 2025, 16(1), 6–17.
10. Shahrima Siddiq, Sneha Gautam, Shamima Akther Eti, Fatima Khatun, Mohammad Mahbubur Rahman, H. M. Solyman, Azrina Abd Aziz, Badiuzzaman Khan, "Characterization, distribution, and risk assessment of microplastic in fish and sediment from the longest river of Bangladesh", *Water Environment Research*, 2025, 97(2), e70029.
11. Rabeya Akter, Md. Monarul Islam, Md. Wahidul Islam, Taslima Akter, Trisha Paul, Mohammad Mahbubur Rahman, Md. Tushar Uddin, Shofiur Rahman, Abdullah N. Alodhayb & Paris E. Georghiou, "Extraction procedure and theoretical studies of chitin from black soldier fly", *Journal of Polymer Research*, 2025, 32(2), 48.
12. Md. Elius Hosen Pk., Md. Monarul Islam, Rabeya Akter, Fajilatun Nesa, Mohammad Mahbubur Rahman, Trisha Paul, Sonjida Mustafi, Md. Rezaul Karim, Shofiur Rahman, Abdullah N. Alodhayb, Erick S. Vasquez-Guardado, Hamad Albrithen, "Carboxymethyl Chitosan-based Biodegradable Films Preparation and Prospects for Food Preservation", *ChemistrySelect*, 2025, 10(1), e202404675.
13. Md Abul Kalam, Salvin Mustakim, Mohammad Jellur Rahman, Md Tushar Uddin, Md Ashraful Alam, Mohammad Mahbubur Rahman, "Bio-degradable smart nanocomposite fiber from *Moringa oleifera* fiber reinforced with safely functionalized carbon nanotubes", *AIP Advances*, 2025, 15(1).
14. Md Khorshed Alam, Mohammad Amirul Hoque, Sabbir Hossain Naeem, Md Asaduzzaman, Md Al Amin, "Study the Effect of Variation in Voltage and Electrolytic Solution Medium in the Electrochemical Exfoliation of Graphite to Graphene Oxide", *Bangladesh Journal of Physics*, 2022, 29(2), 39–50.
15. Banasree Bhowmik, Sadia Afrin, Afsana Habib Jui, Riyadh Hossen Bhuiyan, Md. Mamunur Rashid, Md. Abdus Satter Miah & Mohammad Nazrul Islam Bhuiyan, "Exploring the purification, characterization, and industrial applications of Exopolysaccharide (EPS) from *Bacillus amyloliquefaciens* strain BDIFST240014", *Molecular Biology Reports*, 2025, 52(1), 51.
16. Shabiba Parvin Shandhi, Fahmida Tasnim Richi, Safaet Alam, Kutub Uddin Ahamed, Nazim Uddin Emon, Najneen Ahmed, Chuxiao Shao, Shuanghu Wang, Peiwu Geng, Abdullah Al Mamun, "Isolation, Structure Elucidation, and Bioactivity Evaluation of Two Alkaloids From *Piper chaba* H. Stem: A Traditional Medicinal Spice and Its Chemico-Pharmacological Aspects", *Food Science & Nutrition*, 2024, 12(12), 10680–10698.
17. Mirza Nusrat Sweety, Md Abdus Salam, "Proton conductivity performance and its correlation with physio-chemical properties of proton exchange membrane (PEM)", *Chinese Journal of Chemical Engineering*, 2024, 74, 100–116.

### Patent Submitted:

1. Swapan Kumer Ray, Riyadh Hossain Bhuiyan, Dr. Md. Tanvir Muslim and Dr. Md. Qamrul Ehsan, "Production method of acetobrominated lignin as Emerging Brominated Flame Retardant", Submitted to the office of the Patents and Design and Trademarks, Motijheel, Dhaka, Application number: BCSIR/39.02.0000.043.39.004.24/1057.
2. Sushama Saha Swati, Swapan K Ray, Dr. A. Nayeem Faruqui and Dr. M. Sarwar Jahan, "The Production of Cellulose based Two Layer Superabsorbent Composite", Submitted to the office of the Patents and Design and Trademarks, Motijheel, Dhaka, No. P/BD/2023/000189.

### Scientists pursuing M. S/ M.Phil/ PhD Courses at home or abroad:

1. Shahin Sultana, PSO, Fibre & Polymer Research Division pursuing Ph.D degree in the department of Theoretical and Computational Chemistry, University of Dhaka, Bangladesh under supervision of (Dr. Md. Saiful Islam, Professor and, Dr. Mohammed Abdul Aziz Professor) and working on "Synthesis and characterization of modified acrylic polymers and natural fiber reinforced polymer composites" in 2016-2017 session.
2. Mohammad Amirul Hoque, SSO, Fibre & Polymer Research Division, pursuing a PhD degree in the Department of Applied Chemistry & Chemical Engineering, University of Dhaka, Bangladesh, under the supervision of Dr. Md. Nurunnabi, Professor and Dr. Md. Mostafizur Rahman, Professor, and working on "Synthesis, characterization and application of Graphene materials" in 2018-2019 session.
3. Zahidul Islam, SO, Fiber and polymer research division, pursuing PhD degree in the AST (Applied Science and Technology) PhD program, North Carolina A&T State University, USA, under the supervision of Dr. Debasish Kuila and working on "Catalytic conversion of plastic to fuels and chemicals" in the 2024-2025 session.

### Guidance to research Work (PhD/M. Phil/ M.S/ NCST & BCSIR Fellow):

Sl. No	Title of Research	Ph.D/ M.Phil/ M.S Category	Name of Student	Name of academic Institute	Name of Supervisors in BCSIR
01.	Design and characterization of metal oxide catalysts for efficient production of furfural from sugarcane bagasse-derived hemicellulose	MS Thesis	Abdullah Al Mamun	Department of Chemistry, University of Dhaka	Swapan Kumer Ray, PSO and Professor Dr. Tanvir Muslim, DU
02.	Synthesis and characterization of toddy palm husk-derived hydrogels for sustainable nutrient delivery in agriculture	MS Thesis	Md. Tamjid Ibney Kamal Prottoy	Department of Chemistry, University of Dhaka	Swapan Kumer Ray, PSO and Professor Dr. Md Quamrul Ehan, DU
03.	Catalytic valorization of coconut coir-derived lignin into phenol compounds over ZnO, CuO, and ZnO-CuO modified zeolite catalysts	MS Fellow	Mijanur Rahman	Department of Chemistry, University of Dhaka	Swapan Kumer Ray, PSO and Professor Dr. Tanvir Muslim, DU
04.	Eco-friendly hybrid supercapacitor electrode development using cellulose nanocrystals (CNCs) and reduced graphene oxide (rGO)	MSThesis	Md. Shohidul Islam	Department of Chemistry, Dhaka College	Dr. Mohammad Mahbubur Rahman, PSO and Professor Dr. Md. Mominul Islam, DU
05.	Synthesis and characterization of nano carboxy methyl cellulose for controlling drug delivery system	MS Thesis	Md. Asif Khan	Department of Chemistry, University of Dhaka	Dr. Mohammad Mahbubur Rahman, PSO and Md. Kamrul Hasan, Assistant Professor, DU

### Participation in Training/ Seminar/ Symposium/ Workshop/ Conference:

- Dr. S.M. Asaduzzaman Sujan (PSO), has successfully conducted a training course as course director and trainer on “Unsaponifiable Matter (ppm) and Oil Content Test of Jute Products” in Fiber and Polymer Research Division, BCSIR Dhaka Laboratories from 16-20 February 2025. In this training course, 18 trainees participated from the Department of Jute of the Ministry of Textiles & Jute.
- Riyadh Hossen Bhuiyan (SO), has participated in a five-day training on "X-Ray Diffractometer", organized by P&D, BCSIR, from 14th to 18th September 2025.
- Riyadh Hossen Bhuiyan (SO), has attended a one-day session on "XRD, FTIR, and Raman Spectroscopy Maintenance and Troubleshooting", held by BCSIR Laboratories Dhaka, on 21st May 2025.
- Riyadh Hossen Bhuiyan (SO), has participated in a one-day program on "ISO 17025/2017 for Laboratory Accreditation", hosted by BCSIR Laboratories, Dhaka, on 27th May 2025.
- Md. Rashed Hasan (SO), has participated as a trainer on “Unsaponifiable Matter (ppm) and Oil Content Test of Jute Products” in Fiber and Polymer Research Division, BCSIR Dhaka Laboratories from 16-20 February 2025. In this training course, 18 trainees participated from the Department of Jute of the Ministry of Textiles & Jute
- Md. Rashed Hasan (SO), has participated in training on ‘Basic principle, maintenance and troubleshooting of XRD, FTIR and Raman Spectroscopy’, BCSIR Laboratories, Dhaka, 17 May 2025.
- Shabiba Parvin Shandhi (SO), has participated as a trainer on “Unsaponifiable Matter (ppm) and Oil Content Test of Jute Products” in Fiber and Polymer Research Division, BCSIR Dhaka Laboratories from 16-20 February 2025. In this training course, 18 trainees participated from the Department of Jute of the Ministry of Textiles & Jute
- Shabiba Parvin Shandhi (SO), participated in the one-day training program on “Principal, Application, Troubleshooting and Maintenance of HPLC” organized by BCSIR Laboratories Dhaka, Bangladesh Council of Scientific & Industrial Research (BCSIR), 12th November 2024.
- Shabiba Parvin Shandhi (SO), participated in the one-day training program on “Basic Principal, maintenance and troubleshooting of XRD, FTIR and Raman Spectroscopy” organized by BCSIR Laboratories Dhaka, Bangladesh Council of Scientific & Industrial Research (BCSIR), 21th May 2025.
- Shabiba Parvin Shandhi (SO), participated in the one-day training program on “Training on Research Methodology and Publication” organized by BCSIR Laboratories Dhaka, Bangladesh Council of Scientific & Industrial Research (BCSIR), 26th May 2025.
- Shabiba Parvin Shandhi (SO), participated in the one-day training program on “Understanding of ISO 17025/2017 for laboratory accreditation” organized by BCSIR Laboratories Dhaka, Bangladesh Council of Scientific & Industrial

Research (BCSIR), 27th May 2025.

12. Mirza Nusrat Sweety (SO), participated in the one-day training program on “Principal, Application, Troubleshooting and Maintenance of HPLC” organized by BCSIR Laboratories Dhaka, Bangladesh Council of Scientific & Industrial Research (BCSIR), 12th November 2024.
13. Mirza Nusrat Sweety (SO), participated in a 2 month longer Special foundation training course organized by the National Academy for Planning and Development (NAPD), 22th December, 2024 -19 February, 2025.
14. Mirza Nusrat Sweety (SO), participated in the one-day training program on “Basic Principal, maintenance and troubleshooting of XRD, FTIR and Raman Spectroscopy” organized by BCSIR Laboratories Dhaka, Bangladesh Council of Scientific & Industrial Research (BCSIR), 21th May 2025.
15. Mirza Nusrat Sweety (SO), participated in the one-day training program on “Understanding of ISO 17025/2017 for laboratory accreditation” organized by BCSIR Laboratories Dhaka, Bangladesh Council of Scientific & Industrial Research (BCSIR), 27th May 2025.

### Number of Analytical (Ad-Hoc) Problems Solved:

Name of the Division	Routine type	Research type	Total
Fibre & Polymer Research Division	799	124	923

### Special Analytical Services to the Industries/Institutions:

#### Special Contribution to the Nations:

1. Rendering analytical services on food food-grade quality of plastic products
2. Analytical services on Geo-textile materials
3. Analytical services to Custom Houses on various fibre & polymeric samples
4. Support for public and private university students’ samples

### List of Pictures for Fibre & Polymer Research Division (F&PRD):

#### Major Instruments



FT-MIR/NIR Spectrometer



Reaction Calorimeter with Volumetric Dosing



UPLC-DAD/RID System



HS-GC-FID/ECD System

## Short Biography of FPRD Scientists

### Shahin Sultana (June, 1999 - Present)



Office	Fiber and Polymer Research Division	Blood Group	O+
Position	Principal Scientific Officer	Degree Obtained	M. Phil
Contact	shasultana@gmail.com	Mobile	01715100985

Shahin Sultana is working as a Principal Scientific Officer in Bangladesh Council of Scientific and Industrial Research (BCSIR). She has joined in BCSIR on June, 1999. She obtained her M. Phil from Department of Chemistry, Bangladesh University of Engineering and Technology (BUET). She earned both MSc and BSc (Hons) degree in Chemistry from Jahangirnagar University. Her research interests include the chemistry of polymers, fibers, composites made of recycled and virgin polymers, as well as biocomposite materials. She has authored and co-authored forty-five peer-reviewed scientific journal articles. She has one accepted patent, and nine accepted processes.

### Swapan Kumer Ray (June, 2006 - Present)



Office	Fibre & Polymer Research Division	Blood Group	O+
Position	Principal Scientific Officer	Degree Obtained	MSc
Contact	swapanray_bcsir@ymail.com	Mobile	01534149306

Swapan Kumer Ray, Ph.D., is an accomplished research and development professional with over nineteen years of progressive experience in sustainable materials innovation, biorefinery systems, and technology development. He holds a Ph.D. in Physical Chemistry from the University of Dhaka, specializing in biorefinery and lignin chemistry, and a M.Sc. in Chemistry from the National University of Bangladesh.

Currently serving as a Principal Scientific Officer at BCSIR Laboratories, Dhaka, S. K. Ray leads multidisciplinary research initiatives focused on sustainable materials and circular bioeconomy development. He is a certified ISO/IEC-17025 assessor (UKAS-UK & BAB-BD) and a trained project management professional through the National Academy of Planning and Development, Bangladesh. S. K. Ray's professional expertise encompasses flow chemistry, biomass fractionation, nanomaterials, hydrogels, catalysis, and bitumen modification, supported by advanced analytical techniques including XPS, FTIR, NMR, SEM, TEM, Rheology, DSV, Raman Spectroscopy, STA, Flow Synthesis System, and GPC, etc. He is a life-time member of the Bangladesh Chemical Society.

### Dr. S. M. Asaduzzaman Sujan (June, 2006 - Present)



Office	Fiber & Polymer Research Division	Blood Group	O+
Position	Principal Scientific Officer	Degree Obtained	PhD (2020)
Contact	asad2306@gmail.com	Mobile	01726737404

Dr. S. M. Asaduzzaman Sujan earned both his BSc and MS degrees in Applied Chemistry and Chemical Technology from the University of Dhaka. He obtained a Ph.D. in the Department of Environmental Sciences from Jahangirnagar University, Bangladesh. His research is mainly focused on waste management, waste to valuable products and energy, RE, PVC recycling, etc. He also completed a prestigious training course on

"Research on Biomass Technology" at AIST (National Institute of Advanced Industrial Science and Technology), Chugoku, Hiroshima, Japan (2007-2008). He has over 33 research articles in peer-reviewed journals and two review articles and has received 425 citations (h-index: 07). Till to date, he has published 32 research articles, 18 conference papers, and 3 process as well. Dr. Asaduzzaman also accomplished two projects, "Mitigation of Carbon Emission and Extension of Alternative Energy usage through dissemination of Biogas Technology (1st and 2nd Phase)" under the Ministry of Environment and Forest, Bangladesh Climate Change Trust, People's Republic of Bangladesh, as a Deputy Project Director and Project Director, respectively. He has also completed two special allocation projects and two consultancy works. He is an associate member of the Royal Society of Chemistry, UK, and a member of the Chemical Society as well.

**Dr. Mohammad Mahbubur Rahman (June, 2006 - Present)**

Office	Fiber & Polymer Research Division	Blood Group	A+
Position	Senior Scientific Officer	Degree Obtained	PhD (2024)
Contact	mahbub.bcsir@yahoo.com	Mobile	01911776171

Dr. Mohammad Mahbubur Rahman is currently serving as a Principal Scientific Officer in the Cellulosic Fiber Research Section, Fiber and Polymer Research Division, at BCSIR Dhaka Laboratories. He joined BCSIR in 2006 as a Scientific Officer. Dr. Rahman obtained his B.Sc. (Hons) and M.S. degrees in Chemistry from the University of Dhaka. He was also awarded a Master of Philosophy (M. Phil) in Material Science from Bangladesh University of Engineering and Technology (BUET). He earned his Ph.D. in Material Science from the Department of Chemistry at the University of Dhaka. His research interests focus on cellulose chemistry, material chemistry, and ionic liquids. He has authored and co-authored 35 publications, with more than 10 additional articles currently under review. He holds four accepted processes and a patent. He is a JSPS HOPE Fellow. He is a life member of several professional organizations, including the Bangladesh Chemical Society (BCS), Bangladesh Association for the Advancement of Science (BAAS), Dhaka University Alumni Association (DUAA) and Dhaka University Chemistry Alumni Association (DUCAA) etc.

**Dr. Mohammad Majedul Haque (June, 2006 - Present)**

Office	Fibre & Polymer Research Division	Blood Group	A+
Position	Senior Scientific Officer	Degree Obtained	PhD
Contact	majedulbcsir@gmail.com	Mobile	01914113880

Dr. Mohammad Majedul Haque earned his both BSc and MSc degree in Chemistry from the National University. He obtained PhD in Chemistry from Jahangirnagar University, Bangladesh. His research is mainly focused on Phytochemistry. The research involved extraction, pharmacological assessment of crude extract, fingerprint analyses, isolation of compounds from bioactive extracts and characterization of pure compounds. Current time he is working on bio-based Polyurethane resin as well as food grade plastics. He also works to develop value added products from biopolymers. He also interested in natural dyes, pigments and rubber research. He has authored or coauthored fourteen publications. He has one accepted process

**Md. Amirul Haque (July, 2006 - Present)**

Office	Fibre & Polymer Research Division	Blood Group	A+
Position	Senior Scientific Officer	Degree Obtained	PhD (appeared)
Contact	amirul.bcsir@yahoo.com	Mobile	01720060000

At present, Mr. Mohammad Amirul Hoque is working as an employee of the Fiber and Polymer Research Division at BCSIR Dhaka Laboratories. He joined BCSIR in 2006 as a Research Chemist and currently holds the position of Senior Scientific Officer (SSO). He obtained both his BSc and MS degrees from the Department of Applied Chemistry and Chemical Engineering at the University of Dhaka and commenced his tenure at BCSIR on July 02, 2006. He expressed his interest in research in various sectors of polymer science, especially in Polymeric materials. He is doing his PhD research in Graphene Materials and has submitted his thesis to the University of Dhaka for evaluation. He is trying to set up a laboratory on Graphene Materials. Since affiliation in BCSIR, he has authored seventeen articles in national and international peer-reviewed scientific journals.

**Md. Khabir Uddin Sarker (July, 2006 - Present)**

Office	Fibre & Polymer Research Division	Blood Group	A+
Position	Senior Scientific Officer	Degree Obtained	MSc. (thesis)
Contact	khabirbcsir@yahoo.com	Mobile	01817662339

Md. Khabir Uddin Sarker earned his BSc from National University and MS degree in Environmental Science from Stamford University. His research is mainly focused on the development of natural dyes, biodegradable polymers and composite materials. He has authored or coauthored thirteen publications. He has ten accepted processes and one patent. He is a life member of BAS and Bangladesh Chemical Society

**Riyadh Hossen Bhuiyan (March, 2016- Present)**

Office	Fibre & Polymer Research Division	Blood Group	A+
Position	Senior Scientific Officer	Degree Obtained	MSc. (thesis)
Contact	riyadhbcsir@gmail.com	Mobile	01632 072603

Riyadh Hossen Bhuiyan is presently employed as a Scientific Officer within the Fibre and Polymer Research Division at BCSIR Dhaka Laboratories. He attained both his BSc and MSc degrees in Chemistry from National University and commenced his tenure at BCSIR on March 15, 2016. He initiated his professional trajectory as a researcher specializing in API synthesis at Active Fine Chemicals. Currently, his research portfolio encompasses synthesis Chemistry, lignin Chemistry, Cellulose derivatives, biorefinery processes, biomaterials science, and the fabrication of composite materials. Since affiliating with BCSIR, he has authored twenty-three articles in peer-reviewed scientific journals.

**Md. Rashed Hasan (March, 2016 - Present)**

Office	Fibre & Polymer Research Division	Blood Group	O-
Position	Scientific Officer	Degree Obtained	MSc. (thesis)
Contact	rashedhasanbcsir@gmail.com	Mobile	01816375618

Md. Rashed Hasan has achieved both his BSc(Hons) and MS degrees in Chemistry from Jahangirnagar University. His research interests include biomaterials chemistry, Green Solvent Synthesis, microplastic assessment, and natural dye extraction. He has contributed 08 publications and one patent to be a co-author.

**Shabiba Parvin Shandhi (November, 2021 - Present)**

Office	Fibre & Polymer Research Division	Blood Group	B+
Position	Scientific Officer	Degree Obtained	PhD (appeared)
Contact	shabiba.shandhi@gmail.com	Mobile	01755739736

Shabiba Parvin Shandhi is presently employed as a Scientific Officer within the Fibre and Polymer Research Division at BCSIR Dhaka Laboratories. She attained both her BSc and MSc degrees in Chemistry from the University of Dhaka and commenced her tenure at BCSIR on November 15, 2021. She initiated her professional trajectory as a researcher specializing in phytochemistry and pharmacology. Currently, her research portfolio encompasses synthesis Chemistry, surface Chemistry, plastic recycling, nano-bio-composites, and natural product chemistry. Since affiliating with BCSIR, she has authored four first-author and two other-author articles in peer-reviewed scientific journals.

**Mirza Nusrat Sweety (May, 2022 - Present)**

Office	Fibre & Polymer Research Division	Blood Group	B+
Position	Senior Scientific Officer	Degree Obtained	MSc. (thesis)
Contact	sweety.nstu07@gmail.com	Mobile	01682339389

Mirza Nusrat Sweety is working as a Scientific Officer in Fibre and Polymer Research Division, BCSIR Dhaka laboratories. She has completed her BSc and MS in Applied Chemistry and Chemical Engineering from Noakhali Science and Technology University and Joined BCSIR at 10 May 2022 as a Scientific Officer. She started her early carrier in Hydrogen Energy. Currently she is working in nanocomposite synthesis and cellulose extraction. She has published three articles in peer-reviewed journals after joining BCSIR

## R&D Activities & Achievements 2024-2025



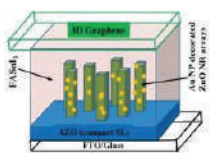
### Scientists of IPD

## Industrial Physics Division

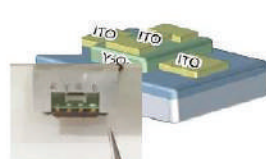


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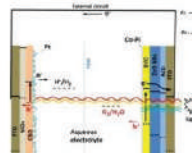
**Energy Conversion & Storage**



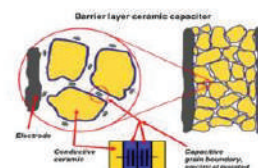
**Nanoengineered Pb-free Perovskite Solar Cells**



**Transparent Conductive Oxides (TCOs) for electronics**

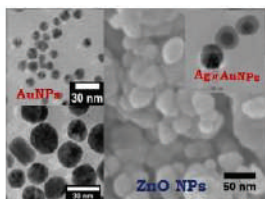


**Metal oxides for Solar Fuels**

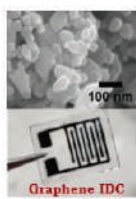


**BaTiO<sub>3</sub> Ceramic & Thin films for Capacitors**

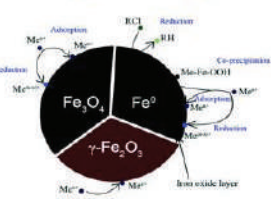
### Metallic, Semiconducting & Magnetic Nanomaterials



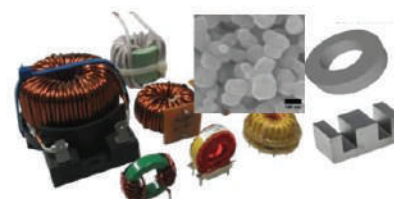
**Facile & Large-Scale Nanoparticles Synthesis**



**Graphene IDC**



**Magnetic Nanoparticles for Sensors & Wastewater Treatment**



**Nanocrystalline materials for Transformer Core**

Physicists in both industry and academia have historically been the driving force behind industrial development and technological breakthroughs, transforming fundamental discoveries into practical commodities and state-of-the-art tools that shape modern life. In today's era of rapidly evolving technology, materials & device physicists and engineers face growing global challenges to minimize both the time and cost required to translate innovations into real-world products and services. With this challenge in focus, the Industrial Physics Division (IPD) is actively engaged in cutting-edge R&D in the fields of materials and energy for sustainable development. The scientists and researchers of this division play a pivotal role in addressing complex problems across academic and industrial sectors by devising custom-designed tools and applying unconventional techniques to enhance the understanding of both synthesized and imported products.

At the heart of IPD's activities lies the tailoring of material properties at the nanoscale and the adoption of advanced, high-precision measurement techniques. These approaches not only meet the demands of diverse stakeholders but also contribute significantly to the nation's broader scientific development strategy, fostering innovation, sustainability, and industrial competitiveness.

❖ Number of Scientists	: 08
❖ Total Ongoing R&D	: 07
❖ Special Allocation	: 01
❖ GARE (Ministry of Education, GoB) research grants	: 1
❖ Analytical Services	: 50
❖ Published Papers	: 18

## R&D Projects:

### 01. Development of high-performance dielectric materials for electrical and electronic device applications

*Suravi Islam (PL), Nazia Khatun, Nazmul Islam Tanvir, Md. Saidul Islam, Ayesha Siddika and Syed Shafquat Mahmood*

#### Introduction:

All around the world, dielectric materials are playing a leading role in the scientific, technical and electronic devices. However, most of the commercial electronic devices are based on lead(Pb) which is a serious concern for environment. This situation drives strongly the need to replace lead-based piezoelectric materials like PZT which contains more than 60% of a toxic element, Pb. In the last decade, researchers showed huge interest towards development of lead-free environment friendly dielectric ceramic materials. Our research will focus on improving the functional response of environment friendly (lead free) dielectric ceramic materials.

#### Objectives:

- To develop eco-friendly dielectric ceramic materials with different compositions and different sintering conditions
- To optimize physical and electrical properties of the ceramic materials in small (laboratory) scale

#### Work Progress :

- Two set of samples have been synthesized. One set of Zirconium doped Barium Titanate (BZT)  $BaZr_xTi_{1-x}O_3$  where ( $x = 0.00, 0.05, 0.10, 0.15, 0.20$ ) samples have been prepared using conventional solid state synthesis technique. The structural, electrical and optical properties of the synthesized samples were investigated by X-ray diffraction (XRD), field emission scanning electron microscopy (FESEM), impedance analyzer and UV-Vis- NIR Spectroscopy.
- Fe and Al doped Barium Titanate samples Fe: BT, Al: BT have been synthesized and characterized for property determination.
- Oral and poster presentations have been given on this R&D.
- One research paper published in a reputed journal (RSC) and one research paper have been submitted in springer journal.

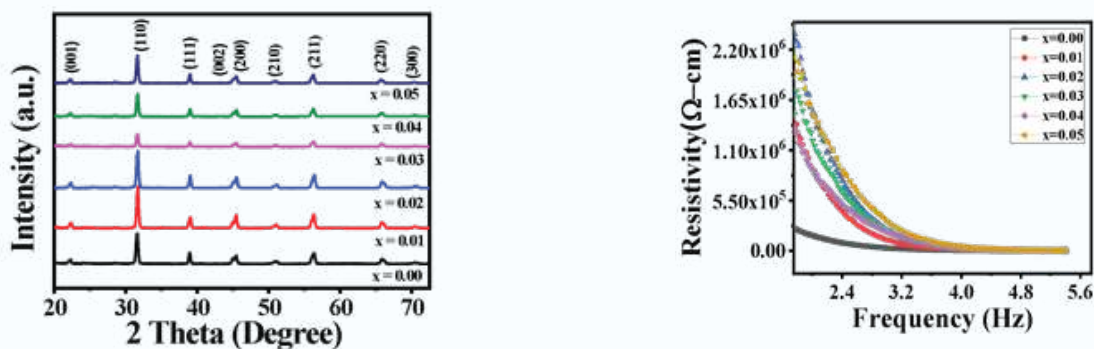


Fig: X-ray diffraction pattern and the resistivity vs. frequency graph of  $Ba_{1-x}Al_xTiO_3$  (where  $x = 0.00, 0.01, 0.02, 0.03, 0.04, 0.05$ )

## 02. Fabrication of ecofriendly photoelectrodes for sunlight-driven self-sustained H<sub>2</sub> production

*Dr. Syed Farid Uddin Farhad(PL), Nazia Khatun, Nazmul Islam Tanvir, Md. Saidul Islam and Shirin Akter Jahan*

### Introduction:

A photo-electrochemical (PEC) system uses sunlight illuminated semiconductors to split water into hydrogen (a clean solar fuel) and oxygen. Binary metal oxides draw much attention for their potentiality for the production of large-scale solar hydrogen via PEC water splitting. However, due to unsatisfactory solar-to-hydrogen (STH) conversion efficiency of binary metal oxides, research efforts have recently been shifted to development of new multinary (ternary and quaternary) metal oxides with large combinations of constituent metals and oxygen. In this project, we aim to utilize solution processable approaches to further develop non-toxic Bismuth-based multinary metal oxide photo-electrodes at Energy Conversion and Storage Research (ECSR) section, Industrial Physics Division (IPD), BCSIR Laboratories, Dhaka.

### Objectives :

- To develop a facile and industrially scalable synthesis of bismuth based photo electrodes and subsequent optimization of physical properties of these photo electrodes.
- To develop a robust fabrication protocol for attaining compact but ultra-thin photo electrode layer atop the transparent conducting substrates (TCS).
- To integrate the property optimized photo electrode into our proposed PEC system for monitoring performance.

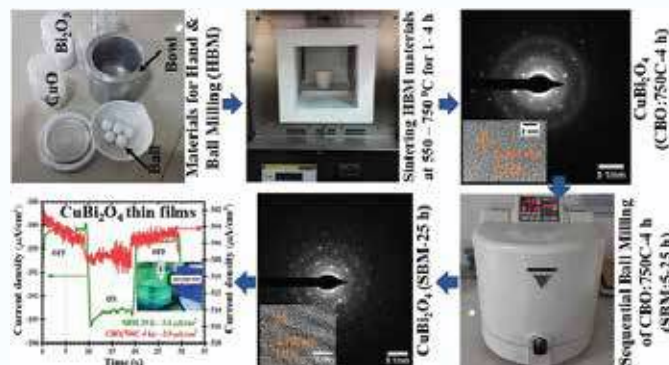


Fig: Schematic of the IPD-developed sequential Ball mill (SBM) technique for large scale production of CuBi<sub>2</sub>O<sub>4</sub> materials. Drop-casted CuBi<sub>2</sub>O<sub>4</sub>/FTO shows H<sub>2</sub> production ability in an aqueous 0.1M NaOH electrolyte (pH~13.0).

### Work Progress:

- Published in ACS Applied Energy Materials (2024): Facile Top-Down Synthesis of Phase-Pure and Tunable Bandgap CuBi<sub>2</sub>O<sub>4</sub> Photocathode Materials by Low-Energy Sequential Ball Milling
- Published in MRS Advances (2024): Structural, Morphological, Optical, and Electrochemical Studies of α-Bi<sub>2</sub>O<sub>3</sub> and CuBi<sub>2</sub>O<sub>4</sub> Photocathode Materials

## 03. Fabrication of ecofriendly absorber layers for high efficiency perovskite solar cells

*Syed Farid Uddin Farhad (PL), Suravi Islam, Syed Shafquat Mahmood, Nazmul Islam Tanvir. Md. Saidul Islam Mohammad Shah Jamal and Aninda Nafis*

### Introduction :

The rapid development of perovskite solar cells (PSCs) has revolutionized photovoltaic research due to their high efficiency and low-cost fabrication. However, the widespread use of toxic lead-based compounds poses significant environmental and health concerns. This project aims to develop lead-free, environmentally benign absorber materials such as FASnI<sub>3</sub> through sustainable solution-based routes. The study will focus on identifying suitable green solvents, optimizing the structural, physicochemical, and opto-electronic properties of the absorber layers, and fabricating high-performance PSCs using the optimized materials. The outcome will contribute to safer, sustainable, and scalable solar energy technologies.

### Objectives :

- To investigate suitable solvents for solution processable ecofriendly absorber (e.g., FASnI<sub>3</sub>) layers
- Optimization of structural, physicochemical and opto-electronic properties of absorber layers
- Design and fabrication of perovskite solar cells using property-optimized absorber layers

## Work Progress:

Significant progress has been made toward achieving the project objectives on eco-friendly perovskite absorber development. Two sets of MAPI absorber samples have been successfully synthesized on both soda lime glass (SLG) and fluorine-doped tin oxide (FTO) substrates, as well as on ZnO nanorod (NR) and ZnS/ZnO NR/ZnS electron tunneling layer (ETL) structures. These samples were processed via spin coating under air atmosphere followed by low-temperature annealing (<250 °C). Comprehensive structural and optical characterizations (XRD, UV-Vis-NIR, and photoluminescence) are in progress. Apart from the physicochemical characterizations, simulation of Pb-free absorber based PSCs were accomplished to get optimum device architecture (See Fig. 1)

Additionally, FASnI<sub>3</sub> thin films with and without MAI<sub>3</sub> surface treatment have been planned for fabrication inside the glovebox to assess performance enhancement. Optimization of green solvent systems (DMF, DMSO, DEF) for forming compact absorber layers is ongoing.

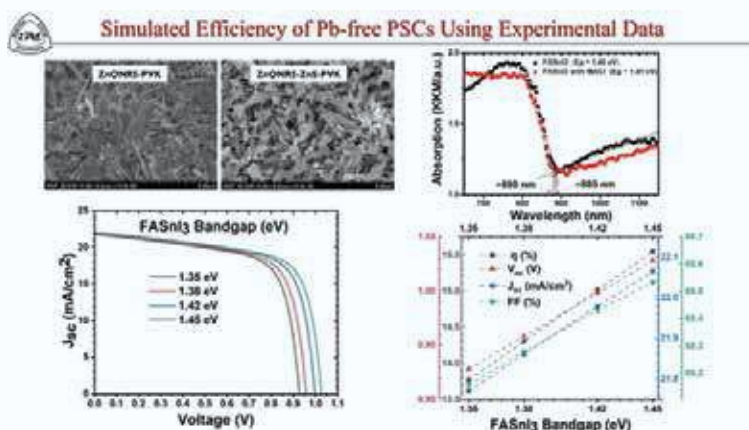


Fig: SEM image of ZnO Nanorods (Top left) and simulated opto-electrical properties of FASnI<sub>3</sub> based Solar cells.

Research outcomes have already resulted in two peer-reviewed publications:

1. MRS Advances 8(5), 194–200 (2023) on wide bandgap SnO<sub>2</sub> ETL.
2. Nanotechnology 35(38), 385704 (2024) on ZnS/ZnO nanorod scaffolds ETL for perovskite solar cells.

This project builds on ongoing TWAS/RSC/GARE (MoE) research grants led by Dr. Syed Farid Uddin Farhad, with parts of the experimental work to be conducted collaboratively at CSIR-Central Electrochemical Research Institute (CECRI), Karaikudi, India, under the UNESCO-TWAS-CSIR postdoctoral split-site program.

## 04. Synthesis of ferrite materials for cost-effective high performance electronic devices

*Nazia Khatun (PL), Suravi Islam, Syed Farid Uddin Farhad, Md. Sajjad Hossain, Ayesha Siddika, Nazmul Islam Tanvir, Md. Saidul Islam and Engr. Nahid Sharmin*

### Introduction:

Ferrites are the most important magnetic materials, without which we cannot think about technological revolution. Nanoparticles (NPs) have tremendously revolutionized multiple sectors of our society due to their ability to be used in diverse applications. Recently, ferrites nanoparticles, have attracted enormous interest due to their salient use in several sectors, including energy, environmental, agricultural, medical, and industrial. Ferrites exhibit excellent electrical and magnetic properties. The advantages of ferrites include high electrical resistivity, low eddy current loss, high permeability and time-temperature stability, wide frequency range, shape versatility, low cost, etc. Ferrites have multitude usages such as permanent magnet, magnetic shielding, magnetic sensors, magnetic recordings, information storage, mobile communication, electronic devices, gyromagnetic device, medical devices, transformers, sensors, pollution control, catalysis, pigments, etc. In this work nano magnetic materials will be used and determined their usefulness in potential application in energy and electronic industries. Now Bangladesh is committed to achieve sustainable development goals (SDG) and we hope this project should be contributory to this purpose.

### Objectives:

- To develop magnetic materials with different compositions
- Characterization of the finished product to confirm the chemical and structural purity and physical robustness
- To optimize the physical, electrical, magnetic, optical and sensitivity properties of the materials in small (laboratory) scale

## Work Progress:

- Mg-doped Zinc ferrites has been successfully synthesized with different composition by Solid state method for humidity sensor.
- Some physicochemical properties of as-synthesized Mg-doped Zinc ferrites has been done by XRD, FTIR, FE-SEM, EDS, UV-VIS-NIR spectroscopy and VSM.
- One manuscript is ready to submit.

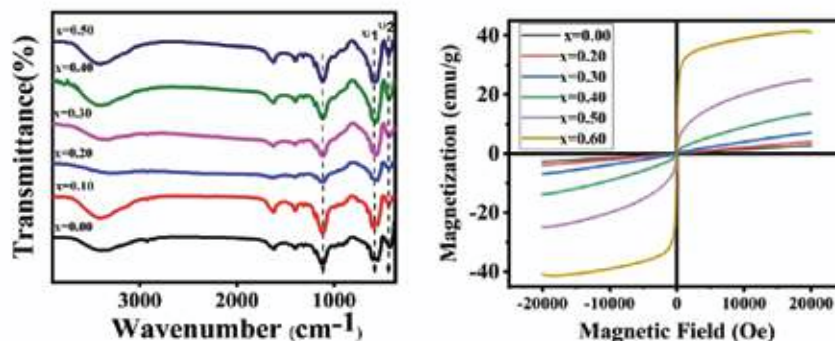


Fig: FTIR analysis spectrum and room temperature Hysteresis (M-H) curve of Magnesium doped Zinc ferrites nanoparticles

## 05. Synthesis of metal nanoparticles and their formulation as conductive ink for electronic devices

*Ayesha Siddika (PL), Suravi Islam, Syed Farid Uddin Farhad, Nazia Khatun, Nazmul Islam Tanvir, Md. Saidul Islam and Muhammad Shahriar Bashir*

### Introduction:

In the recent decade, metal-based conductive nano-inks comprising of nanometer-sized metallic particles of high electrical conductivity suspended in a polymer have revolutionized the field of printed electronics. Research on conductive nano-inks largely focuses on examining electronic properties in nano-inks. Ag-based nano-inks are used in printed electronics because of their good electrical conductivity ( $\sim 2.56 \times 10^6$  S/m) and low room-temperature electrical resistivity ( $\sim 3.9 \times 10^{-7}$   $\Omega \cdot m$ ). One of the most crucial steps in producing high-quality printing metal tracks is synthesizing pure metal nanoparticles, selecting a suitable carrier and choosing an appropriate sintering technique for printing track curing.

### Objectives :

- To synthesize the metal nanoparticles (Ag, Cu, Al) material
- To characterize the properties of the synthesized material and improve their properties according to the application
- To utilize these materials to formulate conductive ink

### Work Progress :

- Silver (Ag) and Copper (Cu) nanoparticles have been synthesized
- Few characterizations (UV-VIS analysis, SEM, EDS analysis, XRD) has been done
- Silver nanoparticle ink has been prepared
- Contact resistance was found  $\sim 60 \Omega$

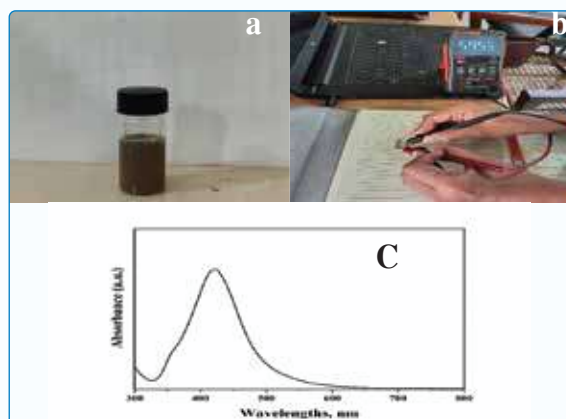


Fig: (a) Silver nanoparticle ink, (b) Contact Resistance measurement and (c) UV absorption Spectrum of Silver nanoparticle

## 06. Development of a flexible storage system from BaTiO<sub>3</sub> composite with polymers

Syed Shafquat Mahmood (PL), Mohammad Sajjad Hossain, Md. Hasnain Mustak and Suravi Islam

### Introduction:

In this study, we are focusing on fabricating a hybrid dielectric material composed of cellulose which is the most abundant natural polymer on earth and/or PVDF with BaTiO<sub>3</sub> for improved dielectric properties, superior thermal stabilities, biocompatibility, light weight, low cost, and extraordinary manufacturing properties which will contribute to the wearable electronic devices, gadgets, automobile industries in Bangladesh.

### Objectives:

- Fabrication of natural (cellulose)/synthetic polymer based BaTiO<sub>3</sub> nanocomposite films
- Minimizing fabrication cost by selecting conducive method
- Optimization of dielectric constant, dielectric loss, discharge energy density, tensile strength, etc. of the prepared films

### Work Progress:

- Fabrication of BaTiO<sub>3</sub> Powder by Hydrothermal Process
- Fabrication of Microcrystalline Cellulose Gel by Acid Hydrolysis and Vacuum Filtration
- Fabrication and Optimization of composite samples of BaTiO<sub>3</sub> and Cellulose

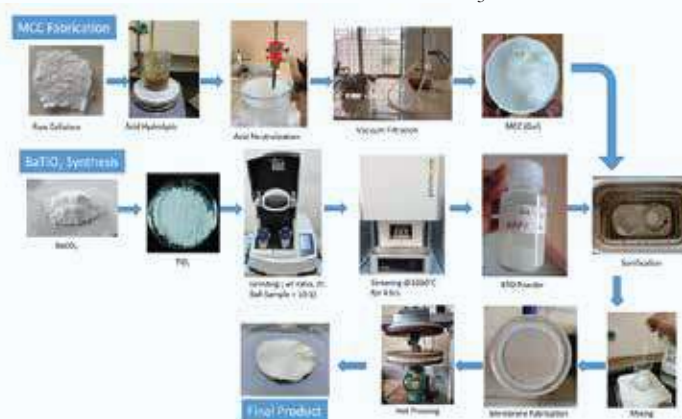


Fig: Flowchart of BaTiO<sub>3</sub> based composite sample preparation

## 07. ZnO nanorods with plasmonic nanoparticles for low cost and high-performance Optoelectronic devices

Nazmul Islam Tanvir (PL), Syed Farid Uddin Farhad, Suravi Islam and Md. Saidul Islam

### Introduction:

In recent times, ZnO Nanostructures (ZnO NS) have attracted a lot of attention due to its excellent optoelectronics properties, which have made ZnO NS valuable for a variety of emerging applications: transparent electrodes in liquid crystal displays, energy-saving or heat-protective windows, and electronics as thin-film transistors and light-emitting diodes and more importantly as electron tunneling layer (ETL) in photovoltaic and photoelectrochemical devices. A variety of morphologies have been developed for ZnO (NSs), such as zero-dimensional (0-D) nanoparticles, 1-D nanowires, 2-D Nano sheets for applications mentioned above including other optoelectronics, optics and electronics devices such as gas sensor. As a toxic gas, it is important to sensitize to nitrogen oxide including other volatile organic compound (VOC) gases that are emitted from automobiles, thermal power plants, chemical plants and manufacturing facilities where toxic fluids and gases are being stored and processed and have harmful effects on the human body, including severe respiratory diseases and skin irritations [1]. Various nanostructured metal oxides such as SnO<sub>2</sub>, ZrO<sub>2</sub>, V<sub>2</sub>O<sub>5</sub>, WO<sub>3</sub>, NiOx, and ZnO have been widely used for sensing NOx gases and other VOC gases such as ethanol, acetone, toluene and hydrogen etc. Among of them ZnO NSs have been one of the significant materials for gas sensors due to its high electron mobility (100 cm<sup>2</sup>V<sup>-1</sup>s) along with nontoxicity, thermal stability and environment friendly low-cost fabrication process. Although ZnO-based sensors have a good performance, their gas sensing properties can be further improved by arranging them with Au NPs. Au NPs are relatively stable, catalytically active, water-soluble, optically sensitive, and universally biocompatible compared to other noble metallic NPs. In this R&D project, Au NPs decorated ZnO NRs device will be fabricated for low cost and high performance photovoltaic, photo-electrochemical, and gas sensing devices.

## Objectives:

- Growth of defect-free ZnO nanorods in certain direction by hydrothermal process.
- Decorate ZnO NRs with Au nanoparticles (different size) to investigate the plasmonic effect usable for high-performance devices

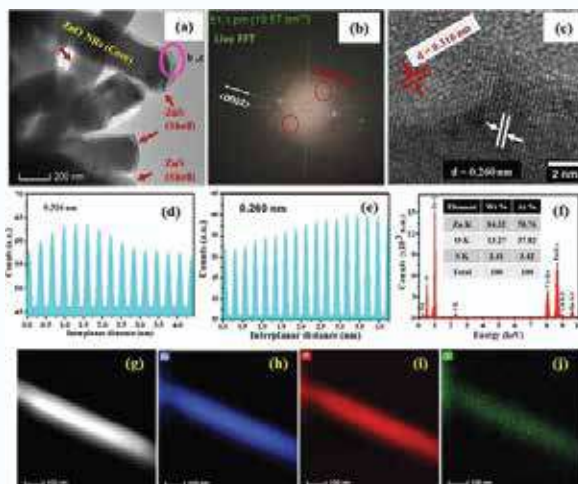


Fig: (a) Bright Field TEM image of ZnO Nanorod (core)-ZnS (Shell) scaffolds, uniform conformal ZnS shell layers ( $\sim 25 \pm 7$  nm) are marked by arrows to guide the reader; (b) Live FFT pattern of the circled area in (a) exhibiting ZnO{10-11}/ZnS{111}-like partial epitaxy, (c) HRTEM lattice fringe images taken at the tip of core-shell (CS) structure, (d) & (e) interlayer spacing plots of ZnS (111) and ZnO (0002) from (c) and (f) EDX of ZnO NR-ZnS CS nano-scaffolds. (g) to (j) shows the TEM/EDX elemental mapping of an individual ZnS coated ZnO Nanorod recorded in STEM mode.

## Work Progress:

- ZnO NPs were successfully synthesized by Sequential Ball Milling (SBM) technique
- Defect-free ZnO NRs with variable features were successfully grown on SBM ZnO NPs seeded layers
- Narrower and denser ZnO NRs were found for ZnO NPs<sub>25 hr seed layer</sub> (ZnO NPs $\sim 16-18$  nm)
- Average diameter (rod-to-rod (R2R) gap) of 5h & 25h ZnO NRs found to be  $\sim 647$  ( $\sim 344$ ) nm and  $\sim 153$  ( $\sim 139$ ) nm, respectively
- Surface nature of ZnO NRs can be controlled by short UV exposure
- Mixture of Au-Ag NPs showed enhancement of R6G on ZnO NRs
- A gas sensing electrode has been developed

## Achievements :

- One article has been accepted (IOP Publication, Nanotechnology, DOI 10.1088/1361-6528/ad544a)
- One manuscript is ready to submit

## 08. Construction of a computer controlled high precision hall effect measurement setup

*Md. Saidul Islam (PL), Suravi Islam, Syed Farid Uddin Farhad, Nazmul Islam Tanvir, Md. Saidul Islam and Mahedi Hassan*

## Introduction:

Electrical properties like conductivity as well as resistivity, surface/sheet resistance are some of the inherent properties of any substance based on which they are classified as metal, semiconductor, insulator as well as dielectric materials. These parameters are also used to determine Hall effect for a material which is a crucial characteristic of a material to find its carrier mobility, charge concentration etc. Now, these measurements span many different ranges which require the different probing techniques of the test sample as well as sensitive equipment to reduce error and measurement accuracy. Low cost analog instruments are unable to provide such precision. Moreover, such analog measurements are time consuming, laborious and inappropriate for modern day researches. Therefore, a Hall measurement setup with smart interface to control and automate such with computer is necessary which will not only make the setup more effective but also advances us to the flow of 4th Industrial Revolution.

## Objectives:

- To design and establish a Hall measurement setup for measuring different electrical parameters of our research samples as well as samples received from the public and private stakeholders
- To convert manually operated custom made equipment to computer operated while keeping them affordable for research institutes as well as for college/university science laboratories
- To compare our interface with existing instrument interfaces by using our simulated and fabricated semiconductor devices

## Work Progress:

- A Hall measurement setup has been designed and established
- An interface for computer controlled operation of through Source Measure Unit (SMU) has been developed using Python programming language
- Successful measurements of some synthesized thin film samples have been performed
- Working on integrating Nanovoltmeter into the interface
- Optimization is required for more precision



Fig. 1 :Home-built Hall measurement setup

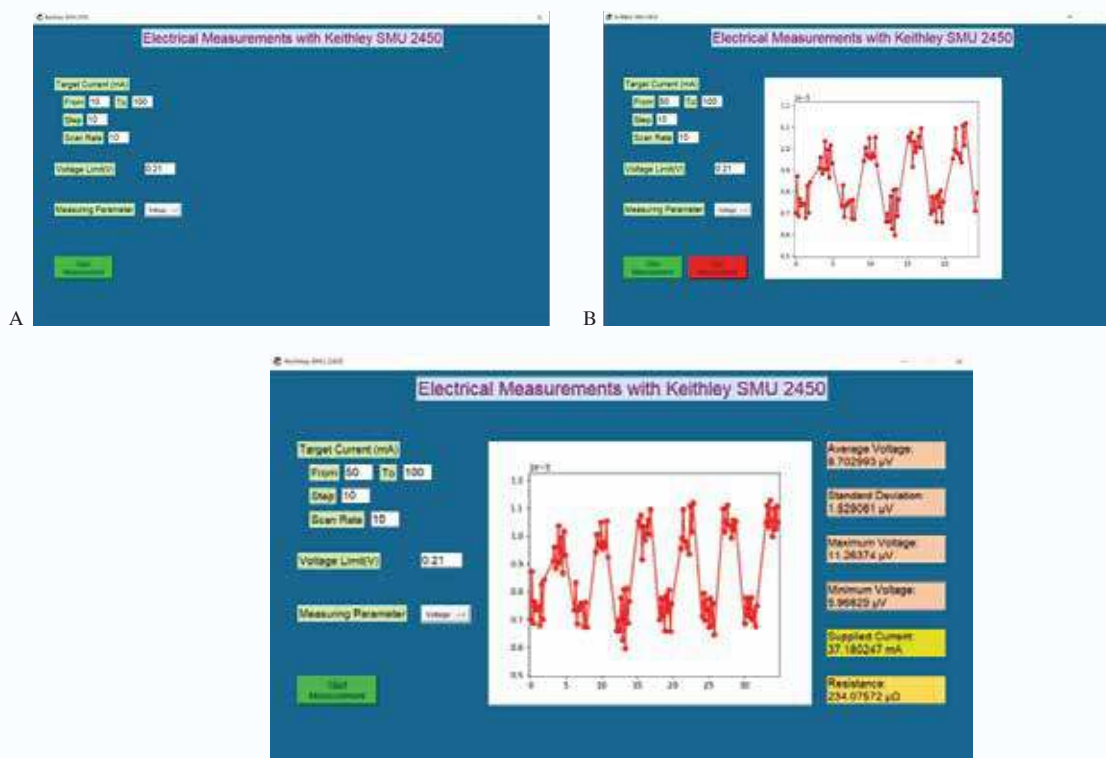


Fig. 2 : Developed interface for computer controlled operation of Hall measurement (a) initial view, (b) while measuring, (c) displaying result after measurement.

## 09. Grants for Advanced Research in Education (GARE) Project (MoE, GoB) FY 2023-2026: Fabrication of lead-free absorber layers for nanoengineered perovskite solar cells

*Syed Farid Uddin Farhad (PI) and Nazmul Islam Tanvir*

## Introduction:

Nowadays, sustainable and environmentally friendly renewable energy sources are becoming more and more desirable. Solar photovoltaic (PV) is one of the most promising renewable energy sources to meet the present and future energy demands of our planet. At present, the majority of installed solar panels are made up of expensive Silicon (Si) wafers, and they comprise a larger part of the global solar panel market share. The cheaper solar cells are made up of CdTe and CuInGaSe<sub>2</sub> (CIGS) thin films. But base materials for this group of solar cells are suffering from two important issues: (1) toxicity of Cd (cadmium) (2) scarcity of Te (tellurium), In (indium), and Ga (gallium). Therefore, scarcity of raw materials, including the environmental issue, limits their practical potential in the case of Tera Watt (TW) level solar panel deployment. Perovskites are showing much promise for cost-effective, eco-friendly solar PV fabrication. Out of the various kinds of PVs, lead (Pb) recently attracted great attention due to its demonstrated power conversion efficiency (PCE) exceeding 25%. However, the utilization of Pb-based perovskites as absorber materials hinders the large-scale commercial production of perovskite solar cells (PSCs) due to their toxicity and less stability. Therefore, an economically viable and environmentally sustainable plan could be the use of non-toxic tin (Sn)-based perovskite absorber material. To this end, rational design and judicious selection of materials and synthesis techniques are the keys to the development of efficient and eco-friendly PSCs. Another big challenge related to devising eco-friendly PSCs is to develop Pb-free perovskite materials with suitable physicochemical properties. To this end, the toxic Pb-free formamidinium tin iodide (FASnI<sub>3</sub>) looks promising to achieve highly efficient, eco-friendly PSCs. Unfortunately, solution-processable stoichiometric FASnI<sub>3</sub> film is very difficult to obtain, and its inherent faster crystallization rate during processing induces a large number of trap states and lowers open circuit voltage (Voc) in the corresponding PSC. The crystal growth of FASnI<sub>3</sub> film can be controlled by introducing hydrogen bonding with polyvinyl alcohol (PVA) additive that results in a compact perovskite film offering reduced trap density in the corresponding PSC. In this proposal, we aim to utilize a solution-processable and/or slot-die coating approach and state-of-the-art characterization tools available in the Industrial Physics Division (IPD) and the different laboratories of BCSIR for the fabrication of an eco-friendly absorber layer for ensuring high-performance and stability of the PSC (See Fig.1 below).

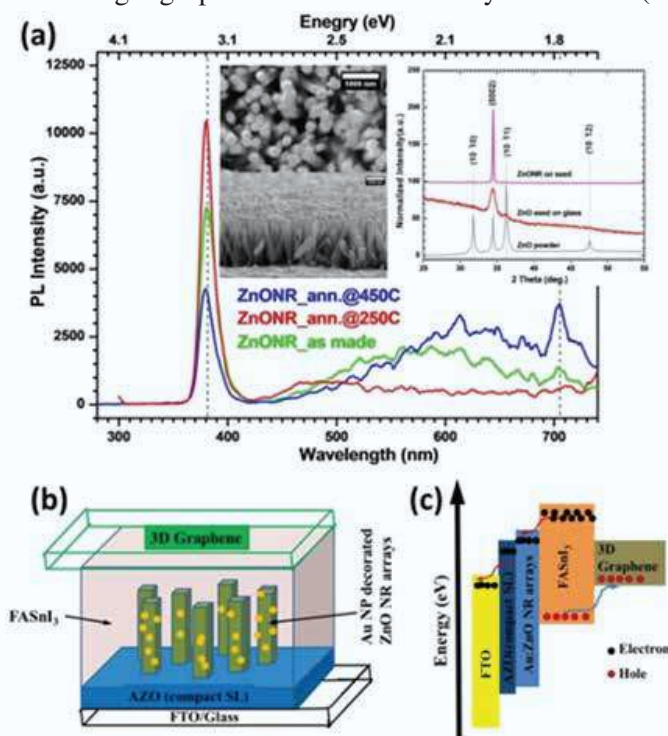


Fig: 2 : (a) Structural, morphological, and luminescent properties of the vertically aligned ZnO nanorods grown by hydrothermal method; (b) Schematic depiction of the proposed Pb-free PSC based on vertically aligned ZnO nanorod arrays decorated by Au-nanoparticles (Au:ZnO Nanorods); (c) Energy band alignment of the proposed Au: ZnO NRs based toxic Pb-free PSC.

## Objectives:

- To investigate suitable solvents for solution-processable, ecofriendly absorber layer
- Optimization of structural, physicochemical, and optoelectronic properties of the absorber layer
- Design and fabrication of perovskite solar cells using property-optimized absorber layer

## Special Allocation Project (MoST, GoB) FY2024-2025:

### Synthesis of silver nanoparticles and their formulation as electrodes for electronic devices

Suravi Islam (PI) and Ayesha Siddika

#### Introduction:

Printing technologies are revolutionizing the electronic field by providing cost-effective manufacturing, allowing new applications now possible. Due to the wide range of printing technologies, the materials (inks/pastes and substrates) must meet certain requirements, depending on the type of printing technology being used and the final application. Synthesis of silver nanoparticle electrodes for electronic devices need to be developed. Application of electrical and electronic devices in industries are increasing, but it is not yet manufactured in our country rather imported. Locally developed cost effective silver nanoparticles material will be benefited to our industries and save foreign currency. It will create a platform for the participant scientists, researchers and university students to contribute in human resource development.

#### Objectives:

1. To synthesize the silver nanoparticles material
2. To characterize the properties of the synthesized material and improve their properties according to the application

#### Progress :

Synthesis of Silver (Ag) nanoparticles have been synthesized by chemical reduction method

An electrode coated with silver nanoparticle has been designed

Characterizations such as SEM & EDS analysis, and UV-Vis analysis has been done for synthesized Ag nanoparticles. XRD, Impedance and other properties will be carried out eventually

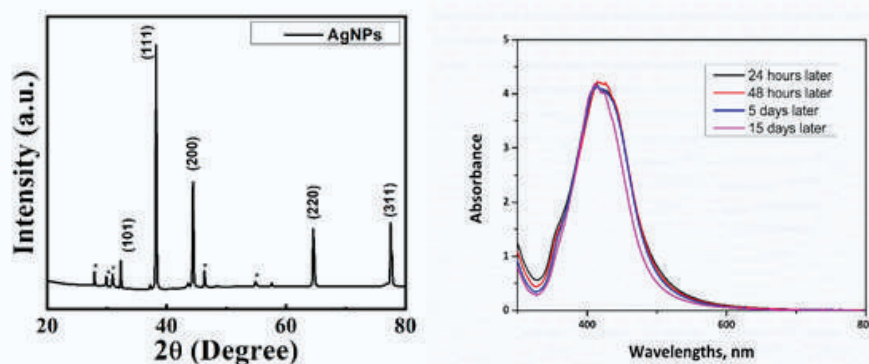


Fig: XRD pattern of synthesized AgNPs and UV-Vis absorption spectra of AgNPs in different time intervals

#### Achievements and Activities: (Only Scopus/SCI/SCIE/BJSR listed)

#### Published Papers :

1. Suravi Islam, Mohammad Robel Molla, Nazia Khatun, Nazmul Islam Tanvir, Mahmuda Hakim, and Md Saidul Islam. "Exploring the effects of zirconium doping on barium titanate ceramics: structural, electrical, and optical properties." *Materials Advances* 6, no. 4 (2025): 1403-1413. DOI: 10.1039/d4ma00967c
2. Syed Farid Uddin Farhad, Mst Irin Naher, Nazmul Islam Tanvir, Md Saiful Quddus, Shirin Akter Jahan, and Md Aftab Ali Shaikh. "Facile Top-Down Synthesis of Phase-Pure and Tunable Bandgap CuBi<sub>2</sub>O<sub>4</sub> Photocathode Materials by Low-Energy Sequential Ball Milling." *ACS Applied Energy Materials* 7, no. 19 (2024): 8278-8287. <https://doi.org/10.48550/arXiv.2209.08530>
3. Nazia Khatun, Md Osman Goni, Md Saidul Islam, Md Aftab Ali Shaikh, Syed Farid Uddin Farhad, Md Al-Mamun, Md Saiful Alam, Nazmul Islam tanvir, Md. Sajjad Hossain, Trisha Paul, and Suravi Islam, "Impact of lanthanum ions on structural, morphological, magnetic, optical and electrical properties of Cobalt-Zinc ferrites." *Journal of Magnetism and Magnetic Materials* (2024): 172740, <https://doi.org/10.1016/j.jmmm.2024.172740>
4. Ayesha Siddika, Munira Sultana, Samia Tabassum, M. S. Bashar, Suravi Islam, Sadia Afrin, and Nilufa Yeasmin, "Performance study of dye-sensitized solar cells: a novel 'slit method' for electrolyte filling and tailoring 1D/3D TiO<sub>2</sub>

- nanorod networks”, *J Mater Sci: Mater Electron*, 2025, 36,1041. DOI:10.1007/s10854-025-15056-8
5. Md Shaha Alam, Nazmul Islam Tanvir, Mohammad Moniruzzaman, Md Aftab Ali Shaikh, and Syed Farid Uddin Farhad. "Size variant spherical gold nanoparticles for in situ detection of trace contaminants by surface enhanced Raman spectroscopy." *MRS Advances* 9, no. 17 (2024): 1345-1351. DOI:10.1557/s43580-024-00909-x
  6. Mst. Irin Naher, Nazmul Islam Tanvir, Nur Amin Bitu, Nazia Khatun, Suravi Islam, Md Saidul Islam, Md Aftab Ali Shaikh, and Syed Farid Uddin Farhad. "Structural, morphological, optical, and electrochemical studies of  $\alpha$ -Bi<sub>2</sub>O<sub>3</sub> and CuBi<sub>2</sub>O<sub>4</sub> photocathode materials." *MRS Advances* 9, no. 21 (2024): 1649-1657. DOI:10.1557/s43580-024-00942-w.
  7. Nipu Kumar Das, Syed Farid Uddin Farhad, Ashoke Kumar Sen Gupta, Mahmud Abdul Matin, and Nowshad Amin. "The Significance of Bilayer Window (Cds: O/Cds) on the Performance of Cdte Thin Film Solar Cells." Available at SSRN 4811217, <https://doi.org/10.1016/j.optmat.2024.115816>
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  12. Khalid Hasan, Abdul Ahad, Mithun Kumar Das, Moushumi Akter, M. N. I. Khan, Syed Farid Uddin Farhad, and Md Abu Taher. "Effect of vanadium doping on structural, dielectric, magnetic, and ferroelectric properties of Ba<sub>0.95</sub>La<sub>0.05</sub>TiO<sub>3</sub> ceramics." *Materials Chemistry and Physics* 326 (2024): 129854, <https://doi.org/10.1016/j.matchemphys.2024.129854>
  13. Md Khairul Islam, Abdullah Al Moyeen, Raiyana Mashfiqua Mahmud, Md Lutfor Rahman, and Suravi Islam. "Influence of Ta and Zr single doping on the properties of sodium yttrium copper titanate ceramics: a multifaceted investigation." *Journal of Materials Science: Materials in Electronics* 36, no. 1 (2024): 19, <https://doi.org/10.1007/s10854-024-14056-4>
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  15. Tanvir Ahmed, Tasnim Akbar Faruquee, Khandaker Mansib Romman, Mowtosi Rahaman Sharkar, Zulfiqar Hasan Khan, Nazmul Islam Tanvir, Md Abdur Rahman et al. "A facile protocol to greatly increase the amplitude of surface-enhanced Raman scattering and harvest significant photoinduced-enhanced Raman scattering by exploiting the synergy of 2D ZnO nanoflakes." *Optics & Laser Technology* 190 (2025): 113249. <https://doi.org/10.1016/j.optlastec.2025.113249>
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  17. M. A. Mishul, F. B. Sobahan, Suravi Islam, M. J. Haque "Doping-induced synergistic modulations in the dielectric and optical properties of multi-doped barium titanate ceramics", *Progress in Engineering science*, 2 (1), 2025, <https://doi.org/10.1016/j.pes.2024.100038>
  18. Md Khairul Islam, A. A. Moyeen, R. M. Mahmud, Md Lutfor Rahman, Suravi Islam, "Influence of Ta and Zr single doping on the properties of sodium yttrium copper titanate ceramics: a multifaceted investigation", *Journal of Materials Science: Materials in Electronics*, Volume 36, 19, (2025)", <https://link.springer.com/article/10.1007/s10854-024-14056-4>

### Patent Submitted :

1. Syed Farid Uddin Farhad, Md. Saidul Islam, Nazmul Islam Tanvir, Md. Saidul Islam and Suravi Islam, "A Portable Light Source with Variable Wavelength, Intensity and Illumination Period", submitted by the office of the Patents and Design and Trademarks, Motijheel, Dhaka. Date: 08.08.2022.

### Guidance to research Work (PhD/M.Phil /M.Sc/NCST & BCSIR Fellow)

Sl. No	Title of Research	Research Category	Name of the Student	Name of the Institution	Name of Supervisors
01.	The consequences of iron (Fe) doping on the optical properties of barium titanate	Nurul Afser Khan Memorial Fellowship (Completed)	Jabun Naher Sikta	Industrial Physics Division	Suravi Islam, CSO
02.	Synthesis and Characterization of Ni and Mn Substituted CuZnFe <sub>2</sub> O <sub>4</sub> Ferrites with a focus on their Suitability as Humidity Sensors	Ph.D. (Continuing)	Mr. Nurul Absar	Department of Physics, CUET	Dr. S.F.U. Farhad, PSO
03.	Fabrication of Zinc Oxide Nanorods on Aluminium doped ZnO seeding layers	M.Phil. (Completed)	Mr. Mukul Hossain	Department of Physics, University of Dhaka	Dr. S.F.U. Farhad, PSO
04.	Synthesis and characterization of CAFe <sub>2</sub> O <sub>4</sub> /Na-montmorillonite composites	M.Sc. (Thesis)	Mouly Ashraf	Jagannath University, Dhaka	Suravi Islam, CSO
05.	Plasmonic gold, silver, and their core-shell nanoparticles for SERS sensors	M.Sc. (Thesis) (completed)	Mr. Tanvir Ahmed (CARF/IPD)	Department of Physics, BUET	Dr. S.F.U. Farhad, PSO
06.	Electrochemical performance of Mn-doped Cobalt Oxide Thin Films deposited by spray pyrolysis technique	M.Sc. (Thesis) (completed)	Mr. Mahidul Islam Suman	Department of Physics, BUET	Dr. S.F.U. Farhad, PSO
07.	Fabrication and Simulation of Inorganic HTM layer for Pb-free Nanoengineered Perovskite Solar Cells	M.Sc. (Thesis) (Continuing)	Mr. Hossain Ahmed	Department of Physics, University of Dhaka	Dr. S.F.U. Farhad, PSO
08.	FDTD simulation of Plasmonic nanoparticle decorated ZnO Nanorods for Solar Cells and SERS applications	M.Sc. (Thesis) (Continuing)	Mr. Md. Ariful Islam	Department of Physics, University of Dhaka	Dr. S.F.U. Farhad, PSO

### Participation in training / Seminar/ Symposium/ Workshop/ Conference:

#### Training:

1. Suravi Islam (CSO), conducted as trainer on “National Integrity strategy” organized by BCSIR Laboratories, Dhaka, 18 May, 2025.
2. Dr. Syed Farid Uddin Farhad conducted training as a trainer on “Basic principle, maintenance and troubleshooting of XRD, FTIR and Raman Spectroscopy”, held on 21 May 2025, BCSIR Dhaka Laboratories.
3. Md. Saidul Islam (SO) participated in a training as a trainer on “Introduction to Python: Basic Programming and Data analysis” organized by BCSIR Dhaka Laboratories on 05 November 2024.
4. Suravi Islam (CSO), Dr. Syed Farid Uddin Farhad, Nazia Khatun (SSO), Nazmul Islam Tanvir (SO), Syed Shafquat Mahmood (SSO), Participated in “Introduction to Python: Basic Programming & Data Analysis” organized by BCSIR Dhaka laboratories on 05 November, 2024.
5. Dr. Syed Farid Uddin Farhad, Syed Shafquat Mahmood (SSO), Participated in “R Programming: Learning the Basics of Statistical Computing” organized by BCSIR Dhaka laboratories on 27 November, 2024.
6. Suravi Islam (CSO), Dr. Syed Farid Uddin Farhad, Md. Saidul Islam (SO) participated in a training on “R&D Data Analysis with SPSS” organized by BCSIR Dhaka Laboratories on 01 January 2025.
7. Syed Shafquat Mahmood (SSO) and Md. Saidul Islam (SO) Participated in “Nano Particle Size Analyzer with Zeta Potential” organized by BCSIR, Dhaka, 19-23 January, 2025.
8. Nazia Khatun (SSO) successfully completed training course on operation and maintenance of “BET Sorptometer” organized by CARF held on 18-2, May 2025, BCSIR, Dhaka.

9. Md. Sajjad Hossain (SSO) successfully completed training course on operation and maintenance of “Simultaneous Thermal Analyzer” (STA), held on 04-08 May 2025, IGCRT, BCSIR, Dhaka.
10. Md. Sajjad Hossain (SSO), Md. Saidul Islam (SO) successfully completed training program on “Basic principle, maintenance and troubleshooting of XRD, FTIR and Raman Spectroscopy”, held on 21 May 2025, BCSIR Dhaka Laboratories.
11. Md. Sajjad Hossain (SSO) and Syed Shafquat Mahmood (SSO) successfully completed training program on “PPA-2006 and PPR-2008 in Scientific Procurement”, held on 22 May 2025, BCSIR Dhaka Laboratories.
12. Md. Sajjad Hossain (SSO), Nazmul Islam Tanvir (SO), and Md. Saidul Islam (SO) successfully completed training program on “National Integrity Strategy”, held on 18 May 2025, BCSIR Dhaka Laboratories.
13. Md. Sajjad Hossain (SSO), Nazmul Islam Tanvir (SO) and Md. Saidul Islam (SO) successfully completed training program on “Research Methodology and Publication”, held on 26 May 2025, BCSIR Dhaka Laboratories.

### Conference/Seminar/Symposium :

1. Dr. Syed Farid Uddin Farhad, PSO, has presented research works entitled “Systematic X-ray Photoelectron Spectroscopy Studies to Elucidate the Particle Size Effect on the Electronic Band Structure of Bismuth-based Metal Oxide” at the International Conference on Centennial Celebration of Bose- Einstein Statistics: A Legacy of Dhaka-2024, Dhaka 7-10 November 2024.
2. Nazmul Islam Tanvir, SO, has presented research works entitled “Variable size ZnO nanoparticles synthesis by sequential ball milling for vertically aligned and variable gap ZnO nanorods” at the International Conference on Centennial Celebration of Bose- Einstein Statistics: A Legacy of Dhaka-2024, Dhaka 7-10 November 2024.
3. Md. Saidul Islam (SO), participated in the International Conference on Centennial Celebration of Bose-Einstein Statistics: A Legacy of Dhaka, Organized by University of Dhaka, 07-10 November 2024 and presented an oral presentation entitled “Development of a portable LED-based light source with selectable wavelengths, intensities, and illumination period for photophysical and photochemical studies”.
4. Four workshops/seminars on advancement of BCSIR in 4th IR (Industrial Revolution) held on 30 September 2024, 13 December 2024, 4th March 2025 and 15 May 2025, across BCSIR, organized by Industrial Physics Division, BCSIR Dhaka Laboratories, BCSIR.

### Award/Grants:

1. Dr. Syed Farid Uddin Farhad, PSO, has been awarded the TWAS Maintenance Grant, January, 2025.
2. Dr. Syed Farid Uddin Farhad, PSO, has been awarded CSIR-TWAS Postdoctoral fellowship to conduct research on the lead-free perovskite solar cells at the Central Electrochemical Research Institute (CECRI), Council of Scientific and Industrial Research (CSIR), Karaikudi, Tamil Nadu, India.
3. Dr. Syed Farid Uddin Farhad, PSO, has been awarded a competitive research grant (BDT 20,00000) entitled “Grants for Advanced Research in Education (GARE)” from the Ministry of Education, Government of Bangladesh for the development of “PS-20232528: Fabrication of lead free absorber layers for nanoengineered perovskite solar cells” to accomplished in the financial year June, 2023 to June, 2026.

### Number of Analytical (Ad-Hoc) Problem Solved:

Name of the Division	Routine type	Research Type	Total
Name of the Division	50	300	350

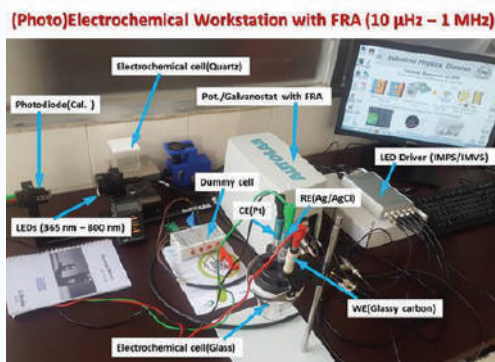
### Special Analytical services:

Apart from R&D works and analytical as well as technical supports to the diverse stakeholders, IPD scientists regularly visit local industries and arrange ‘Stakeholder Meetings’ for the following purposes:

1. Commercialization of IPD Developed products
2. Potential collaborative R&D projects for mutual benefits
3. Provide analytical & technical supports from IPD to local industries

Scientists of IPD are also aware of the National and Global energy crisis and to resolve this issue aligned with UN SDGs “Everyone should contribute for the sustainability of our earth planet” and this is not possible only by

inventing efficient equipment and developing renewable energy technology. Because efficient technology development itself uses huge amount of energy. Scientists of IPD recognized this burning issue quite early and to this end, as a social commitment for the betterment of our people as well as for global citizens, they introduced a test project called “Energy Saving Initiative” by switching off unnecessary lights, fans and unattended equipment etc. to minimize the energy burden in the national grid. To implement this idea and to achieve the project target there is a rewarding system called “Earth Champions” for the person who scores the highest. With this in mind a special R&D project entitled “Towards a Sustainable Materials Physics Laboratory: Safe and Energy-Efficient Practices for Wet-Chemical Synthesis of Functional Materials” has been proposed for awarding external grant (RSC, UK).



Centrifuge Machine



Solar Simulator



Nanovoltmeter



Picoammeter

### Short Biography of IPD Scientists

#### Suravi Islam ( June 1998 – Present)



Office	Industrial Physics Division	Blood Group	B+
Job Title	Principal Scientific Officer	Degree Obtained	M.Sc (1996)
Contact	suraviislambcsir@gmail.com	Mobile	01715840503

Suravi Islam received both B.Sc and M.Sc degree in Physics from the University of Dhaka. She obtained Master's degree in Environmental Management and Development from Australian National University (ANU), Canberra under Aus AID scholarship. Her research interests are in the field of solid state physics and materials science. Her current research is focused on design, synthesis and development of magnetic and dielectric materials for electrical and electronic devices. She has authored or coauthored forty five publications in reputed Journals and one accepted process at BCSIR. She is life member of BPS, BAAS and member of BCS, NITUB and BEC. Now, she is acting as a CSO and scientists-in-charge of Industrial Physics Division.

#### Dr. Syed Farid Uddin Farhad (June 2006 – Present)



Office	Industrial Physics Division	Blood Group	O+
Job Title	Principal Scientific Officer	Degree Obtained	Ph.D. (2016)
Contact	sf1878@my.bristol.ac.uk	Mobile	01881755767

Dr. S.F.U. Farhad is a materials & device physicist who received both B.Sc. and M.S. degrees in Physics from the University of Dhaka. He earned a Ph.D. degree in Metal Oxide-based Solar Cells under a collaborative research project of the Electron Microscopy Group of the School of Physics and the Electrochemistry group of the School of Chemistry, University of Bristol, UK. His current research focuses on the ecofriendly materials for high-performance solar cells and solar fuels (H<sub>2</sub>). Dr. Farhad recently received prestigious UNESCO/TWAS, Royal Society of Chemistry (RSC), UK, and GARE (Ministry of Education, GoB) research grants in these fields. He has authored or coauthored 70 publications and has been recognized in the world's Top 2% Scientist list (Stanford University & Elsevier). He has two accepted processes and one patent. He is a member of IoP(UK), MRS(USA), ACS(USA), RSC(UK), BPS, and BAAS. He is also currently acting as a principal coordinator of physical sciences' equipment in the CARF, BCSIR.

#### Nazia Khatun (June 2006 – Present)



Office	Industrial Physics Division	Blood Group	B+
Job Title	Senior Scientific Officer	Degree Obtained	M.Sc. (Physics)
Contact	naziabcsir@gmail.com	Mobile	01710412484

Nazia Khatun earned her both B.Sc. and M.Sc. degree in Physics from the National University, Bangladesh. Her research interests are in the field of solid state physics and materials science. Her current research is focused on design, synthesis and development of magnetic and dielectric materials for electrical and electronic and sensor devices. She has authored or coauthored 33 publications. She has three accepted process. She is a life member of BAAS, BPS and BEA.

#### Mohammad Sajjad Hossain (February 2013 – Present)



Office	Industrial Physics Division	Blood Group	B+
Job Title	Senior Scientific Officer	Degree Obtained	M.S. (Physics)
Contact	sajjadbcsir@gmail.com	Mobile	01678071517

Mohammad Sajjad Hossain received his B.S.(Honours) and M.S. degrees in Physics from the Jahangirnagar University, Bangladesh. His research focuses on materials science and nanotechnology, especially in dielectric and semiconductor materials and thin film solar cells. He additionally participated in research projects of solar energy appliances, ceramic materials for electronics and energy storage applications. He has authored and co-authored 17 research articles.

**Syed Shafquat Mahmood (June 2016 – Present)**

Office	Industrial Physics Division	Blood Group	B+
Job Title	Senior Scientific Officer	Degree Obtained	M.S. (Physics)
Contact	shafquat.mahmood@gmail.com	Mobile	01926833403

Syed Shafquat Mahmood received his B.S.(Honours) and M.S. degrees in Physics from the University of Dhaka, Bangladesh. His research focuses on materials science and nanotechnology, especially in dielectric and semiconductor materials and thin film solar cells. He additionally participated in research projects of solar energy appliances, ceramic

materials for electronics and energy storage applications. He has authored and co-authored 5 research articles and has two accepted processes.

**Ayesha Siddika (March 2016 – Present)**

Office	Industrial Physics Division	Blood Group	O+
Job Title	Scientific Officer	Degree Obtained	MS (Physics)
Contact	mowry.du@gmail.com	Mobile	01917018956

Ayesha Siddika received her B.S.(Honours) and M.S. degrees in Physics from the University of Dhaka, Bangladesh. Her research focuses on materials science and nanotechnology, especially semiconductor materials for high-efficiency solar cells. She additionally performed research on metal oxide materials for environmental protection. She has also worked on ceramic materials for

electronics and energy storage applications. She has authored and co-authored 13 research articles and has two accepted processes. She is a life member of BPS.

**Nazmul Islam Tanvir (August 2016 - Present)**

Office	Industrial Physics Division	Blood Group	B+
Job Title	Scientific Officer (SO)	Degree Obtained	M.Sc. (2015)
Contact	nazmul.tanvir88@gmail.com	Mobile	01912218428

Nazmul Islam Tanvir received his both B.Sc. and M.Sc. degree in Physics from the National University, Bangladesh. His research is mainly focused on Optics, Solid State Physics and Materials Science. He also worked as a Research Fellow in BCSIR (2015–2016). He has authored or coauthored 28 publications. He has two (02) accepted process.

**Md. Saidul Islam (November 2021 – Present)**

Office	Industrial Physics Division	Blood Group	O-
Job Title	Scientific Officer	Degree Obtained	M.Sc. (Thesis) (2017)
Contact	saidulislam0712@gmail.com	Mobile	01674921302

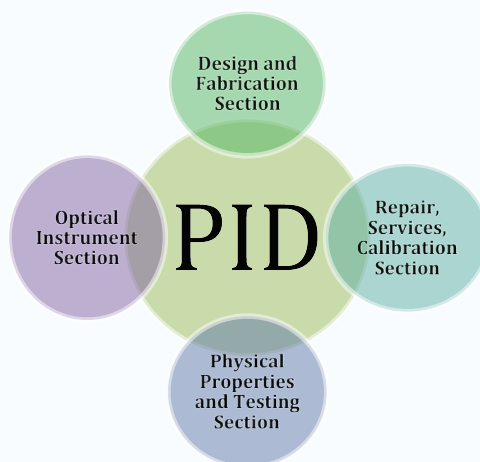
Md. Saidul Islam earned his both B.Sc. (Honours) and M.Sc. degree in Electrical & Electronic Engineering from University of Dhaka. His research is mainly focused on Electronic Device, Instrument Automation, Materials Science and Solid State Physics. He has authored and co-authored 5 publications.

## Physical Instrumentation Division



### The main works of PID are:

- Conducting research activities for the development of scientific/laboratory instruments using locally available raw materials
- Maintenance, repairing, servicing, and installation of scientific equipment and electronic instruments
- Conducting innovative activities in the field of information technology
- Provide computer training (software and hardware)



At present, two (02) Scientists/Engineers are working in this Division.

### R&D Project :

#### 01. Computational study of MAX Phases, perovskite compounds and agent based simulation for resource allocation

*Khaledun Nahar Babi (PL), Suravi Islam and Md. Sadequl Islam*

### Introduction :

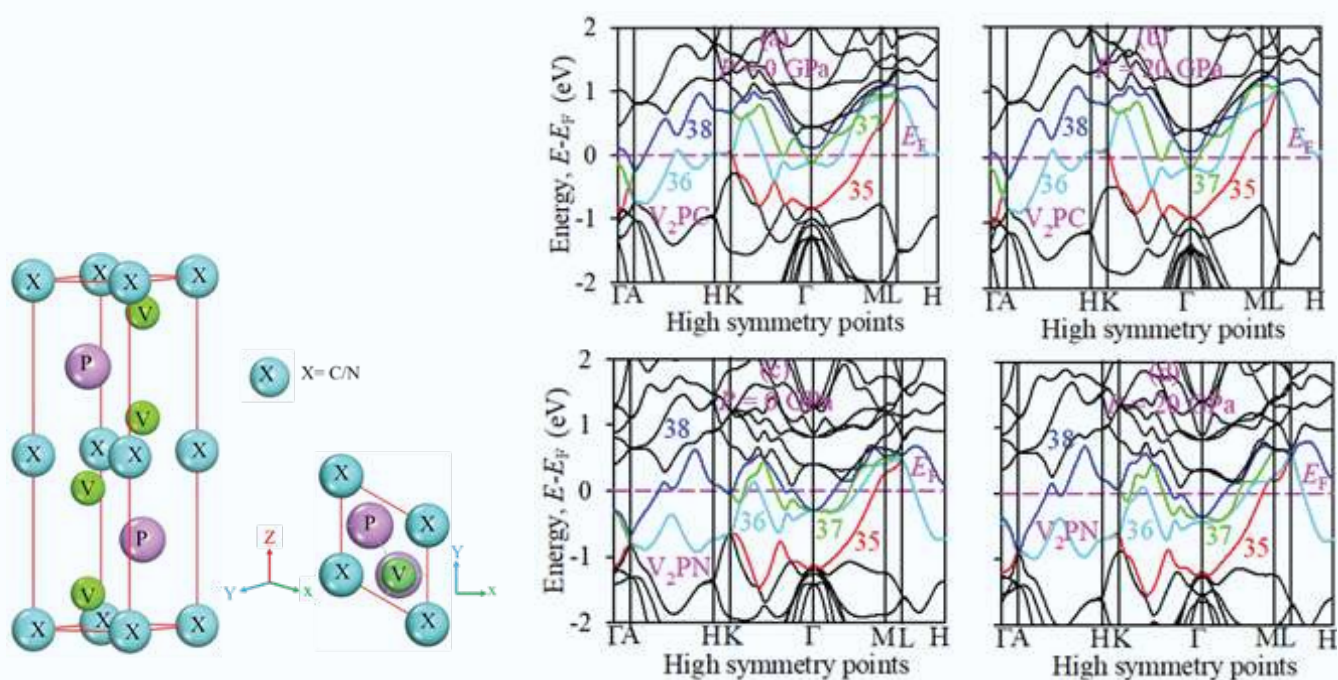
MAX phases, known for combining metallic and ceramic characteristics, are used in industries like energy storage and aerospace due to their excellent thermal and mechanical properties. Perovskite compounds are pivotal in fields like renewable energy, particularly for high-efficiency solar cells due to their exceptional optoelectronic properties. Alongside, Agent-Based Simulation (ABS) has emerged as an effective tool for optimizing resource allocation in complex systems. This research integrates these two areas by conducting a computational study of MAX phases and perovskite compounds, while developing an agent-based model for resource allocation, aiming to advance both material science and systems optimization.

## Objectives :

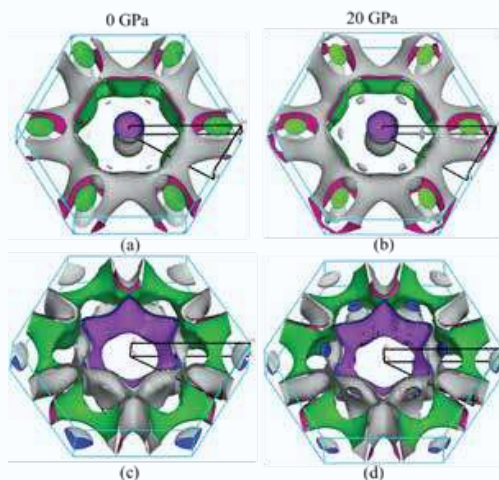
- To investigate the structural, electronic, and mechanical properties of V<sub>2</sub>PC and V<sub>2</sub>PN MAX phase compounds
- To investigate the structural, electronic, and mechanical properties of BaTiO<sub>3</sub>, KBeBr<sub>3</sub>, and RbBeBr<sub>3</sub> Perovskite compounds
- To design an agent-based model that optimizes resource allocation by simulating and evaluating distribution strategies in dynamic environments

## Progress :

- The structural, mechanical, electronic, optical, and vibrational properties of 211 MAX phases V<sub>2</sub>PC, V<sub>2</sub>PN, BaTiO<sub>3</sub>, KBeBr<sub>3</sub>, and RbBeBr<sub>3</sub> have been studied using first-principles density functional theory (DFT) with ultrasoft pseudopotentials. The results agree well with existing theoretical data, confirming the reliability of the calculations
- The agent-based model for optimized resource allocation has been successfully developed, enabling simulation and evaluation of distribution strategies under dynamic conditions
- One manuscript is ready for submission, and one manuscript is in progress



**Fig.** Electronic band structure of V<sub>2</sub>PX (X = C, N) along the high symmetry directions of the Brillouin zone at 0 and 20 GPa, respectively.



**Fig.** Fermi surfaces of (a, b) V<sub>2</sub>PC and (c, d) V<sub>2</sub>PN at 0 and 20 GPa respectively.

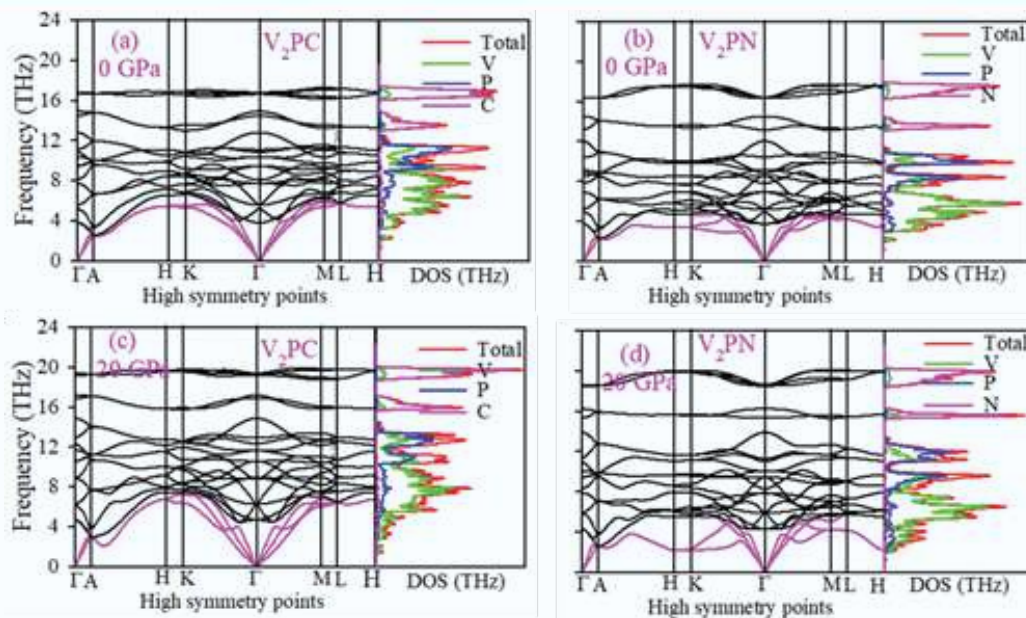


Fig. The phonon dispersion curve along with phonon density of states of (a, c) V2PC and (b, d) V2PN for 0 and 20 GPa respectively.

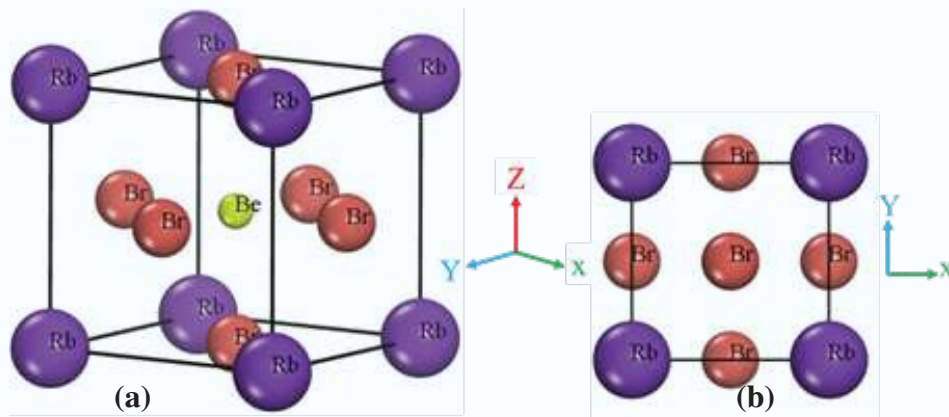


Fig. a) 3D crystal structure of RbBeBr3, (b) 2D view in the xy-plane.

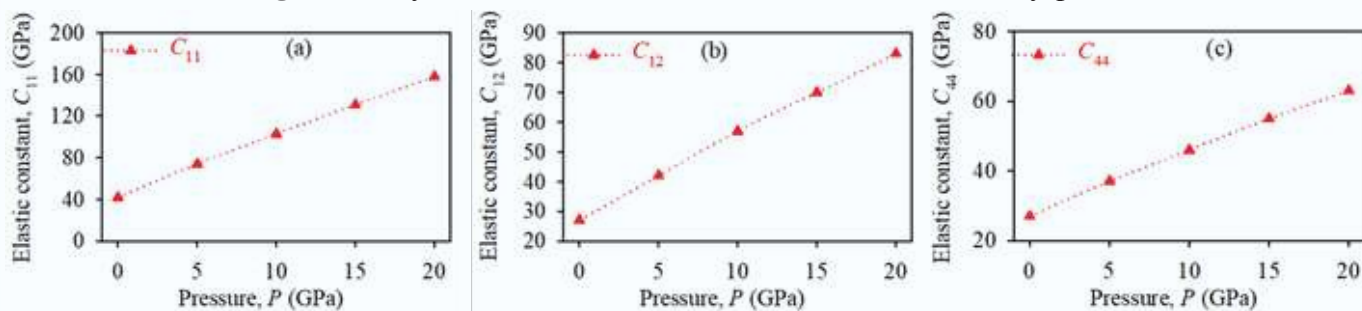
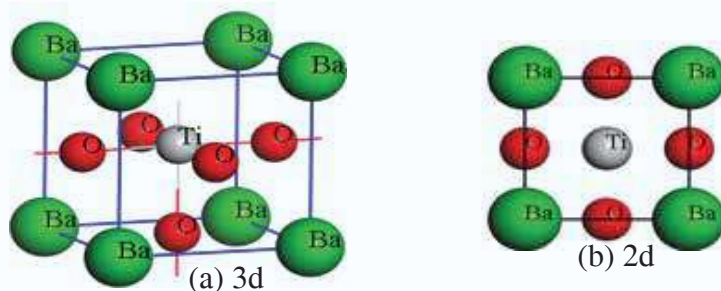


Fig. Single crystal elastic constants  $C_{ij}$  of RbBeBr3 as a function of pressure which satisfies the Born Criteria ( $0.33(C_{11} + 2C_{12} + P) > 0$ ;  $(C_{44} - P) > 0$ ;  $0.5(C_{11} - C_{12} - 2P) > 0$ )



## 02. Design and development of an IoT-based intelligent air pollution monitoring and prediction system

*Khaledun Nahar Babi (PL), Mohammad Moniruzzaman, Badhan Saha and Md. Sadequl Islam*

### Introduction:

Air pollution, driven by rapid urbanization and industrialization, poses severe risks to health and the environment. This research develops an IoT-based intelligent air pollution monitoring and prediction system using low-cost sensors, wireless communication, and machine learning. The system enables real-time detection and forecasting of key pollutants (CO<sub>2</sub>, CO, NO<sub>2</sub>, PM<sub>2.5</sub>, and PM<sub>10</sub> etc.), providing valuable insights for policymakers and supporting the development of sustainable cities.

### Objectives:

- To design and develop an IoT-based portable device for collecting and monitoring real-time air pollution data
- To implement machine learning technique for prediction of air pollution levels

### Work Progress:

- Prototype design is in process

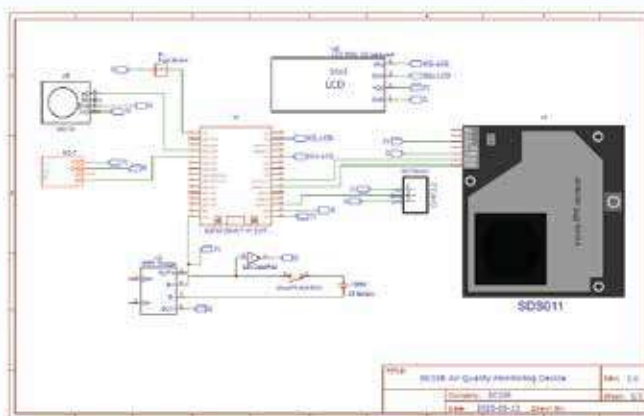


Fig: Schematic diagram of the Prototype

### Other Activities:

Repairing, Servicing, Maintenance, Calibration, and Installation of scientific/ laboratory equipment: During the period from 1st July, 2024 to 30th June, 2025, services were provided to 40 Laboratory/Scientific Instruments (such as: Computer CPU, Printer, and On-line UPS).

### Achievements and Activities:

### Published Paper:

Istiaq Ahmed, Md. Abul Kashem, Md. Sadequl Islam and Khaledun Nahar Babi, "Structural, mechanical and electronic properties of Zr<sub>2</sub>SeB MAX phase through DFT approach at ambient and elevated pressures", Bangladesh Journal of Scientific and Industrial Research, 2024, 59(3), 129-138.

### Scientists pursuing M.S./M.Phil/ PhD Courses at home or abroad:

1. Khaledun Nahar Babi, PSO, Physical Instrumentation Division, BCSIR Dhaka Laboratories, pursuing PhD at the Department of Computer Science and Engineering, Jahangirnagar University, Bangladesh.

### Guidance to research Work (PhD/M.Phil/ M.S/NCST & BCSIR Fellow):

Sl. No	Title of Research	Research Category	Name of the Student	Name of the Institution	Name of Supervisors
01.	MAX phases through DFT approach at ambient and elevated pressures	BCSIR Fellow (Dr. Abdullah Al-Muti Shorfuiddin memorial fellowship)	Istiaq Ahmed	University of Rajshahi	Khaledun Nahar Babi, PSO

## Participation in training / Seminar/ Symposium/ Workshop/ Conference:

### Training:

1. Khaledun Nahar Babi (PSO) participated in the training program on “জনপ্রশাসন মন্ত্রণালয় কর্তৃক আয়োজিত OMS বিষয়ক প্রশিক্ষণ ও বিদ্যমান অর্গানোগ্রামের উপাত্তভান্ডার তৈরিতে ০৫ (পাঁচ) দিনব্যাপী প্রশিক্ষক প্রশিক্ষণ (TOT)” held on 16-20 February, 2025 at BIAM Foundation (BIAM Bhaban), 63 New Eskaton Road, Dhaka, Bangladesh.
2. Md Sadequl Islam (M. Engr.) participated in the training program on “শুদ্ধাচার কর্ম-পরিকল্পনা বাস্তবায়ন” held on 18 May, 2025 at BCSIR Dhaka Laboratories, Bangladesh Council of Scientific and Industrial Research.

### Workshop:

1. Khaledun Nahar Babi (PSO) participated in the Workshop on 'সেবা সহজিকরণ' organized by Aspire to Innovate (a2i), 28-30 January, 2025 at BIAM Foundation (BIAM Bhaban), 63 New Eskaton Road, Dhaka, Bangladesh.

### Khaledun Nahar Babi (June 2006 – Present)



Office	Physical Instrumentation Division	Blood Group	O+
Job Title	Principal Scientific Officer	Degree Obtained	MSc (2012)
Contact	khaledunnahar@gmail.com	Mobile	01816218248

Khaledun Nahar Babi is pursuing a PhD at the Department of Computer Science and Engineering, Jahangirnagar University, Bangladesh. She has authored or coauthored 6 research articles in national and international Journal and 7 conference proceedings. She is a co-inventor of the 01 process. She is a life member of NITUB, BPS and an Associate member of Bangladesh Computer Society (BCS). Research interest: Artificial Intelligence (AI), Internet of Things (IoT), Embedded System Design. Skills and expertise: Programming in C/C++, Java, Python, and Flutter; Android Studio, LaTeX, MySQL, Oracle, HTML, CSS, Microsoft Project, Visio 2013, Proteus 7.10 & 8.3, ArcGIS etc.

### Md. Sadequl Islam (July 2002 – Present)



Office	Physical Instrumentation Division	Blood Group	A+
Job Title	Maintenance Engineer	Degree Obtained	B.Sc Engineering in (EEE) 1998, PGDSI 2006
Contact	sadeq@bcsir.gov.bd	Mobile	01996362048

Engr. Md Sadequl Islam earned his BSc (Hon) degree in Electrical & Electronics Engineering (EEE) from the Rajshahi University of Engineering and Technology (RUET). He obtained Post Graduate Diploma in Scientific Instrumentation (PGDSI) from ISI, University Grant Commission (UGC), Agargoan, Dhaka, Bangladesh. Field of interest: Electronic control system



Engineer and Technician are repairing Instruments



Digital Control Winding Machine



High Performance Computing System with VASP Software

## Pulp and Paper Research Division



### R&D Project :

#### 01. Pulp and paper production from different bamboo species grown in Chittagong hill tract forest

*Md. Mostafizur Rahman (PL); Mohammad Nashir Uddin, Md. Tushar Uddin, Md. Nur Alam Likhon and Sharmin Islam*

### Introduction :

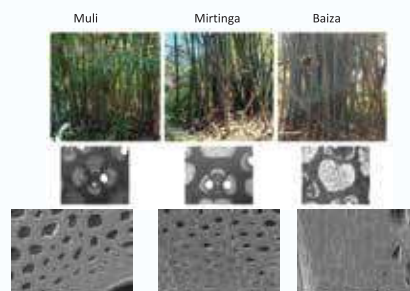
Consumption of paper in Bangladesh is increasing, but domestic pulp production stopped after the closure of Karnaphuli Paper Mills (KPM) in 2016. To reduce pulp imports, BCIC plans to revive KPM using bamboo, an abundant and fast-growing resource in the Chittagong Hill Tracts. Bamboo's fibre and chemical properties make it suitable for pulp production. This study investigates three bamboo species available in the Chittagong Hill Tracts (e.g., *Melocanna baccifera*, *Bambusa tulda*, *Bambusa balcooa*) to evaluate their morphological, chemical, pulping, and bleaching characteristics. The research aims to optimize pulping and bleaching conditions, analyze black liquor, and assess bamboo's potential for sustainable paper production in Bangladesh.

### Objectives :

- To investigate the most available bamboo species for producing paper-grade pulp
- To evaluate the pulp yield of forest bamboo species
- To investigate the papermaking properties of the bamboo species
- To study black liquor effluent

### Work Progress :

Anatomical and morphological analyses of the three bamboo species were carried out to determine their fiber dimensions, such as fiber length, width, lumen diameter, and cell wall thickness, which are crucial parameters for assessing their suitability for papermaking. The chemical composition of the bamboo samples—including cellulose, hemicellulose, lignin, extractives, and ash contents—was determined following standard TAPPI methods to evaluate their potential as raw materials for pulp production. To assess pulping performance, the bamboo samples were subjected to various kraft pulping conditions by varying temperature, time, and active alkali charge. The optimum pulping condition was identified at 170 °C, 2 h, and 18% active alkali. The pulp obtained under optimum conditions was further analyzed for its physical and mechanical properties, including tensile, burst, and tear indices, to evaluate its suitability for papermaking applications.



## 02. Production of epoxy resin from non-wood lignin

*Md. Nur Alam Likhon (PL), Mohammad Nashir Uddin, Md. Mostafizur Rahman, Md. Tushar Uddin and Sharmin Islam*

### Introduction :

Brief Discussion/ introduction of each Research and Development activities: Traditionally lignin has been viewed as a waste material or a low value by-product of pulping with its utilization predominantly limited to use as a fuel to fire the pulping boilers. Indeed, it has been estimated that only 1–2% of lignin is isolated from pulping liquors and used for special products (Lora and Glasser, 2002). The time is now ripe to change this view, industries are broadening their end user markets by producing lignin based advanced materials like polymers, resins, adhesives etc. However, as an agricultural country Bangladesh is also producing agricultural wastes/residues which are non-woods and those wastes are not going towards its valuable end uses. This is why for the first time lignin from non-woods has been submitted for the production of resin

### Objectives :

- Separation of non-wood lignin from black
- Production of epoxy resin from lignin
- Characterization of the epoxy resin

### Work Progress :

- Pulping of non-wood biomass was conducted with following conditions to get black liquor:
  - Alkali charge- 18%
  - M:L- 1:8
  - Temperature- 160 °C
  - Time: 2 hours
- Separation of lignin from black liquor
- Purification of lignin

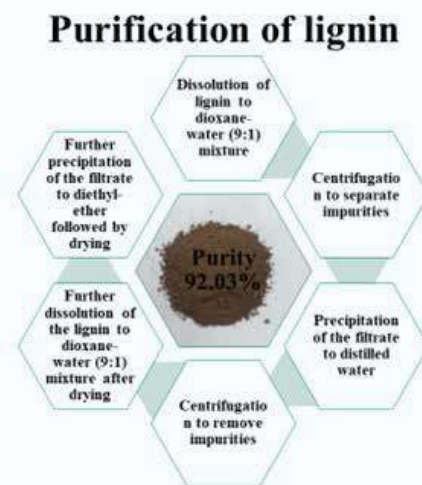
## Special Allocation Projects

## 03. Pulp And Paper Production from Different Bamboo Species Grown in the Chittagong Hill Tract

*Dr. Md. Mostafizur Rahman (PI) and Mohammad Nashir Uddin*

### Introduction :

The demand for paper in Bangladesh is increasing day by day; however, the country faces a severe shortage of raw materials for pulp production due to the absence of domestic pulp mills since the closure of Karnaphuli Paper Mills (KPM) in 2016. This challenge can be effectively mitigated by utilizing bamboo, an abundant and fast-growing renewable resource widely available in the Chittagong Hill Tracts. Bamboo possesses favorable fiber morphology and chemical composition, making it highly suitable for pulp and paper production.



## Objectives :

- To evaluate the pulp yield of forest bamboo species.
- To evaluate the papermaking properties of the bamboo species.

## Work progress :

- Anatomical and morphological analysis Conducted to determine the fiber characteristics (length, width, lumen diameter, and wall thickness) of the three bamboo species.
- Chemical composition of the bamboo samples were done according to standard TAPPI methods to determine cellulose, hemicellulose, lignin, extractives, and ash contents.
- Pulping performance was evaluated using the kraft pulping process under various conditions by varying temperature, time, and active alkali charge.
- Optimum pulping condition was found at 170 °C, 2 hours, and 18% active alkali, resulting in good delignification and acceptable pulp yield.
- Paper-making properties of the pulp produced under optimum conditions were tested for physical and mechanical properties to assess for papermaking.

## Achievements and Activities

### Published Paper:

1. Mohammad Nashir Uddin, Md Nur Alam Likhon, Md Mostafizur Rahman, and Md Sarwar Jahan. "Effect of fibre-quality parameters on pulp properties by using multiple linear regression and artificial neural network." *International Wood Products Journal* 15, no. 2-4 (2024): 91-99.
2. Md Nakib Hossen, M. Mostafizur Rahman, Taslima Ferdous, Jannatun Nayeem, and M. Sarwar Jahan. "Biobased nanocomposite coating of paper for packaging." *Nordic Pulp & Paper Research Journal* 39, no. 4 (2024): 655-665.
3. Anik, Niloy Roy Kerjee Baral, Nazia Afrin Jashi, Md Ismail Hossen Emon, Munmun Basak, Md Mostafizur Rahman, AFM Mustafizur Rahman et al. "Recovery of cellulose nanocrystal from mixed office wastepaper and the development of bio-based coating matrixes with enhanced water, gas, oil, and grease resistances for packaging." *RSC advances* 15, no. 17 (2025): 13188-13198.
4. M. Sarwar Jahan, and M. Mostafizur Rahman. "Organosolv Lignin: Extraction." In *Handbook of Lignin*, pp. 1-13. Singapore: Springer Nature Singapore, 2025.
5. Md Mostafizur Rahman, AKM Golam Sarwar Sarwar, Jannatun Nayeem, Md Eakramul Haque, and M. Sarwar Jahan. "Effect of sowing time on fibre yield and chemical composition of flax genotypes." *Bangladesh Journal of Scientific and Industrial Research* 60, no. 1 (2025): 45-52.
6. Md Abu Saeed, Shahidul Islam, Md Abdul Jalil, Shahin Hossain, Sanjay Belowar, Farjana Akter, Md Mahbubur Rahman Bhuiyan, and Md Mostafizur Rahman. "Sustainable Utilization of *Cyanodon dactylon* Biomass for Cellulose Derivatives and Biofilm Production." *Waste and Biomass Valorization* (2025): 1-16.
7. Md Nur Alam Likhon, Sharmin Islam, M. Mostafizur Rahman, Bo Jiang, Yangcan Jin, and M. Sarwar Jahan. "Molecular and spectroscopic characterization of technical lignin from *Trema orientalis* and *Trewia nudiflora* obtained from formic acid biorefinery." *Cellulose Chemistry and Technology* 59, no. 5-6 (2025): 579-587.
8. M. Nashir Uddin, Taslima Ferdous, Yangcan Jin, M. Mostafizur Rahman, and M. Sarwar Jahan. "Chemometric Model for Rapid Determination of Syringyl/Guaiacyl Ratio in Non-Wood by FT-NIR Spectroscopic Data." *Analytical Science Advances* 6, no. 1 (2025): e70005.
9. M. Mostafizur Rahman, Taslima Ferdous, Yangcan Jin, and M. Sarwar Jahan. "Hemicellulose as an additive in papermaking." *Nordic Pulp & Paper Research Journal* 40, no. 2 (2025): 357-364.
10. Sharmin Islam, M. Mostafizur Rahman, M. Nakib Hossen, M. Likhon, Nur Alam, Hasan Jameel, and M. Sarwar Jahan. "Conversion of paper-grade pulp from rice straw into dissolving pulp." *TAPPI JOURNAL* 24, no. 6 (2025).
11. Sharmin Islam M. Mostafizur Rahman, and M. Sarwar Jahan. "Kraft pulping of *Eucalyptus camaldulensis* planted in homestead forestry in Bangladesh." *Journal of the Indian Academy of Wood Science*, 2024, 1-8.
12. Md Abul Kalam, Salvin Mustakim, Mohammad Jellur Rahman, Md Tushar Uddin, Md Ashraf Alam & Mohammad Mahbubur Rahman. "Bio-degradable smart nanocomposite fiber from *Moringa oleifera* fiber reinforced with safely functionalized carbon nanotubes". *AIP Advances* 15, 015001 (2025)
13. Rabeya Akter, Md. Monarul Islam, Md. Wahidul Islam, Taslima Akter, Trisha Paul, Mohammad Mahbubur Rahman, Md. Tushar Uddin, Shofiur Rahman, Abdullah N. Alodhayb & Paris E. Georghiou. "Extraction procedure and theoretical studies of chitin from black soldier fly". *Journal of Polymer Research* 2025 32:48

### Scientists pursuing M.S/M.Phil/ PhD Courses in home or abroad

1. Razia Sultana Popy, SO, Pulp and Paper Research Division, Pursuing Ph.D. degree in Department of Paper Science and Engineering, University of Western Michigan, USA

### Industrial Tours / Dissemination

Name and Designation	Name of the Institut	Date
1. Dr. Md. Mostafizur Rahman, PSO	Eque Paper Mill, Saidpur, Nilphamari	18/01/2025
2. Dr. Md. Tushar Uddin, PSO		
3. Md. Nur alam Likhon, SO		

### Guidance to research Work (PhD/M.Phil. /M.S/NCST & BCSIR Fellow)

Sl. No	Title of Research	Research Category	Name of the Student	Name of the Institution	Name of Supervisors
01.	Functionalized Nanocellulose-Based Coating for Enhancing Paper Barrier and Mechanical Properties	MS Thesis (Student)	Most. Busrat Jahan Shila	Department of Chemistry Begum Rokeya University Rangpur	Dr. Md. Mostafizur Rahman

### Participation in training / Seminar/ Symposium/ Workshop/ Conference

1. Dr. Md. Tushar Uddin (PSO), conducted in training course as Trainer on “PPA -2006 and PPR-2008 in Scientific Procurement” held on 22 May, 2024 at BCSIR Laboratories Dhaka, Bangladesh Council of Scientific and Industrial Research (BCSIR).
2. Dr. Md. Tushar Uddin (PSO), conducted in training course as Trainer on “Understanding of ISO 17025:2017- for Laboratory Accreditation” held on 27 May, 2024 at BCSIR Laboratories Dhaka, Bangladesh Council of Scientific and Industrial Research (BCSIR).
3. Dr. Md. Tushar Uddin (PSO), participated in training program on Applications of Data Science in Industrial R&D: Chemometric Analysis with “CAMO The Unscrambler Design Expert” held on 24 May to 26 May 2024 at Computer Lab of BCSIR Central Library, Bangladesh Council of Scientific and Industrial Research (BCSIR).
4. Md. Nur Alam Likhon (SO), participated in five (05) days training program on “Nuclear Magnetic Resonance (NMR) Spectrometer” held on 08-12 December, 2024 at BCSIR Laboratories Dhaka, Bangladesh Council of Scientific and Industrial Research (BCSIR)
5. Sharmin Islam (RC), participated in instrumental training program on HPLC held on 16-20 March, 2025 at Fiber and polymer research division, BCSIR Laboratories Dhaka, Bangladesh Council of Scientific and Industrial Research (BCSIR)
6. Sharmin Islam (RC), participated in instrumental training program on FT-NMR-NIR-Spectroscopy held on 01-05 December, 2024 at Fiber and polymer research division, BCSIR Laboratories Dhaka, Bangladesh Council of Scientific and Industrial Research (BCSIR)

### Award

Name of the Division	Routine type	Research type	Total
Pulp and Paper Research Division	888	45	933

### Pictures of PPRD



Paper Bursting strength, Smoothness, Tear and Tensile strength tester



Fiber Quality Analyzer



HPLC for sugar analysis

## Short Biography of PPRD Scientists

### Dr. Mohammad Nashir Uddin (October 2001 - Present)



Office	Pulp & Paper Research Division	Blood Group	O+
Job Title	Principal Scientific Officer	Degree Obtained	PhD (2016)
Contact	nashirbcsir@gmail.com	Mobile	01912068516

Dr. Mohammad Nashir Uddin achieved his BSc and MSc degree in Statistics from University of Dhaka. Next, he obtained MS degree in Population Sciences from University of Dhaka with UNFPA scholarship. Later he achieved PhD degree in Chemometrics from Jahangirnagar University. His researches are mainly in the area of Chemometric modeling for quantification and classification purpose, Experimental Design, Statistical Analysis of both quantitative and qualitative data. He has authored or coauthored 55 publications and has supervised more than 20 students for accomplishing their MSc thesis.

### Dr. Md. Tushar Uddin (June 2006 - Present)



Office	Pulp & Paper Research Division	Blood Group	O+
Job Title	Principal Scientific Officer	Degree Obtained	PhD (2014)
Contact	tusarri@yahoo.com	Mobile	01712-127119

Dr. Md. Tushar Uddin obtained his BSc (Hon's) degree in 2003 and MSc degree in 2005 from the Department of Applied Chemistry & Chemical Technology, Rajshahi University. Later he obtained his PhD degree from the Chemistry Department of Jahangirnagar University in 2014. He joined BCSIR as Scientific Officer on 15 June 2006. He was promoted to Senior Scientific Officer on 07 June 2012 and Principal Scientific Officer on 23 October 2024. Currently he is working in Pulp & Paper Research Division, BCSIR Laboratories Dhaka. He has authored & co-authored 25 publications and 05 accepted processes.

### Dr. Md. Mostafizur Rahman (November 2006 - Present)



Office	Pulp & Paper Research Division	Blood Group	A+
Job Title	Senior Scientific Officer	Degree Obtained	PhD (2019)
Contact	mmbcsir@yahoo.com	Mobile	01737683668

Dr. Md. Mostafizur Rahman completed his B.Sc. and M.Sc. (Chemistry) from the University of Rajshahi. He later obtained his Ph.D. in Pulp and Paper Science from the University of Pardubice, Czech Republic, with a research focus on brown stock pulp washing. Dr. Rahman's research interests include pulping, brown stock pulp washing, biorefinery, and biomaterials. He has published over 70 research articles in peer-reviewed journals as a first author, corresponding author, and coauthor. In addition, he has supervised 16 M.Sc. students for their thesis work. Dr. Rahman is a member of several professional organizations, including the International Society of Wood Science and Technology (SWST) (Membership Invoice No. 004672), the Bangladesh Chemical Society, the Bangladesh Association for the Advancement of Science (BAAS), the Rajshahi University Chemistry Alumni Association (RUCAA), and the BCSIR Scientists' Association.

**Razia Sultana Popy (December 2016 - Present)**

Office	Pulp & Paper Research Division	Blood Group	A+
Job Title	Scientific Officer	Degree Obtained	MSc (2014)
Contact	razia_jnu@yahoo.com	Mobile	01727-169725

Razia Sultana Popy completed her B.Sc (Hons.) and M.Sc in Chemistry from Jagannath University. She is working in the field of non-wood pulping of agricultural wastes in biorefinery initiative and utilization of dissolved biomass. She has authored and coauthored thirteen (13) publications.

**Md. Nur Alam Likhon (November 2021 - Present)**

Office	Pulp & Paper Research Division	Blood Group	O+
Job Title	Scientific Officer	Degree Obtained	MS (2018)
Contact	likhon.bcsir@gmail.com	Mobile	01750650950

Md. Nur Alam Likhon achieved both his BS Honor's and MS (Organic Chemistry) degree in Chemistry from University of Dhaka. Recently he is working as a Scientific Officer in Pulp and Paper Research Division under BCSIR Laboratories, Dhaka. He has done his MS thesis on Lignin modification. His research is mainly focused on pulping and bleaching of biomass, wood chemistry, biorefinery, Lignocellulosic modification. He has published seven (07) articles with authored one (1) publication.

**Sharmin Islam (February 2023 - Present)**

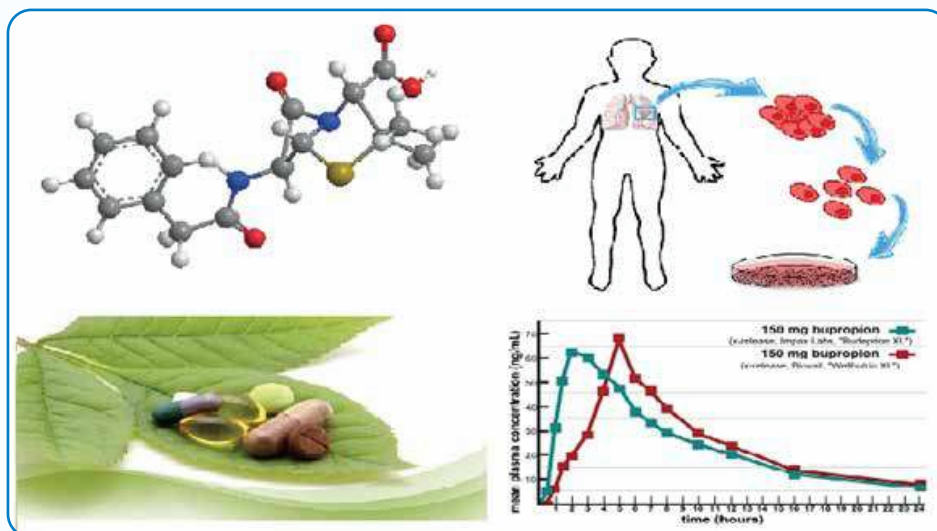
Office	Pulp & Paper Research Division	Blood Group	B+
Job Title	Research Chemist	Degree Obtained	MS (2020)
Contact	sharminsweety292@gmail.com	Mobile	01851995279

Sharmin Islam achieved both her BS Honours and MS (Inorganic Chemistry) degree in Chemistry from University of Dhaka. Recently she is working as a Research Chemist in Pulp and Paper Research Division under BCSIR Laboratories, Dhaka. She has done her MS thesis on Cellulose based hydrogel. Her research is mainly focused on Lignocellulosic chemistry. She has 4 published papers.

## Scientists of PSRD



## Pharmaceutical Sciences Research Division (PSRD)



The Bangladeshi pharmaceutical industry makes significant economic contributions by satisfying 98% of domestic drug demand, with only about 2.0% of essential high-tech medicines (such as vaccines, anticancer drugs, blood products, and biosimilars) being imported. They are exporting to over 150 countries, contributing to the national exchequer and providing the largest white-collar employment sector. Driven by the 1982 Drug Control Ordinance and a patent waiver, the sector has seen substantial growth, with its market size reaching approximately \$3.5 billion in 2022 and projected to exceed \$6 billion by 2025, a remarkable growth rate.

In spite of the developments, it still have foreign dependency for import of Active Pharmaceutical Ingredients (APIs) and excipients, lack of Bioequivalence facility and advance research facilities for drug development etc. Bioequivalence studies in Bangladesh are increasingly important for ensuring the quality, safety, and efficacy of generic medicines. The DGDA mandates BE studies for specific drugs, and local CROs are growing in capacity. Still, strengthening regulatory oversight, laboratory standards, and international accreditation is key to making Bangladesh a stronger hub for global generic drug approval. Pharmaceutical Sciences Research Division is working to overcome the aforementioned problems by establishing modern state-of-the-art research facilities on Pharmaceutical Sciences and bioequivalence studies and thus help to support pharmaceutical industry of Bangladesh.

Scientists of Pharmaceutical Sciences Research Division are working at different field of Pharmaceutical sciences with a mission to carry out fundametal and applied Research and Development (R&D) activities in different stages of drug discovery research, collaborate with academia and other research organizations in home and abroad for translational research for the development of new and generic drugs to achieve the vision of becoming a Centre of Excellence in Pharmaceutical Research, fostering innovation in both new and generic drug development.

**Pharmaceutical Sciences Research Division (PSRD) at a glance:**

- Number of Scientists: 16
- Total R & Ds: 12; Ongoing (12), Completed (00)
- Special Allocation Project: 00
- Analytical Services: 864 samples (264 individuals)



Fig.: Research sections of Pharmaceutical Sciences Research Division (PSRD)

## 01. Drug discovery study on potential medicinal plants of Bangladesh and their associated endophytic fungi

*Md. Hossain Sohrab (PL), Satyajit Roy Rony, Md. Najem Uddin, Md. Ariful Haq, Md. Sakhawat Hossain and Mamtaz Sultana*

### Introduction:

The development of resistance in infectious microorganisms towards existing drugs is increasing and new threats such as AIDS, Ebola, Bird Flu and SARS are routinely invading the human population, necessitates the development of new drugs. Besides, an increase in cellular resistance to chemotherapeutic agents urges the discovery of new cancer therapeutic agents. A current area of much interest is the novelty of compounds being isolated from endophytic microbes especially from fungal endophytes. Many of these compounds are bioactive such as antifungal, antibacterial, anticancer, anti-inflammatory, antiviral, antioxidant, nematocidal/insecticidal, immunosuppressant etc. Medicinal plants and their associated endophytic fungi can be an ideal target for discovery of potential bioactive compounds or lead structures for new drugs. It is worthy of note that some plants generating bioactive natural products have associated endophytes that produce the same or similar natural products.

### Objectives :

- To work with endophytic fungal extracts and screen them for anticancer and antimicrobial activities
- To perform a batch culture of novel strains of endophytic fungi and obtain extracts from the culture media and mycelia
- To partially purify crude extracts before performing the bioassays, which will limit matrix interference in the bioassays and enhance purification when activity is detected
- To employ anticancer and antimicrobial assays to select extracts for further fractionation. Purification of active metabolites will be guided by assay data
- To complete the total structure elucidation of the active compounds using spectroscopic techniques including 2D-NMR and HRMS

### Working Progress:

- Plant samples of *Catharanthus roseus* and *Dillenia indica* were collected
- Six endophytic fungi were isolated from the leaves and stems of *Catharanthus roseus*, and seven from the bark and leaves of *Dillenia indica*
- The isolated fungi from both plant species have undergone successful extraction
- Bioactivity assays of the fungal extracts were conducted
- Isolation of bioactive compounds will be carried out using chromatographic techniques

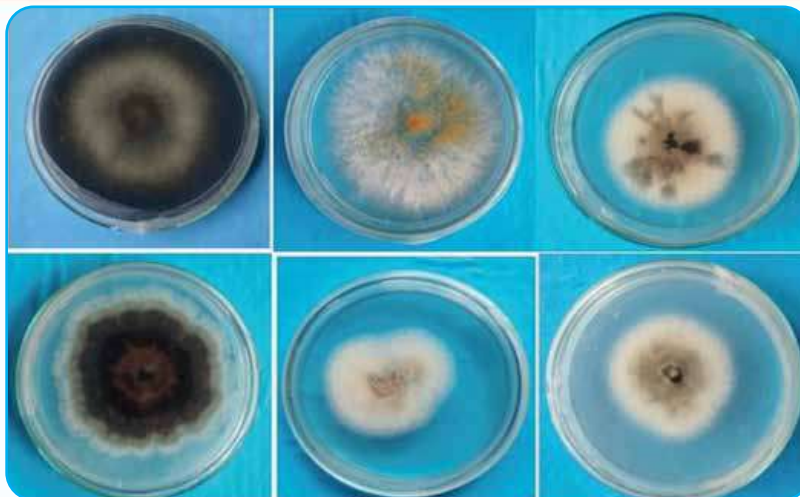


Fig.: Endophytic fungi isolated and purified from the stem and Leaves of *Catharanthus roseus*

## 02. Formulation of hemorrhoid healing herbal supplements

A D A Shahinuzzaman (PL), Saima Mollick, Md. Najem Uddin, Md. Zakaria Al Noman and Mamtaz Sultana

### Introduction :

The word hemorrhoid is originated from Greek “haema (blood)” and “rhoos (flow)”. The symptoms of the disease characterize vascular bleeding from the anus. This is further manifested by the swelling of veins in or around the rectum. The symptoms may also include pain and itching in the anus. The treatment plan of hemorrhoids includes both medication and life style modification amd increased intake of fiber and water and dietary supplements. Medicine includes flavonoids e.g. Diosmin, hesperidin in combination with dietary fiber and lactulose solution. But often they fail to generate adequate benefit and patient needs to go through surgical intervention.

### Objectives :

- Conduct proteomics and metabolomics analysis of mammalian cell line, e.g. RAW macrophage with treatment of existing patented drugs Vs existing herbal medicine Vs selected plant extracts
- Identify candidate extracts that maybe helpful in reducing hemorrhoids
- Generate Rabbit model for hemorrhoids
- Treat Rabbit hemorrhoids model with candidate extract and note improvement
- Develop herbal formulation

### Work Progress :

- Different plants e.g. *Abroma augustum*, *Ocimum tenuiflorum*, *Azadirachta indica* and different mushrooms e.g. Oyster Mushroom (*Pleurotus ostreatus*), HK Variant Oyster Mushroom (*Pleurotus florida*), King Oyster Mushroom (*Pleurotus eryngii*), Pink Oyster Mushroom (*Pleurotus djamor*), were collected, dried crushed and organic extracts were prepared, through solvent treatment
- Initial screenings of crude extracts are being validated through CAM Assay, which will be in next stage further validated in RAW macrophage cell line.



Fig.: Disks containing crude extracts are incubated in fertilized egg for screening of anti-inflammatory response.

### 03. Method Development for quantification of Naproxen, Pantoprazole and Atorvasatin using a low volume of biological matrix by LC-MS/MS.

*Fatema Moni (PL), Saima Mollick, Md. Najem Uddin and Mst. Maya Khatun*

#### Introduction:

Generic drugs must demonstrate bioequivalence to their brand-name counterparts to gain approval from regulatory authorities such as the FDA, EMA, and others. Bioanalytical methods are essential for accurately measuring drug concentrations in biological matrices (e.g., blood, plasma, urine) to establish pharmacokinetic profiles and confirm bioequivalence. Bioanalytical methods and techniques are continually advancing through technological developments, constantly undergoing changes and enhancements, and often represent the forefront of technology. The present study is to develop and validate a new, simple, accurate, reliable and accurate method to determine few common generic drugs marketed in Bangladesh into small volume of blood samples (e.g. Naproxen, Pantoprazole, Atorvastatin etc.) which will facilitate Bioavailability and Bioequivalence study as well as Pharmacokinetic study.

#### Objectives :

- To develop simple, sensitive method for quantification of Naproxen, Pantoprazole and Atorvastatin in small volume of biological matrix
- Validation of the developed bioanalytical method

#### Work Progress :

- An analytical method for quantification of Pantoprazole in serum samples was developed to quantify by LC-MS/MS using Losartan Potassium as Internal Standard
- Study on alteration of Pantoprazole Pharmacokinetics with co-administration of Nigella Oil on animal model was completed. Quantification of pantoprazole in serum samples is in progress

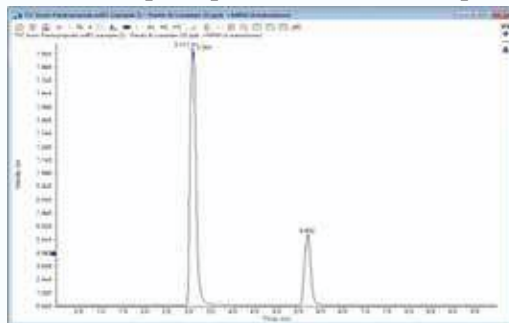


Fig.: Chromatogram of Pantoprazole (RT 3.00 min) along with Internal Standard

### 04. Morpho-molecular identification and biochemical profiling of endophytic fungi isolated from heliotropium indicum

*Shammi Akhter (PL), Md. Hossain Sohrab, Satyajit Roy Rony, Mamtaz Sultana, Md. Saiful Islam and Mst. Maya Khatun*

#### Introduction:

The growing problem of drug resistance, particularly in the Indian subcontinent, threatens global health by undermining treatments for major infectious diseases like respiratory infections, HIV/AIDS, diarrheal diseases, tuberculosis, and malaria. Resistance to first-line drugs forces reliance on more expensive and less accessible second and third-line treatments, which are also at risk of becoming ineffective. Addressing this requires a multifaceted approach: promoting the rational use of existing drugs through antimicrobial stewardship and enhanced surveillance; developing new drug candidates from natural sources, synthetic compounds, and repurposed medications; leveraging advanced research technologies such as genomics, AI, and nanotechnology; and strengthening global collaboration through international partnerships, funding, and public education. Many plant-derived products have been used as preventive medications for treating illnesses in both humans and animals since ancient times, due to their potential pharmacological activities. Nowadays, plant-based treatments are becoming increasingly popular among both patients and physicians due to their fewer side effects compared to modern allopathic medicines.

### Objectives :

- Isolation of endophytic fungi from *Heliotropium indicum*
- Morphological and molecular identification of the isolated endophytic fungi
- Small scale followed by large scale cultivation for chemical screening and bioassay
- Isolation, characterization and structure elucidation of active secondary metabolites
- Bioassay of the isolated metabolites to identify lead compound of future drugs

### Work Progress :

- Plant sample collection of *Heliotropium indicum* has been carried out
- Isolation of 5 endophytic fungi (four from bark and one from leaf) has been done
- Morphological and Microscopic identification of three fungi has been completed
- Extraction of isolated fungi is ongoing
- Bioactivity assay of fungal extracts will be carried out later. Isolation of bioactive compounds will be carried out using chromatographic techniques

## 05. Assessment of antibiotic susceptibility pattern of pathogens responsible for common infectious diseases

*Saima Mollick (PL), Satyajit Roy Rony, A.D.A. Shahinuzzaman, Fatema Moni, Mamtaz Sultana and Md. Hossain Sohrab*

### Introduction:

Antimicrobial Resistance (AMR) has become a global health concern, threatening our ability to combat a wide range of common infectious diseases such as pneumonia, urinary tract infections, and tuberculosis, as well as more serious conditions like bloodstream infections. According to the World Health Organization (WHO), mutations in microorganisms resulting in AMR, which consequently render medicines ineffective and infections persist in the body, increasing the risk of spread to others. Effective antimicrobial drugs are essential for treating infections and preventing complications. Isolating, identifying, and characterizing pathogens responsible for infections are critical steps in understanding and combating these diseases. In addition, assessing the antibiotic susceptibility patterns against antimicrobial agents is vital. This assessment helps determine the effectiveness of current drugs and guides the development of new ones. This will help target resistant bacteria and other pathogens effectively, ensuring better health outcomes and mitigating the impact of AMR on global health and economies

### Objectives :

- Prevalence and distribution of pathogen responsible for commonly infectious diseases
- Isolation, identification and Characterization of pathogen
- Assessment of antibiotic susceptibility pattern against antimicrobial agents
- Exploration of potential lead effective against the isolated resistant pathogens

### Work Progress :

- Fifty eight urine sample have been collected from clinically suspected urinary tract infection (UTI) patients
- Four different types of bacteria have been isolated and identified from urine sample
- Distribution of the prevalence of major pathogens causing UTI among patients by age and sex have been done

## 06. Analysis of heavy metal content and drug adulterants in commonly used topical products available in Bangladesh

*Md. Ariful Haq (PL), Md. Hossain Sohrab, Satyajit Roy Rony, Fatema Moni, Md. Najem Uddin, Kutub Uddin Ahamed and Bakul Akter*

### Introduction :

The application of different topical products for personal care is as old as human civilization. In the manufacturing of coloured topical products, mineral pigments are commonly used, which leads to the contamination of heavy

metals (HMs) such as Cu, Ni, Co, Pb, Cr, Cd and other elements. A topical product is said to be adulterated when it contains heavy metals such as mercury or substances listed as Scheduled Poisons such as hydroquinone, tretinoin, antibiotics or steroids. Adulterants are added to a topical product to show that it is effective for its intended purpose. Heavy metals are toxic compounds that accumulate in the body, causing various ailments such as cancer, hair loss, lung damage, reproductive issues, and developmental problems. So, it is important to conduct a comprehensive risk assessment by using AAS and ICP-MS. Analysis of adulterants like hydroquinone, salicylic acid, arbutin and corticosteroids and prohibited ingredients like trimethoprim, terbinafine and naphazoline etc in topical products can be done using chromatographic techniques (HPLC, GCMS and LCMS etc).

### Objectives :

- Quantification of heavy metal (Pb, Cd, Cr, Co, As, Hg, Ni, Cu, Zn, V, Mn) contents in commonly used topical products available in Bangladesh
- Analysis of drug adulterant or prohibited ingredients (eg. Hydroquinone and steroids) in these topical products
- To appraise health risks (eg. Carcinogenic, non-carcinogenic etc.) associated with exposure to heavy metals and drug adulterants present in topical products

### Work Progress :

- Literature review and market survey has been completed
- Sample collection is completed (no. of collected samples: 99)
- Sample preparation technique for heavy metal analysis is optimized
- Sample preparation technique optimization for adulterant analysis is ongoing
- Heavy metal analysis of prepared samples by ICPMS is ongoing

## 07. Dengue seroprevalence and the association of infecting dengue virus serotypes with clinical manifestation

*Mamta Sultana (PL), Md. Hossain Sohrab, Md Monirul Islam, Satyajit Roy Rony, A.D.A. shahinuzzaman, Shammi Akhter and Kutub Uddin Ahamed*

### Introduction :

Dengue, a mosquito-borne viral disease in tropical and subtropical countries, is caused by structurally similar but antigenically distinct four dengue virus serotypes (DENV1~4). It is a global public health burden affecting millions of people each year and over 40% of world populations are at risk of dengue. Any DENV serotype infection can produce full spectrum of illnesses and severity, ranging from non-specific febrile syndrome, flu-like fever and classical DF to DHF and DSS. Moreover, much details on infecting DENV serotypes and its association with clinical dengue manifestation in Bangladesh is yet to be available. Overall, while there is evidence to suggest that dengue virus serotypes may influence disease severity, the relationship is multifactorial and influenced by various factors including viral genetics, host immunity, and environmental factors. Therefore, in this study we attempt to explore DENV seroprevalence along with DENV serotype-specific clinical manifestations of dengue infection in Dhaka, Bangladesh.

### Objectives :

- To investigate DENV sero-prevalence (DENV serotyping) in the current dengue outbreak in Dhaka, Bangladesh.
- To carry out clinical dengue manifestation. (clinical investigation of the dengue disease)
- To assess the correlation between infecting DENV serotypes (single and concurrent multiple DENV) and the dengue disease severity
- To explore the natural anti-dengue immune responses following DENV infection

### Work Progress :

- A total of 120 blood samples have been collected from confirmed and suspected dengue patients across multiple diagnostic centers within the Dhaka Division, ensuring a representative distribution of clinical cases
- Serum separation was performed promptly following sample collection, adhering to standardized centrifugation protocols to preserve sample integrity

- Primer design has been successfully completed using target-specific sequences, optimized for downstream molecular analyses
- RNA extraction is currently ongoing, utilizing validated protocols to ensure high-quality and intact viral RNA
- Comprehensive assessment of clinical parameters is underway, including the evaluation of hematological, biochemical, and symptomatic profiles to correlate with molecular findings

## 08. Green Synthesis of iron oxide nanoparticle for enhanced bioactivity exploration and environmental pollution remediation

*Asma Shafiq Shathi (PL), Md. Hossain Sohrab, Satyajit Roy Rony, Shammi Akhter and Mst Maya Khatun*

### Introduction :

The green synthesis of iron nanoparticles has gained prominence due to its dependable, sustainable, and eco-friendly methods of nanoparticle production, along with the easy accessibility of plant materials and their pharmacological benefits. These materials are non-toxic, highly dispersible, and suitable for targeted drug delivery. Green synthesized iron nanoparticles have been investigated for a wide range of biotechnological applications, displaying antimicrobial and anticancer properties. Additionally, these nanoparticles play a crucial role in the remediation of various environmental pollutants, essential for maintaining ecological balance. Further, to render them suitable for catalytic applications, several protection strategies such as surfactant or polymer, silica and carbon coating of magnetic nanoparticles or embedding them in a matrix/support have been reported in the literature. The methods of synthesizing as well as their crystallinity, size, shape and quality, influence their behavior significantly.

### Objectives :

- Green synthesis of iron-based nanomaterial from the medicinal plant
- Surface modification and characterization of prepared nanomaterials
- Bioactivity exploration of synthesized nanomaterial
- Environmental pollution remediation of nanoparticle

### Work Progress :

- Plant material has been collected from Sylhet, dried, pulverized, and extracted to obtain the bioactive fraction
- Preliminary investigations have been carried out, including GC-MS profiling, antioxidant evaluation, and quantification of phenolic and flavonoid contents
- The synthesis process has been optimized by adjusting experimental parameters to enhance yield and regulate particle size
- Characterization has been undertaken using spectroscopic, crystallographic, microscopic, and surface charge analyses to establish structural and stability features
- Further studies have been initiated to evaluate the bioactivity and environmental remediation potential of the synthesized nanoparticles

## 09. Metabolomic profiling of three medicinal plants using an integrated approach and isolation of bioactive compounds

*Md. Saiful Islam (PL), Md. Hossain Sohrab, Satyajit Roy Rony, ADA shahinuzzaman, Md. Najem Uddin and Md. Sakhawat Hossain*

### Introduction :

Phytochemical research is one of the most successful sources of discovering potential new chemical entities (NCEs) all over the world because a large number of secondary metabolites or biochemical constituents have been profoundly recovered from various medicinal plants. Based on the literature survey, we have found three medicinal plants that have numerous medicinal values but have not been enough explored. Therefore, the objective of the present research was to perform an extensive metabolomic profiling study using GC-MS/MS, LC-MS/MS and NMR techniques to gain a broader insight into the chemical composition. From these metabolomic data, we will be prompted to isolate the target bioactive compounds and perform different pharmacological activities.

**Objectives :**

- To gain a broader insight into the chemical composition by using integrated metabolomic profiling techniques
- To isolate bioactive compounds and characterize them using spectroscopic techniques, including 1D, 2D-NMR and HRMS
- To investigate the therapeutic effect of these compounds

**Work Progress :**

- Sample collection, extract preparation and partitioning were done for three plants
- Metabolomic profiling through GC-MS/MS was done
- Two (02) molecules have been isolated and identified

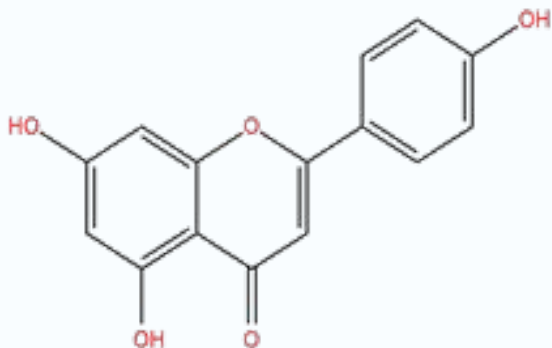


Fig.1: Apigenin

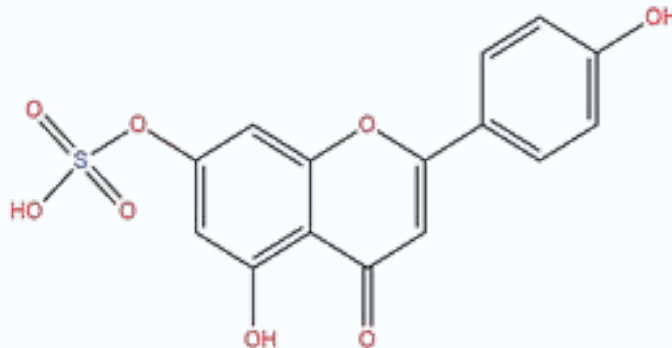


Fig. 2: Apigenin 7-sulfate

**10. Method development and validation of two international non-proprietary names (INN) drug**

*Mst. Maya khatun (PL), Md. Hossain Sohrab, Fatema Moni, Asma Shafiq Shathi and Saima Mollick*

**Introduction :**

Method development is the process of selecting an accurate assay procedure to determine the composition of a formulation. Method validation is the process of proving that an analytical method is appropriate for its mint use. Method validation parameters are accuracy, precision, linearity, specificity, limit of detection, limit of quantification, ruggedness, robustness and system suitability. Bioanalytical methods provide the data necessary to confirm that the generic drug has the same bioavailability and produces the same clinical outcomes.

Linagliptin is a new dipeptidyl peptidase-4 (DPP-4) inhibitor, this enzyme is responsible for the downgrade of the incretin hormones glucagon-like peptide-1 (GLP-1). This action increases the insulin level in the blood and the level of glucagon will be decreased. Cilnidipine is a slow-acting Ca<sup>2+</sup> channel blocker, antihypertensive, dual blocker of L-type voltage-gated Ca<sup>2+</sup> channels in vascular smooth muscle and N-type Ca<sup>2+</sup> channels in sympathetic nerve terminals that supply blood vessels. Objective of project is to develop a simple, accurate, precise and reliable gradient analytical and bioanalytical method for Linagliptin & Cilnidipine which will facilitate Bioavailability and Bioequivalence field.

**Objectives :**

- To develop simple, accurate, precise analytical method and bioanalytical method for two drugs (e.g. Linagliptin and Cilnidipine) in a small volume of biological matrix
- Validation of the developed analytical and bioanalytical method

**Work Progress :**

- Method development and optimization have been performed
- Method validation parameters such as Linearity, Accuracy, Precision, System suitability, Specificity for Linagliptin have been evaluated
- Further studies have been initiated on the method development and validation of Cilnidipine

## 11. Analysis of trace elements and heavy metal contamination present in herbal nutraceuticals marketed in Bangladesh

*Kutub Uddin Ahamed (PL), Md. Hossain Sohrab, Satyajit Roy Rony, Md. Ariful Haq, Md. Sakhawat Hossain and Bakul Akter*

### Introduction :

Herbal nutraceuticals, derived from plants and their parts, have long been used for promoting health and treating ailments, particularly in traditional Indian and Chinese medicine. Today, this field has evolved into a specialized scientific industry supported by research and advanced technology. The global nutraceutical market was valued at \$383 billion and is projected to exceed \$561 billion, with rapid growth in the world. Despite their benefits, challenges include inconsistent study outcomes, lack of standardization, and safety concerns. Heavy metal contamination from cultivation, processing, or therapeutic use poses serious health risks such as cancer, hypertension, and immune dysfunction. Therefore, comprehensive risk assessment using highly sensitive techniques like inductively coupled plasma mass spectrometry (ICP-MS) is essential.

### Objectives :

- Quantification of trace elements & heavy metal contents accurately in herbal nutraceuticals
- Carcinogenic, non-carcinogenic, and mutagenic health risks assessment of heavy metals exposure from herbal nutraceuticals in Bangladesh
- Assist in ensuring quality and safety of herbal nutraceuticals as well as protecting public health from heavy metals contamination

### Work Progress :

- A comprehensive literature review and market survey have been completed
- Collection of representative samples has been successfully carried out
- The sample preparation technique for heavy metal analysis has been standardized and optimized
- Heavy metal analysis of multiple samples is currently in progress using ICP-MS

## 11. Quantification and Toxicity Assessment of Heavy Metal Contamination in Traditional Medicine of Bangladesh

*Bakul Akter (PL), Md. Hossain Sohrab, Satyajit Roy Rony, Md. Ariful Haq and Kutub Uddin Ahamed*

### Introduction :

Traditional medicine (TM) is the oldest form of health care, historically used worldwide for preventing and treating illnesses. It has contributed to the discovery of lead compounds, drug candidates, and insights into pharmacological properties. Currently, about 74% of the global population uses TM products, including herbal and nutritional supplements. The medicinal plant market, valued at \$14 billion, is projected to reach \$5 trillion by 2050. However, increasing cases of heavy metal contamination during cultivation, processing, or intentional addition raise serious health concerns, including cancer, immune dysfunction, and reproductive damage. To ensure safety, comprehensive risk assessment using inductively coupled plasma mass spectrometry (ICP-MS), with its high sensitivity and accuracy, is essential for detecting and quantifying toxic elements in TM products.

### Objectives :

- Quantification of toxic heavy metal contents in traditional medicines
- Comprehensive assessment of public health risk related with heavy metal contamination
- Assist in exploring the solution to overcome the difficulties related with heavy metal

### Work Progress :

- A comprehensive literature review has been completed
- A set of representative samples has been successfully carried out
- The sample preparation technique for heavy metal analysis has been optimized
- The Heavy metal content of multiple samples is ongoing through ICP-MS

## Achievements and Activities:

## Published Paper :

1. Afroz F., Moni F., Sharmin S., Mollick S., Rony S. R., Masum S. M. & Sohrab M. H. (2025). Development and validation of simple and convenient UV spectrophotometric methods of trimetazidine in five different solvent systems. *The Scientific World Journal*, 2025, Article 9262176. <https://doi.org/10.1155/tswj/9262176>
2. Noor S., Begum M. N., Rony S. R., Chowdhury A. A., Sohrab M. H. & Mazid M. A. (2025). Bioactivity and chemical screening of endophytic fungi associated with seaweeds *Gracilaria* sp. and *Sargassum* sp. of the Bay of Bengal, Bangladesh. *Scientific Reports*. 15: 16121. <https://doi.org/10.1038/s41598-025-00099-y>
3. Shimu S. N., Mollick S., Zinnurine R., Haq M. A., Chowdhury S. A., Parvin M. N. & Sohrab M. H. (2025). Isolation of three metabolites from the plant *Cajanus cajan* (L.) Huth and evaluation of antibacterial and cytotoxic potentials of extract of *Cajanus cajan* (L.) Huth available in Bangladesh. *Bangladesh Journal of Scientific and Industrial Research*, 2025:60(1), 1–8. <https://doi.org/10.3329/bjsir.v60i1.75846>
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5. Shathi A. S., Islam M. M., Susan M. A. B. H., Miran M. S., & Mostafa M. G. (2025) . "Characterization and catalytic properties of MnO<sub>2</sub>-modified kaolinite for formic acid oxidation." *Sustainable Chemistry for Climate Action*, 6: 100066. <https://doi.org/10.1016/j.scca.2025.100066>
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8. Sarkar M. A. A. S. U., Saha B. K., Kabir M. A., Islam M. T., Khatun M. M. & Siddik M. N. A. (2025) "Fatty acid profile, antioxidant capabilities and Physico-chemical assessment of functional oils from safflower seeds: A potential source in Bangladesh". *Results in Chemistry* 15: 102235. <https://doi.org/10.1016/j.rechem.2025.102235>
9. Karim, M. R., Hossain M. A., Shamim M., Hosen M. R., Islam M. S., Hossain M. T., Simran K. T. & Akhter M. S. (2025). In vivo and in silico approaches for exploring the hypoglycemic potential of *Moringa oleifera* Lam. flowers' extract. *International Journal of Minor Fruits Medicinal and Aromatic Plants*. 11. 252-263. <https://doi.org/10.53552/ijmfmap.11.1.2025.252-263>
10. Hossain M. A., Mitra K., Hossen M. M. & Akhter S. (2025). "Optimization the preparation of whey protein from pasteurized liquid milk using Response Surface Methodology and Artificial Neural Network Model." *Applied Food Research*, 5(1): 100828. <https://doi.org/10.1016/j.afres.2025.100828>.
11. Akter B., Ahamed K. U., Sohrab M. H., Aishee S., Sarkar B., Anika A., Hossain M. K., Alharbi H. M., Sindi E. R. & Aktar, M. (2025). Integrated In Vivo, In Vitro, and In Silico Evaluation of *Spermacoce ocyroides* Methanolic Extract for Antidiarrheal, Thrombolytic, and Antiarthritic Activities. *Cell Biochemistry and Biophysics*, pp.1-20. <https://doi.org/10.1007/s12013-025-01884-2>
12. Begum A., Afrin N., Ali M. L., Rahman M. H., Hoque N., Tripty A. S., Islam M. M., Ahamed K. U., Akter B. & Khanam, B. H. (2025). Exploration of In Vitro and In Vivo Pharmacological Activities of the Ethnomedicinal Plant *Eranthemum pulchellum* Andrews, Supported by In Silico Investigation. *Chemistry & Biodiversity*, p.e01276. <https://doi.org/10.1002/cbdv.202501276>
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17. Islam, M. S., Rakhi S. A., Kuddus M. R., Sarkar M. & Ahmed F. (2024). Antioxidant and thrombolytic activities of *Crinum asiaticum* L. *Bangladesh Journal of Scientific and Industrial Research*. 59. 191-194. <https://doi.org/10.3329/bjsir.v59i4.73758>.
18. Islam, M. S., Hossain, M. S., Shaha, H. K., Shipa, S. J., Ahmed, F., & Saqueeb, N. (2024). Antibacterial, antioxidant, anti-inflammatory and anti-diarrheal potentiality evaluation of whole plant extract of *Phyllanthus niruri* L. *Bangladesh Journal of Scientific and Industrial Research*, 59(4), 195–202. <https://doi.org/10.3329/bjsir.v59i4.74975>
19. Noman Z. A., Alam S., Dey S. S., Bhuiyan M. N. H., Siddique M. P. & Sikder M. M. H. (2024). "Antibiotic Resistance Risk Assessment in Mymensingh, Bangladesh: Current Scenario from Human-Animal-Environmental Interfaces Viewpoint", *Heliyon*, 10, e35878. <http://doi.org/10.1016/j.heliyon.2024.e35878>
20. Noman Z. A., Tasnim S., Masud R. I., Anika T. T., Islam M. S., Rahman A. M. M. T., Rahman M. T. (2024). "Reverse-zoonosis: Global impact and changes in transmission patterns", *Journal of Advanced Veterinary and Animal Research*, 11(3), 601-617. <http://doi.org/10.5455/javar.2024.k810>

### Guidance to research Work (PhD/M.Phil/M.S/NCST & BCSIR Fellow):

Sl. No	Title of Research	Ph.D/ M.Phil/ M.S Category	Name of Student	Name of academic Institute	Name of Supervisors in BCSIR
01.	Edible Mushrooms as Source of Antibacterial Agents and Inhibitors of Angiogenesis: A Systematic Investigation	M.S.	Faiiaz Nasir	Deptment of Genetics Engineering and Biotechnology, Jagannath University.	Dr. A.D.A. Shahinuzzaman, SSO, Pharmaceutical Sciences Research Division.
02.	Isolation and Characterization of Phytochemical Constituents and Evaluation of Biological Activities of <i>D. pentandra</i> Leaves	Thesis (M. Pharm)	Mst. Amina Khatun	Department of Pharmacy, Jagannath University.	Satyajit Roy Rony, SSO, Pharmaceutical Sciences Research Division.
03.	Exploration of Phytochemicals & Investigation of the Pharmacological Properties of the Methanolic Extract of <i>N. Canescens</i> Leaves.	Thesis (M. Pharm)	Jerin Tasnim	Department of Pharmacy, Jagannath University.	Satyajit Roy Rony, SSO, Pharmaceutical Sciences Research Division.
04.	Phytochemical and Biological Activity of <i>S. Pulcherrima</i> Leave Extracts Through in-Vitro, in-Vivo, and in-Silico Studies	Thesis (M. Pharm)	Tawhida Akter	Department of Pharmacy, Comilla University.	Satyajit Roy Rony, SSO, Pharmaceutical Sciences Research Division.
05.	Research and Development Project on the drug	M. S.	Nusrat Jahan Nitu	Department of Biochemistry & Molecular Biology, Jagannath University	Dr. Md. Hossain Sohrab, Director, BCSIR Laboratories, Dhaka
06.	Research and Development Project on the drug	M. S.	Md. Selim Reza	Department of Biochemistry & Molecular Biology, Jagannath University	Dr. Md. Hossain Sohrab, Director, BCSIR Laboratories, Dhaka.
07.	Isolation of bioactive compounds from <i>L. adscendens</i> (L.) H. Hara and investigation of potentiality	M. Phil	Nisarar Nizhum	Department of Pharmaceutical Chemistry, University of Dhaka.	Dr. Md. Hossain Sohrab, Director, BCSIR Laboratories, Dhaka.
08.	Investigation of Chemical constituents and pharmacological activities of <i>C. nurvala</i> and <i>H. hirta</i>	PhD	Taslina Begum	Department of Pharmacy, Faculty of Pharmacy, University of Dhaka, Dhaka	Dr. Md. Hossain Sohrab, Director, BCSIR Laboratories, Dhaka.
09.	Investigation of Chemical constituents and pharmacological activities of two aquatic plants of Bangladesh	PhD	Kamrun Nahar	Department of Pharmacy, Faculty of Pharmacy, University of Dhaka, Dhaka	Dr. Md. Hossain Sohrab, Director, BCSIR Laboratories, Dhaka.
10.	Isolation and structure elucidation of bioactive compounds from selected medicinal plants and their associated endophytic fungi in Bangladesh	PhD	Nigar Sultana Tithi	Department of Pharmacy, Faculty of Pharmacy, University of Dhaka, Dhaka	Dr. Md. Hossain Sohrab, Director, BCSIR Laboratories, Dhaka

11.	Isolation and Characterization of Phytochemical Constituents and Evaluation of Biological Activities of <i>D. pentandra</i> Leaves	PhD	Sadia Noor	Department of Pharmaceutical Chemistry, Faculty of Pharmacy, University of Dhaka.	Dr. Md. Hossain Sohrab, Director, BCSIR Laboratories, Dhaka
12.	Isolation and characterization of bioactive compounds from endophytic fungi associated with <i>Gynura procumbens</i> (Lour.) Merr. and <i>Lantana camara</i> L	PhD	Mst. Nadira Begum	Department of Botany, University of Dhaka, Dhaka.	Dr. Md. Hossain Sohrab, Director, BCSIR Laboratories, Dhaka
13.	Isolation and characterization of two ethno-pharmacologically important Gingeraceae plants of Bangladesh and their endophytic fungi.	PhD	Kazi Jannatul Ferdous	Dept. of Biochemistry and Molecular Biology, University of Dhaka	Dr. Md. Hossain Sohrab, Director, BCSIR Laboratories, Dhaka
14.	Isolation and characterization of bioactive compounds from the aquatic medicinal plant <i>N. hydrophylla</i> and <i>E. crassipes</i> as well as their associated endophytic fungi.	PhD	Zihan Rahman Khan	Department of Biochemistry & Molecular Biology, University of Dhaka.	Dr. Md. Hossain Sohrab, Director, BCSIR Laboratories, Dhaka
15.	Isolation of bioactive compounds from <i>L. adscendens</i> (L.) H. Hara and investigation of potentiality	PhD	Gazi Md. Monjur Murshid	Department of Pharmaceutical Chemistry, Faculty of Pharmacy, University of Dhaka	Dr. Md. Hossain Sohrab, Director, BCSIR Laboratories, Dhaka.
16.	Isolation, characterization and pharmacological screening of active constituents from <i>D. candenatensis</i> and <i>B. tersa</i>	BCSIR Fellow	Sayema Khanum	Dr. Quadrat-I-Khuda doctorate Fellowship	Dr. Md. Hossain Sohrab, Director, BCSIR Laboratories, Dhaka
17.	Bioanalytical method development and validation of commonly prescribed anticancer, cardiovascular and antihistaminic drugs of Bangladesh.	BCSIR Fellow	Farhana Afroz	Dr. Quadrat-I-Khuda doctorate Fellowship	Dr. Md. Hossain Sohrab, Director, BCSIR Laboratories, Dhaka
18.	Chemical exploration of bioactive molecules and investigating their biological activities isolated from the endophytic fungi of the medicinal Plant <i>E. fluctuans</i> Loar.	BCSIR Fellow	Abdur Rahman	Pro. Nurul Absar Khan post graduate fellowship	Dr. Md. Hossain Sohrab, Director, BCSIR Laboratories, Dhaka
19.	Isolation and Identification of bioactive compounds from five mangrove plant species and associated endophytic fungi	BCSIR Fellow	Kazi Shubarna Rahman	Dr. Quadrat-I-Khuda doctoral Fellowship.	Dr. Md. Hossain Sohrab, Director, BCSIR Laboratories, Dhaka

### Participation in training/Seminar/Symposium/Workshop/Conference:

#### Training:

1. Dr. Md. Hossain Sohrab (DIRECTOR) participated in a training program on “Operational Training using the SCIEX 7500TM Triple Quadrupole Mass Spectrometer and SCIEX OS”, held at SCIEX, Framingham, Massachusetts, USA from 15 to 19 July, 2024.
2. Satyajit Roy Rony (SSO) participated in a training program on “Operational Training using the SCIEX 7500TM Triple Quadrupole Mass Spectrometer and SCIEX OS”, held at SCIEX, Framingham, Massachusetts, USA from 15 to 19 July, 2024.
3. Fatema Moni (SSO) participated in a training program on “Operational Training using the SCIEX 7500TM Triple Quadrupole Mass Spectrometer and SCIEX OS”, held at SCIEX, Framingham, Massachusetts, USA from 15 to 19 July, 2024.

4. Md. Saiful Islam (SO) participated in a training program on “Operation and maintenance of Preparative High Performance Liquid Chromatography” held on 06-10 October, 2024 at BCSIR Rajshahi Laboratories.
5. Mamtaz Sultana (SO) participated in a training program on “Introduction to Python: Basic Programming and Data Analysis” held on 5 November, 2024 at BCSIR Laboratories, Dhaka.
6. Mamtaz Sultana (SO) participated in a training program on “Principal, Application, Troubleshooting and Maintenance of HPLC” held on 12 November, 2024 at BCSIR Laboratories, Dhaka.
7. Shammi Akhter (SSO) participated in a training program on “R Programming Learning the basics of statistical computing” held on 27 November, 2024 at BCSIR Dhaka Laboratories, BCSIR.
8. Mamtaz Sultana (SO) participated in a training program on “R Programming: Learning the basics of statistical computing” held on 27 November, 2024 at BCSIR Laboratories, Dhaka.
9. Satyajit Roy Rony (SSO) participated in a training program on ‘Operation and maintenance of Nuclear Magnetic Resonance (NMR) Spectrometer’ as trainer held at BCSIR, Dhaka, from December 08 to 12, 2024.
10. Md. Sakhawat Hossain (SO) participated in a training program on ‘Operation and maintenance of Nuclear Magnetic Resonance (NMR) Spectrometer’ as trainer held at BCSIR, Dhaka, from December 08 to 12, 2024.
11. Md. Zakaria Al Noman (SO) participated in a training program on “28th Special Foundation Training for Scientific Officer of BCSIR” held on 22 Dec, 2024 -19 Feb, 2025 at National Academy of Planning and Development, Dhaka.
12. Mamtaz Sultana (SO) participated in a training program on “28th Special Foundation Training Course for Scientific Officers of BCSIR” held on 22 December 2024-19 February 2025 at the National Academy for Planning and Development (NAPD).
13. Md. Saiful Islam (SO) participated in a training program on “28th Special Foundation Training Course for Scientific Officers of BCSIR” held on 22 December 2024-19 February 2025 at the National Academy for Planning and Development (NAPD).
14. Md. Saiful Islam (SO) participated in a training program as a trainer on “Operation and maintenance of Nuclear Magnetic Resonance (NMR) Spectrometer” held on 08-12 December, 2024 at BCSIR Dhaka Laboratories.
15. Shammi Akhter (SSO) participated in a training program on “R&D Data Analysis with SPSS” held on 01 January, 2025 at BCSIR Dhaka Laboratories, BCSIR.
16. Mst. Maya Khatun (RP) participated in a training program on “R&D Data Analysis with SPSS” held on 01 January, 2025 at BCSIR Laboratories, Dhaka.
17. Md. Ariful Haq (SO) participated in a training course on “Operation and Maintenance of Atomic Absorption Spectrometer (AAS)” Organized by INARS, BCSIR, Dhaka, from 05 to 09 January, 2025.
18. Md. Sakhawat Hossain (SO) participated in a training program on “Operation and maintenance of Atomic Absorption Spectrometer (AAS)”, held at INARS, BCSIR, Dhaka, from 05 to 09 January, 2025.
19. Shammi Akhter (SSO) participated in a training program on “Nano Particle Size Analyzer with Zeta Potential” held on 19-23 January, 2025 at IGCRT, BCSIR.
20. Md. Ariful Haq (SO) participated in a training program on “Operation and maintenance of Gas chromatography Mass Spectrometer (GC-MS)” held on 09-13 February, 2025 at BCSIR Laboratories, Chattogram.
21. Mst. Maya Khatun (RP) participated in a training program on “Operation and maintenance of Gas chromatography Mass Spectrometer (GC-MS)” held on 09-13 February, 2025 at BCSIR Laboratories, Chattogram.
22. Satyajit Roy Rony (SSO) participated in a training program on “LC-MS/MS” as a trainer held on 09-13 March, 2025 arranged by BCSIR, Dhaka.
23. A. D. A. Shahinuzzaman (SSO) participated in a training program on “LC-MS/MS” as a trainer held on 09-13 March, 2025 arranged by BCSIR, Dhaka.
24. Fatema Moni (SSO) participated in a training program on “LC-MS/MS” as a trainer held on 09-13 March, 2025 arranged by BCSIR, Dhaka.
25. Saima Mollick (SO) participated in a training program on “LC-MS/MS” as a trainer held on 09-13 March, 2025 arranged by BCSIR, Dhaka.
26. Md. Najem Uddin (SO) participated in a training program on “LC-MS/MS” as a trainer held on 09-13 March, 2025 arranged by BCSIR, Dhaka.
27. A. D. A. Shahinuzzaman (SSO) participated in a training program on “Operation and Maintenance of MiniSeq Sequencing Platform” held on 20-24 April, 2025 at BCSIR Laboratories, Dhaka.
28. Saima Mollick (SO) participated in a training program on “Operation and Maintenance of MiniSeq Sequencing Platform” held on 20-24 April, 2025 at BCSIR Laboratories, Dhaka.
29. Mamtaz Sultana (SO) participated in a training program on “Operation and Maintenance of MiniSeq Sequencing Platform” held on 20-24 April, 2025 at BCSIR Laboratories, Dhaka.

30. Asma Shafiq Shathi (SO) participated in a training program on “Operation and maintenance of Simultaneous Thermal Analyzer (STA)” held on 04-08 May, 2025 at IGCRT, BCSIR.
31. Mamtaz Sultana (SO) participated in a training program on “Operation and maintenance of LC-MS/MS” held on 09-13 May, 2025 at BCSIR Dhaka Laboratories.
32. Md. Saiful Islam (SO) participated in a training program on “Operation and maintenance of LC-MS/MS” held on 09-13 May, 2025 at BCSIR Dhaka Laboratories.
33. Zakaria Al Noman (SO) participated in a training program on “Polymerase Chain Reaction (PCR)” held on 18-22 May, 2025 at BCSIR Laboratories, Chottogram.
34. Zakaria Al Noman (SO) participated in a training program on “Atomic Force Microscopy” held on 18-22 May, 2025 at BCSIR Laboratories, Dhaka.
35. Md. Ariful Haq (SO) participated in a training program on “National Integrity Strategy” held on 18 May, 2025 at BCSIR Laboratories, Dhaka.
36. Asma Shafiq Shathi (SO) participated in a training program on “Basic principle, maintenance and troubleshooting of XRD, FTIR and Raman Spectroscopy” held on 21 May, 2025 at BCSIR Laboratories, Dhaka.
37. Mst. Maya Khatun (RP) participated in a training program on “Basic principle, maintenance and troubleshooting of XRD, FTIR and Raman Spectroscopy” held on 21 May, 2025 at BCSIR Laboratories, Dhaka.
38. Shammi Akhter (SSO) participated in a training program on “Basic principle, maintenance and troubleshooting of XRD, FTIR and Raman Spectroscopy” held on 21 May, 2025 at BCSIR Laboratories, Dhaka.
39. Md. Ariful Haq (SO) participated in a training program on “Basic principle, maintenance and troubleshooting of XRD, FTIR and Raman Spectroscopy” held on 21 May, 2025 at BCSIR Laboratories, Dhaka.
40. Md. Ariful Haq (SO) participated in a training program on “PPA-2006 and PPR-2008 in Scientific Procurement” held on 22 May, 2025 at BCSIR Dhaka Laboratories.
41. Md. Saiful Islam (SO) participated in a training program on “PPA-2006 and PPR-2008 in Scientific Procurement” held on 22 May, 2025 at BCSIR Dhaka Laboratories.
42. Fatema Moni (SSO) participated in a training program on “Research Methodology and Publication” held on 26 May, 2025 at BCSIR Laboratories, Dhaka.
43. Mst. Maya Khatun (RP) participated in a training program on “Research Methodology and Publication” held on 26 May, 2025 at BCSIR Laboratories, Dhaka.
44. Mamtaz Sultana (SO) participated in a training program on “Understanding of ISO 17025:2017-for Laboratory Accreditation” held on 27 May, 2025 at BCSIR Laboratories, Dhaka.
45. Mst. Maya Khatun (RP) participated in a training program on “Understanding of ISO 17025:2017 – for Laboratory Accreditation” held on 27 May, 2025 at BCSIR Laboratories, Dhaka.

### Symposia :

1. Dr. Md. Hossain Sohrab (DIRECTOR) presented an ‘Oral Lecture’ on “Bioactive metabolites from medicinal plants of Bangladesh and their associated endophytic fungi” in the ACS (American Chemical Society) Spring 2025 Symposia, held at San Diego, California, USA, from 23 to 27 March, 2025.

### Conference:

1. A. D. A. Shahinuzzaman (SSO) presented an ‘Oral Presentation’ on “Mass Spectrometry in Drug Discovery Research”, held at RMSTU International Bioscience Conference and Carnival 2025, Rangamati, Bangladesh, May 16–18, 2025.
2. Bakul Akter (RP) presented an ‘Oral Presentation’ on “Innovations and Collaborations in Bioscience, Biosafety and Biosecurity: Quest for a sustainable Healthcare and Agricultural”, held at RMSTU International Bioscience Conference and Carnival 2025, Rangamati, Bangladesh, May 16–18, 2025.

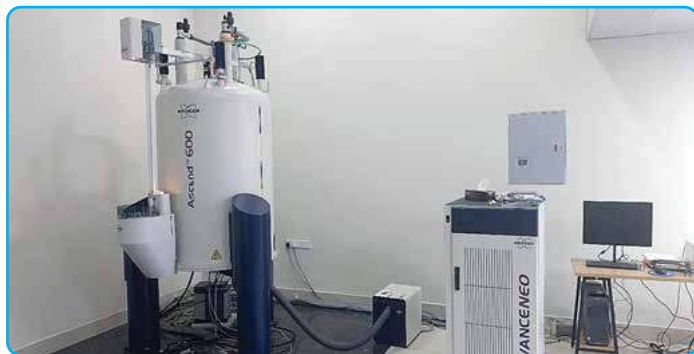
### Award :

1. Md. Saiful Islam (SO) was awarded the Director General’s Award for securing the Medal and Merit Second Position in the course on “28th Special Foundation Training Course for Scientific Officers of BCSIR” held on 22 December 2024-19 February 2025 at the National Academy for Planning and Development (NAPD).

### Number of Analytical (Ad-Hoc) Problem Solved:

Name of division	Routine type	Research type	Total
Pharmaceutical Sciences Research Division	864	-	864

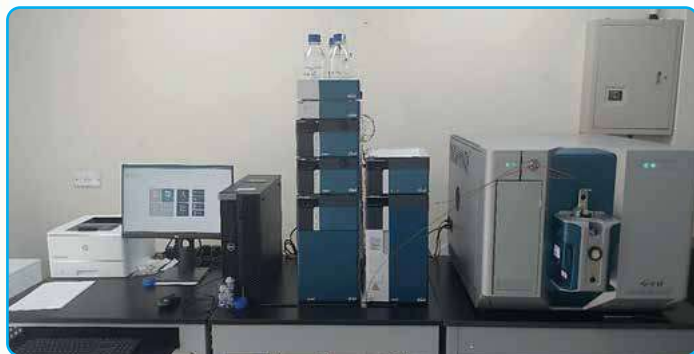
### Advanced Instruments of PSRD



600 MHz NMR Spectrometer



HPTLC-MS



Triple Quadrupole LC-MS/MS



GC-MS/MS



Cyclic IMS-HRMS



Affinity Chromatograph



Laboratory Room



Synthetic Reactor

## Short Biography of PSRD Scientists

### Dr. Md. Hossain Sohrab (February 1997 - Present)



Office	Pharmaceutical Sciences Research Division	Blood Group	O+
Job Title	Chief Scientific Officer & Director (Addl. Charge)	Degree Obtained	PhD (2005)
Contact	mhsohrab@yahoo.com	Mobile	01720121525

Dr. Md. Hossain Sohrab is the most prominent Mycologist and one of the top phytochemist in Bangladesh. He has been working as a Chief Scientific Officer and officer in charge at Pharmaceutical Sciences Research Division, BCSIR Laboratories, Dhaka. He was the project director of "Institute of Bioequivalence studies and Pharmaceutical sciences" (IBSPS). His research is mainly focused on Isolation and Synthesis of Bioactive Natural Products. He has earned his B.Pharm and M.Pharm degree from the University of Dhaka. He obtained Ph.D in Chemistry from University of Paderborn, Paderborn, Germany and Post. Doc from Institute of Environmental Research (INFU), Department of Chemistry and Chemical Biology, Technische Universität Dortmund, Otto-Hahn-Str. 6, D-44221 Dortmund, Germany (2009–2010). He has authored or coauthored more than 126 publications and gets 1695 citation (h-index: 22). He has two accepted patent and two accepted process.

### Satyajit Roy Rony (June 2011 - Present)



Office	Pharmaceutical Sciences Research Division	Blood Group	B+
Job Title	Senior Scientific Officer	Degree Obtained	M. Pharm
Contact	satyajit_pharm@yahoo.com	Mobile	01717257981

Satyajit Roy Rony is working as a Senior Scientific Officer in Pharmaceutical Sciences Research Division, which is a division in BCSIR laboratories, Dhaka. He earned his B. Pharm degree from Stamford University Bangladesh and M. Pharm degree from State University of Bangladesh. His research is mainly focused on Pharmaceutical Science, New Drug development, Analytical and Natural Product Chemistry. He has also worked as an Assistant Project Director (APD) in the Annual Development Programme (ADP) of Government of Bangladesh named 'Institute of bioequivalence studies and pharmaceutical sciences'. He has more than 51 publications in different renowned national and international journals. He has 02 accepted processes. He is a member of Bangladesh Pharmaceutical Society, Bangladesh Chemical society and Bangladesh Botanical Society.

### Dr. A.D.A. Shahinuzzaman (February 2013 - Present)



Office	Pharmaceutical Sciences Research Division	Blood Group	B+
Job Title	Senior Scientific Officer	Degree Obtained	PhD (2019)
Contact	shahinbcsir@gmail.com	Mobile	1308637064

I received my M.S. and B.S. in Genetic Engineering and Biotechnology from the University of Dhaka, Bangladesh, and Ph.D. in Chemistry from the University of Texas at Arlington, USA. During my Ph.D., I used immune precipitation and mass spectrometry-based proteomics techniques to explore immune signalling in activated macrophages and Post-translational modifications (PTMs) identification using mass spectrometry. Here, I am involved in mass spectrometric analysis (both structural and quantitative) of proteins, peptides and metabolites. I am also working in natural product purification and characterization. I have also developed workflow for in silico analysis of enzyme ligand interaction and inhibition studies. I am also involved in transcriptome sequencing based analysis and application note development as an expansion to our current workflow.

**Fatema Moni (July 2015 - Present)**

Office	Pharmaceutical Sciences Research Division	Blood Group	B+
Job Title	Senior Scientific Officer	Degree Obtained	M. Pharm (2011)
Contact	moni.fatema@yahoo.com	Mobile	01816619127

Fatema completed his both B. Pharm. and M. Pharm. degree in Pharmacy from the University of Dhaka. Her research is mainly focused on the development of analytical and bioanalytical method of pharmaceutical compounds. She is also working on different projects on isolation of bioactive metabolites from natural sources. She has 18 peer-reviewed research articles and gets 264 citations (h-index: 7). She has one accepted process.

**Shammi Akhter (March 2016 - Present)**

Office	Pharmaceutical Sciences Research Division	Blood Group	B+
Job Title	Senior Scientific Officer	Degree Obtained	MS in Pharmaceutical Technology
Contact	shammiakhter74@gmail.com	Mobile	01676454575

Shammi Akhter is working as a Senior Scientific Officer in Pharmaceutical Sciences Research Division, which is a division in BCSIR laboratories, Dhaka. Shammi Akhter received her both B. Pharm and MS degree in Pharmaceutical Technology with thesis (Phytochemistry) from University of Asia Pacific (UAP). Her research is mainly focused on Pharmaceutical Science, New Drug discovery and Natural Product Chemistry. She is also working as an Associate Scientist (Additional Charge) in the Annual Development Programme (ADP) of Government of Bangladesh named 'Institute of bioequivalence studies and pharmaceutical sciences'. She has authored or co-authored 11 publications in different renowned national and international journals. She is a member of Bangladesh Pharmaceutical Society.

**Saima Mollick (October 2018 - Present)**

Office	Pharmaceutical Sciences Research Division	Blood Group	O+
Job Title	Scientific Officer	Degree Obtained	M. Pharm
Contact	rsaimamollick@gmail.com	Mobile	01824626465

Saima Mollick is working as a Scientific Officer in Pharmaceutical Sciences Research Division, BCSIR Laboratories, Dhaka. She has completed B. Pharm. in Pharmacy and M. Pharm. in Clinical Pharmacy and Pharmacology from department of Pharmacy, University of Dhaka. She is involved in the research area of isolation, characterization of compounds from natural sources and new Drug discovery. She is a member of Bangladesh Pharmaceutical Society.

**Md. Najem Uddin (October 2018 - Present)**

Office	Pharmaceutical Sciences Research Division	Blood Group	AB+
Job Title	Scientific Officer	Degree Obtained	M. Pharm (2015)
Contact	najem.ru@gmail.com	Mobile	01737269296

Md. Najem Uddin is working as a Scientific Officer at Pharmaceutical Sciences Research Division, BCSIR Laboratories, Dhaka. He has completed both B. Pharm. and M. Pharm. degree from the University of Rajshahi. His research focus is mainly on Analytical Chemistry, Clinical microbiology and Natural Product Chemistry. He is 'A' grade registered Pharmacist under Pharmacy council of Bangladesh. He is also a member of Bangladesh Pharmaceutical Society.

**Md. Ariful Haq (November 2018 - Present)**

Office	Pharmaceutical Sciences Research Division	Blood Group	B+
Job Title	Scientific Officer	Degree Obtained	M. Pharm (2015)
Contact	md.arifulhaq13@gmail.com	Mobile	01768344233

Md. Ariful Haq earned his B.Pharm and M.Pharm degree from Khulna University, Khulna. He is currently working as a Scientific Officer at Pharmaceutical Sciences Research Division, BCSIR Laboratories, Dhaka. His research is mainly focused on Phyto-chemistry, Microbiology and Natural Product Chemistry. He is 'A' grade registered Pharmacist under Pharmacy council of Bangladesh. He is also a member of Bangladesh Pharmaceutical Society.

**Md. Sakhawat Hossain (November 2021 - Present)**

Office	Pharmaceutical Sciences Research Division	Blood Group	O+
Job Title	Scientific Officer	Degree Obtained	M. Pharm
Contact	sakhawat.du11@gmail.com	Mobile	01737507075

Md. Sakhawat Hossain is working as a Scientific Officer in Pharmaceutical Sciences Research Division, BCSIR laboratories, Dhaka. He has completed B. Pharm in Pharmacy and M. Pharm in Pharmaceutical Chemistry from Faculty of Pharmacy, University of Dhaka, Bangladesh. He worked as a lecturer and senior lecturer in the department of Pharmacy of renowned private university for three and half years. His research area is mainly focused on isolation and characterization of bioactive compounds from natural sources and also investigation of pharmacological activities. He has 16 publications in different renowned national and international journals.

**Md. Zakaria Al Noman (May 2022 - Present)**

Office	Pharmaceutical Sciences Research Division	Blood Group	B+
Job Title	Scientific Officer	Degree Obtained	D.V.M, MS
Contact	zakarianoman95@gmail.com	Mobile	01773559882

Md. Zakaria Al Noman holds a Doctor of Veterinary Medicine (DVM) degree and a Master of Science (MS) in Pharmacology from Bangladesh Agricultural University, Mymensingh-2202. Presently, he serves as a Scientific Officer in the Pharmaceutical Sciences Research Division at BCSIR Dhaka Laboratories, where he has been employed since May, 2022. His research primarily focuses on Antimicrobial Resistance, Zoonotic Disease Epidemiology, and One Health concerns. He is a registered veterinarian (BVC Reg. No: 5687). He has contributed to 20 scientific publications in various national and international journals (212 citations with h-index: 6 by google scholar) and actively participated in several scientific conferences.

**Mamtaz Sultana (January 2023 - Present)**

Office	Pharmaceutical Sciences Research Division	Blood Group	B+
Job Title	Scientific Officer	Degree Obtained	MS (2017)
Contact	mamtaz.bcsir@gmail.com	Mobile	01777334941

Mamtaz Sultana achieved her both BSc (Hons) and MS degree in Biochemistry and Molecular Biology from the University of Chittagong. She got JASSO scholarship and worked as a 'Special Research Student' in Tokyo University of Agriculture and Technology (TUAT), Tokyo, Japan under the supervision of Professor Dr. Yutaka Kuroda. Her research was mainly focused on the design, expression and synthesis of recombinant protein using site directed mutagenesis and recombinant DNA Technology. She also worked as an Assistant Professor in Biochemistry and Molecular Biology at Primeasia University. Currently, she is working on compound isolation from endophytic fungus and their structural elucidation as well as Dengue Serotyping. She has one publication in Asian pacific journal of Tropical medicine.

**Asma Shafiq Shathi (January 2023 - Present)**

Office	Pharmaceutical Sciences Research Division	Blood Group	B+
Job Title	Scientific Officer	Degree Obtained	MS (2018)
Contact	asmashafiqshathi@gmail.com	Mobile	01940959003

Asma Shafiq Shathi is working as a Scientific Officer in Pharmaceutical Sciences Research Division, BCSIR Dhaka Laboratories. She has completed her B.S.(Honours) in Chemistry and MS degree in Inorganic and Analytical Chemistry from University of Dhaka. She has worked as an R&D Officer on API synthesis section in a renowned pharmaceutical company. Her research area is mainly focused on method development and validation, nanoparticle synthesis and focusing on their potential applications in pharmaceutical and environmental research. She has published three articles on international journal.

**Md. Saiful Islam (June 2023- Present)**

Office	Pharmaceutical Sciences Research Division.	Blood Group	B+
Job Title	Scientific Officer	Degree Obtained	MS (2017)
Contact	saiful.du.phr.50@gmail.com	Mobile	01751035574

Md. Saiful Islam is working as a Scientific Officer in the Pharmaceutical Sciences Research Division. He has completed B. Pharm in Pharmacy and M. Pharm in Pharmaceutical Chemistry from the Faculty of Pharmacy, University of Dhaka, Bangladesh. He worked as a lecturer in the Department of Pharmacy of a renowned private university. His research area is mainly focused on the isolation and characterization of bioactive compounds from natural sources and also the investigation of pharmacological activities. He has 4 publications in different renowned national and international journals.

**Kutub Uddin Ahamed (November 2021- Present)**

Office	Pharmaceutical Sciences Research Division.	Blood Group	B+
Job Title	Research Pharmacologist	Degree Obtained	M. Pharm
Contact	kutub@bcsir.gov.bd	Mobile	01777239300

Kutub Uddin Ahamed is working as a Research Pharmacologist in Pharmaceutical Sciences Research Division. He has earned his M. Pharm degree from Jagannath University. He has experience of serving in a pharmaceutical company as a product executive for a couple of years and as a clinical research associate in a clinical research organization for ten months. His research focus is mainly on Drug discovery & development, Bioactive compound isolation from natural sources and also investigation of pharmacological activities, Heavy metal analysis in herbal nutraceuticals, Molecular Biology and Computer-aided drug design (CADD). He is 'A' grade registered Pharmacist under Pharmacy council of Bangladesh. He has authored or co-authored 08 publications in different renowned national and international journals.

**Mst. Maya Khatun (May 2022 - Present)**

Office	Pharmaceutical Sciences Research Division	Blood Group	B+
Job Title	Research Pharmacologist	Degree Obtained	M. Pharm
Contact	maya2014pharmacy@gmail.com	Mobile	01767244744

Mst. Maya Khatun is working as a Research Pharmacologist in Pharmaceutical Sciences Research Division, BCSIR Laboratories, Dhaka. She has completed B. Pharm. and M. Pharm. in Pharmacy from department of Pharmacy, University of Rajshahi. She has worked as an R&D Officer on Method Development and Validation of two International Non-proprietary Names (INN) drugs. Her primary research focuses on drug discovery through the exploration of natural product chemistry, method development and validation in analytical chemistry as well as the isolation and characterization of bioactive compounds. She has published two articles on international journal. She is a member of Bangladesh Pharmaceutical Society.

**Bakul Akter (August 20, 2023-Present)**

Office	Pharmaceutical Sciences Research Division	Blood Group	O+
Job Title	Research Pharmacologist	Degree Obtained	M. Pharm (2023)
Contact	bakulcu210@gmail.com	Mobile	01625770738

Bakul Akter is working as a Research Pharmacologist in the Pharmaceutical Sciences Research Division (PSRD). She has completed both B. Pharm Professional and M. Pharm (Thesis) in Pharmacy from the University of Chittagong, Bangladesh. She worked as a Lecturer in the Pharmacy department at the International Islamic University of Chittagong (IIUC). Her research encompasses a diverse range of fields, including ring-opening metathesis polymerization (ROMP), bioinformatics, heavy metal toxicity, and the development of novel drug formulations derived from natural resources. She has 12 publications in different national and international journals.

## Photo Gallery



Scientists of BCSIR Dhaka Laboratories



Weekly seminar of BCSIR Dhaka Laboratories



Scientific Seminar at BCSIR Dhaka Laboratories Seminar Room



Scientists of BCSIR Dhaka Laboratories



Day-Long In House Training on Research Methodology and Publication



Stakeholder Meeting 2025



Appropriate technology application and dissemination Seminar in Nature

## BCSIR Dhaka Laboratories List of accepted process (considerable for leasing)

1. Production of super paper adhesive, 20.10.10\_D/L
2. Production Zinc Acetate from Zinc Oxide, 24.10.10\_D/L
3. Production of Essential Oil of Garlic (Garlic Oil), 01.12.10\_D/L
4. Production of Super Wood Adhesive, 02.02.11\_D/L
5. Production of Printing Roller Wash, 02.02.11\_D/L
6. Production of Microcrystalline cellulose, 03.02.11\_D/L
7. Deodorized blood meal as organic fertilizer, 27.02.11\_D/L
8. Production of Herbal Shaving Foam, 08.05.11\_D/L
9. Production of Mouth Wash, 08.05.11\_D/L
10. Production of Essential Oil from Kalozira, 10.05.11\_D/L
11. Production of Photographic Film Developer, 29.05.11\_D/L
12. Production of Photographic Film Fixer, 29.05.11\_D/L
13. Production of bitter gourd capsule, 25.08.11\_D/L
14. Preparation of chitosan-charcoal bio-composite for chromium removal, 13.10.11\_D/L
15. Production of tamarind kernel based textile sizing agent for jute & cotton yarns, 13.10.11\_D/L
16. Production of tamarind kernel powder (TKP) aqueous solution, 13.10.11\_D/L
17. Production of poultry feed from unused fish scales including natural ingredient, 08.01.12\_D/L
18. Production of Aloe Gel, 08.01.12\_D/L
19. Production of Activated Carbon, 4.4.12\_D/L
20. Production of Ethyl Salicylate, 24.07.12\_D/L
21. Production of Food Drug & Cosmetic Grade Water Soluble Curcumin Pigments, 29.01.13\_D/L
22. Production of Water Soluble Curcumin, 27.02.13\_D/L
23. Production of Alcohol Soluble Curcumin, 27.02.13\_D/L
24. Production of herbal hand wash, 02.06.13\_D/L
25. Production of synthetic rubber based rubber curing agent containing high percentage of Sulfur powder for the use in synthetic rubber based products, 03.03.14\_D/L
26. Production of rubber curing agent incorporating natural rubber latex in sulfur powder for the use in natural rubber based products, 03.03.14\_D/L
27. Production of pectin from ripe mango peels, 18.05.15\_D/L
28. Production of starch from ripe mango seeds, 18.05.15\_D/L
29. Production of fruit flavored salt for gastric comfort, 17.11.15\_D/L
30. Production of Bio Fertilizer from Press mud and Spent Wash, D/L, 04.01.16
31. Production of Oil from kernel of ripe mango, D/L, 05.01.16
32. Production of Anhydrous Aluminum chloride from scrap aluminum, D/L 12.06.2016
33. Rayon grade pulp from white press cutting, 18.10.16\_D/L
34. Rayon Pulp from rice straw by organic acid, 18.10.16\_D/L
35. Sodium Sulfide flakes from sodium sulfate, Dhaka Lab-21.08.17
36. Pectin from Ripe Jackfruit waste, 30.10.17\_D/L
37. Baby Liquid Laundry Detergent, (Sponsored), 01.11.17\_D/L
38. Transformer core using soft ferrite material, 27.11.17\_D/L
39. Facial Cleanser (Sponsored), 11.06.18\_D/L
40. Fatty Oil from Cotton seeds (BombaxCieba), 09.12.18\_D/L
41. Herbal Body Oil, 09.12.18\_D/L
42. Herbal Face Wash, 25.03.19\_D/L
43. Ultrasound Gel, 07.4.19\_D/L
44. Spin Coater for thin film solar cell fabrication, 24.4.19\_D/L
45. Aluminum Sulphate Anhydrous from scrap Aluminum, 12.12.19\_D/L
46. Production of Herbal Mosquito Spray (Sponsored), 27.09.20\_D/L
47. Production of Herbal Body wash, 17.12.20\_D/L
48. Herbal Skin Care Cream (Sponsored), 09.03.21\_D/L
49. Anti Bacterial Hand Wash (Sponsored), 10.03.21\_D/L
50. Production of Amyl Acetate, 04.11.21\_D/L
51. Production of Hand Sanitizer Gel, 16.11.21\_D/L
52. Development of in-situ Arsenic Detection Kit for Aqueous Medium, 24.11.21\_D/Lab
53. Production of Iron (III) Chloride ( Anhydrous) from Scarp Iron, 24.01.22\_D/L
54. Formulation Hair and Scalp Cleanser, 25.04.22\_D/L
55. A process for the production of Herbal Powder Mouth wash, 27.09.2022\_D/L
56. A Process for the production of Octyl Acetate, 29.09.2022\_D/L
57. Production of Ammonium Oxalate (monohydrate) from Ammonium Carbonate, 29.09.2022\_D/L
58. Formulation of Vanilla flavor, 30.10.2022\_D/L
59. Production of Calcium Acetate hydrate from Calcium Carbonate, 31.10.2022\_D/L
60. Formulation of Moisturizing Hand Wash, 25.01.2023\_D/L
61. Formulation of Skin Care Gel, 07.05.2023\_D/L
62. Analytical Grade Sodium Oxalate, 29.12.2024\_D/L
63. Production of 2-Nitrochalcone, 26.01.2025\_D/L
64. Analytical Grade Sodium Acetate, 26.05.2025\_D/L



◆ Contact Address ◆

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