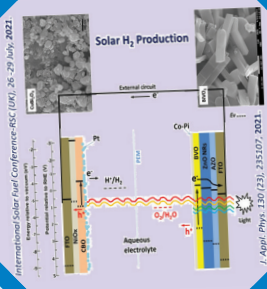
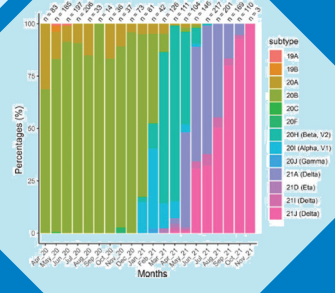
ANNUAL REPORT
2021-2022





BCSIR Dhaka Laboratories
Bangladesh Council of Scientific and Industrial Research (BCSIR)
Dr. Qudrat-i-Khuda Road, Dhanmondi, Dhaka-1205
Website: www.dhakalabs.bcsir.gov.bd

BCSIR DHAKA LABORATORIES ● ANNUAL REPORT 2021-2022

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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BCSIR

Message from the Chairman

It is an immense pleasure for me to know that the BCSIR Dhaka Laboratories is going to publish its Annual Report for the fiscal year 2021-2022. This report reflects the yearly research and development (R&D) activities and achievements of this multidisciplinary institute.

I recall with the most profound respect to the Father of the Nation Bangabandhu Sheikh Mujibur Rahman, the greatest Bengali of all time for his dynamic leadership to bring Independence to Bangladesh in 1971. Bangladesh is currently referred to as a **"Role Model for Development"** all over the world. We are feeling proud of commissioning Padma Bridge- the largest bridge in the country, which was financed by our fund through the rock-solid fortitude and unwavering perseverance of Honorable PM Sheikh Hasina. Many other infrastructure projects are near to commencing their services. Keeping this Government's visionary ideology; Bangladesh Council of Scientific and Industrial Research (BCSIR) is functioning symmetrically for contributing to national development.

BCSIR Dhaka Laboratories commenced its magnificent journey in 1955 to invigorate scientific and industrial research in Bangladesh. It is the largest multidisciplinary research laboratory in BCSIR and conducts both basic and applied R&D projects focusing on several important fields, including biological, chemical, fiber and polymer, genomic, industrial physics, pulp and paper, pharmaceutical sciences, physical instrumentation, and soil, water, and environmental research.

In this fiscal year, BCSIR has established the **"Synthesis Laboratory"** in BCSIR Dhaka Laboratories which is an excellent platform for advanced research and development activities. Dhaka Laboratories continued the genome sequencing of new variants of Corona Virus and also developed a low-cost Covid-19 Kit, known as **'BCSIR-COVID Kit'**.

Another noteworthy work of BCSIR Dhaka Laboratories is a collaborative work with Government mega projects to assess its impact on air quality. This unit has taken various initiatives for the skill development of scientists and associates by arranging and participating in different scientific conferences, seminars, symposiums, workshops and training programs at the national and international levels. The Scientists of this institute are also providing support to the research works of MS, M.Phil, and Ph.D students of different universities through institutional supervision.

I express my heartiest appreciation to the Director and Scientists of BCSIR Dhaka Laboratories for their diligent endeavor and sincere contribution to flourish this institute and wish overall success of its journey.

(Professor Dr. Md. Aftab Ali Shaikh)
Chairman, BCSIR

BCSIR

Message from the Director

I am delighted to introduce the Annual Report of BCSIR Dhaka Laboratories for the fiscal year 2021-2022 and pleased to read through the abundance of R&D activities and accomplishments undertaken throughout the seven divisions of this institute. This report represents a comprehensive view of all the numerous research activities, services to the industries, skill enhancement training program of scientists and the overall growth of the unit. BCSIR Dhaka Laboratories ensures significant research development through engagement with the major sectors to identify opportunities for new research, weekly seminars to present project progress as well as supporting research works of MS, M.Phil, and Ph.D students of different universities. It is mentionable that scientists from Genomic Laboratory of this Institute have wholeheartedly performed the genome sequencing of new variants of Corona Virus and developed **'BCSIR-COVID Kit'.**

BCSIR Dhaka Laboratories is one of the prominent institutes of BCSIR. This unit helps the industrial sector in many ways, viz: by developing new products, improving the quality of existing products, testing for export and import items, etc in the fields of biological, chemical, physical and pharmaceuticals. However, there was a lack of advanced **Synthesis Laboratory** to synthesize the novel compounds. This fiscal year, a dedicated modern Synthesis Laboratory has been established in BCSIR Dhaka Laboratories.

I express my deepest gratitude to the chairman of BCSIR for his kind support to improve the research quality. I want to thank the committee members for their hard work and dedication for publishing this Annual Report. I also acknowledge to all scientists and staffs for their sincere effort for making this year significant with their research work.

I'm excited about the upcoming years and the laboratories continuous research progress.

Dr. Md. Sarwar Jahan
Director, BCSIR Dhaka Laboratories

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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 Laboratories, Dhaka 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. Sarwar Jahan
Total number of research Divisions	: 07

Projects

Total ongoing R&Ds	: 55
Number of ongoing ADPs	: 01

Achievements

Number of published papers	: 66
Number of accepted processes	: 05
Number of patents	: 03 (submitted)

Services

Analytical services	: 3131
Student supervision	: 49
Dissemination of technology	: 34

Manpower

Number of scientists	: 106
Number of officers	: 20
Number of staff	: 41

Organizational Chart of BCSIR Dhaka Laboratories

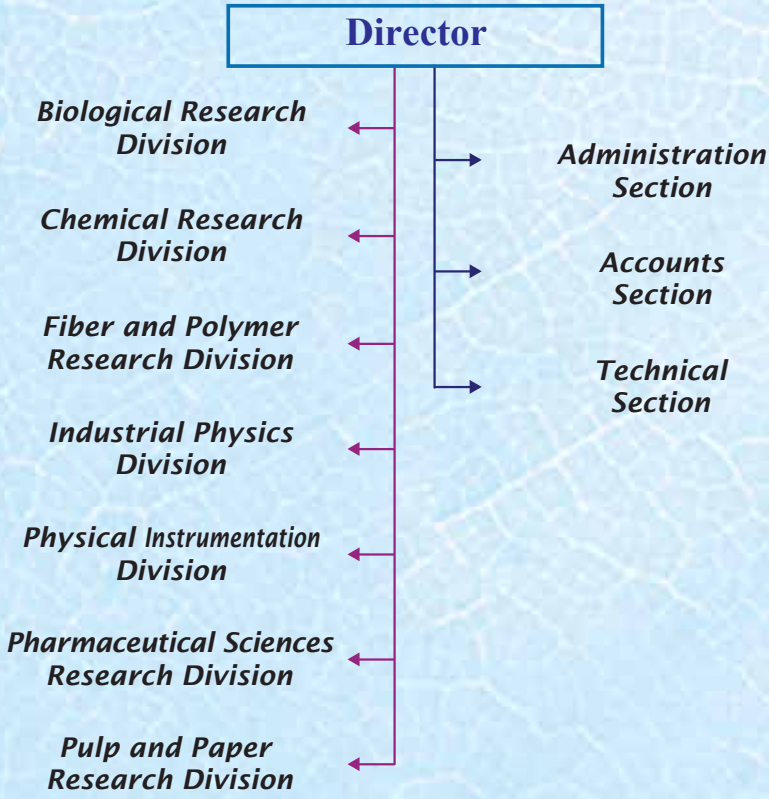

Table & Contents

BIOLOGICAL RESEARCH DIVISION (BRD)

Scientists of BRD

BIOLOGICAL RESEARCH DIVISION (BRD)

BIOLOGY, A WAY OF GREEN LIFE

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

- Number of scientists: 27
- Total ongoing R & D: 14
- Analytical services: 1678
- Published Paper: 16
- Accepted Process: 01

  - Tissue Culture: biotechnological research along with whole genome sequencing of human, bacteria and viruses using next generation sequencing technique.
  - Soil, Agronomy and Environment: conduct research on soil pollution remediation, soil health improvement, air pollution monitoring, air pollution remediation.
  - Applied Botany: research on economically important algae, medicinal, horticultural and flowering plants culture and producing and marketing *Spirulina.*
  - Plant Pathology: to identify fungal and bacterial infection on plant and their remediation.
  - Plant Physiology: conducts research on plant hormones and biochemical activities of different vegetables.
  - Zoology: engaged on applied entomology and fisheries.

R&D projects:

1. Analyzing the impact of Wnt signaling system as molecular Diagnostic method and therapeutic target for cancer

Iffat Jahan (PL), Dr. Md. Salim Khan, Dr. Md. Ahashan Habib, Dr. Shahina Akter, Dr. Tanjina Akhtar Banu, Dr. Murshed Hasan Sarkar, Barna Gowsami, Md Saddam Hossain, Md. Mohi Uddin

Introduction:

Wnt pathway plays a vital role in regulating different physiological processes. Wnts and their downstream effectors involve in various processes that are important for cancer progression, including tumor initiation, tumor growth, cell senescence, and metastasis. Breast cancer represents one of the most significant disease burdens of any cancer worldwide. However, breast cancer is a complex, heterogeneous disease characterized by a great multitude of aberrations at the genomic and molecular level, which can manifest in deregulated signaling pathways. A hallmark of many cancers is aberrant regulation of the Wnt signaling pathway, and breast cancer is no exception.

Objectives:

- Analyzing the activity of Wnt signaling pathway in different breast cancer patients.
- Demonstrating the co-relation between Wnt signaling and metastatic tumorogenesis.
- Establishing the interconnection between Wnt signaling and tumor repressor oncogenes.

Work Progress:

- Laboratory experiment method has optimized by undergoing trial and error process.
- Chemicals, reagents and kits for undergoing the experiment has received.
- Sample collection of breast cancer patients is ongoing.
- Nucleic acid extraction has completed of collected samples.
- Runned metatranscriptomics of 24 samples.

2. Integrated genomic analysis of ovarian cancer related gene in human

Salim Khan (PL), Ahashan Habib, Shahina Akter, Tanjina Akhtar Banu, Dr. Md. Murshed Hasan Sarkar, Barna Goswami, Iffat Jahan, Mohammad Mohi Uddin

Introduction:

Ovarian cancer represents the leading cause of cancer deaths among gynecological malignancies, accounting worldwide for about 225.000 new cancer cases and about 140,000 deaths every year. The annual mortality rate per 100,000 people from ovarian cancer in Bangladesh has increased by 40.3% since 1990, an average of 1.8% a year. Next-generation-sequencing which is currently providing new and exciting results will be very potential in case of precision medicine. In this project the DNA sequences of exons from coding genes in ovarian cancer of some patients will be analyzed.

Objectives:

- Whole genome sequencing of ovarian cancer patient's sample.
- Mapping, germline variant calling analysis and annotation of sequency data.
- Find out various pathogenic variants of ovarian cancer genes (Hereditary mutant genes as well as GWAS risk gene) using whole genome sequencing (NGS) data.

Work Progress:

- Sample collection and all other experiments are ongoing.
- Nucleic acid extraction protocol are established.
- Library preparation protocol are established.

3. Extraction of alkaline protease enzyme and its industrial application

Dr. Md. Ahashan Habib (PL), Dr. Md. Zamilur Rahman, Dr. Md. Tushar Uddin, Dr. Md. Murshed Hasan Sarkar, Md. Abdur Razzaq, Dr. Md. Salim Khan

Introduction:

The use of chemicals around the globe in different industries has increased tremendously, affecting the health of people. Establishing enzymatic processes in spite of chemical processes has been a prime objective of scientists. Various enzymes, specifically microbial proteases are the most essentially used in different sectors, such as textile, leather, feed, waste and others. Of the 60% of enzymes marketed worldwide, proteases account for 20%. Researchers are looking for microbial proteases as they can tolerate harsh conditions, ways to prevent auto-proteolytic activity, stability in optimum pH, and substrate specificity.

Objectives:

- The main purpose of this study is isolation, screening, and identification by morphological and biochemical aspects of potent alkaline protease-producing bacteria.
- This enzyme can be applied in more than one specific industrial application, such as bioactive peptides used in the food and pharmaceutical industries.

Work Progress:

- Laboratory experiments are ongoing.

4. Production of a locally developed low-cost molecular diagnostic kit to tackle the COVID-19 pandemic

Dr. Md. Murshed Hasan Sarkar (PL), Salim Khan Ahashan Habib, Shahina Akter, Tanjina Akhtar Banu, Barna Goswami, Iffat Jahan, Mohammad Mohi Uddin

Introduction:

Most molecular tests for SARS-CoV-2 are designed to detect specific RNA sequences found in the viral genome. The BCSIR has been monitoring the SARS-CoV-2 virus mutations, and potential impact on testing, throughout the pandemic. The recently identified B.1.1.7, B.1.351 and P.1 variant has been associated with an increased risk of transmission; therefore, early identification of this variant in patients may help reduce further spread of infection. Molecular tests are typically highly sensitive for the detection of the SARS-CoV-2 virus. However, all diagnostic tests may be subject to false negative results, and the risk of false negative results may increase when testing patients with genetic variants of SARS-CoV-2.

Objectives:

- To strengthen local country capacity in Bangladesh for COVID-19 response by bridging the current void in locally manufactured diagnostic test kits.
- It will create local capacity for scaled-up manufacturing of validated diagnostic test kits, thereby creating supply assurance and self-reliance for COVID-19 diagnostic testing.

Work Progress:

- Kit is ready and already applied for DGDA Approval.

5. Effect of insect in formation of agar within agarwood tree

Nahid Sultana (PL), Md. Rakibul Hasan, Shanzida Islam, Amena Kibria

Introduction:

Aquilaria malaccensis commonly known as agar wood has aromatic and medicinal values. Generally it takes 4 or 5 years to accumulate resin as agar. The quality of nailing agar does not match with the naturally infested product which is mainly caused due to the infection of some biological objects such as insect, fungus etc. The present research is to study the natural phenomena associated with the production of high quality agar.

Objectives:

- Collection of insects from Agar plants and their taxonomic identification.
- Studying the Life-cycle of insects in laboratory scale.
- Identifying other biological agents incorporating agar formation within agarwood tree.

Work Progress:

- One kind of fungus *Fusarium solani* supposed to be responsible for agar formation was inoculated within a branch of agarwood tree. After four months of inoculation agar is formed within the fungus injected branch.
- Agar oil was extracted from the cutting wood pieces of the fungus infected tree.

A

B

C

Fig. 1: Culture and growth of *Fusarium solani* in Laboratory and agarwood tree. *A. F. solani* in broth media B. Growth of fungus within agarwood tree C. Wood pieces after agar formation (Brown coloured portion)

6. Developing a sustainable technology for *Tubifex* worm Culture

Nahid Sultana (PL), Mahmuda Begum, Shanzida Islam

Introduction:

Tubife tubifex (Tubificid) commonly known as sludge worm is one of the cosmopolitan freshwater oligochaeta that plays an important role as supplementary food (live or freeze dried) in aquaculture. In Bangladesh fish farming is now expanding tremendously. But still now we are not self-independent for fish feed especially for juvenile & ornamental fish. Aquarium culturists are collecting tubifex other than natural resource mostly from India. So, an initiative has been taken to develop a suitable technique for this high protein live feed for fishes.

Objective:

- To develop an ecofriendly appropriate culture media for Tubifex worm culture.
- Providing a reliable supply of live food & assuring human and aquaculture health through commercialization.

Work Progress:

- Two culture set up of tubifex worm was continued using different organic media such as cow dung, poultry manure, rice gruel, rice polish and mustard oil cake.
- Cow dung and mixture of cow dung and poultry manure showed highest growth among these media.

A B

Fig. 1: *Tubifex* worm culture system A. Experimental set up of *Tubifex* worm B. Growth of *Tubifex* worm in single culture system (Cowdung+Poultry Manure)

7. Trace metals and radionuclides in raw, pasteurized, powder, ultra heat treated commercial cow milk and infant formula: Health risk assessment in Bangladesh

Dr. Mohammad Moniruzzaman (PL), Sabrina Mostofa, Badhan Saha, Dr. Md. Monarul Islam, Afsana Parvin, Priyanka Dey Suchi

Introduction:

Milk is an essential component of human nutrition, especially for infants and children. It is also an appropriate source of calcium for adults to prevent bone fracture and osteoporosis. Moreover, milk is a critical indicator of contamination within the food chain as it can provide a strong vector of radionuclides and heavy metals from the environment to humans. Contamination of milk might result in growth and mental retardation, neurological and cardiovascular diseases. Therefore, this research aims to determine the concentration of the trace metals and radionuclides in raw, pasteurized, powder, commercial cow milk and infant formula and assess the human health risk in Bangladesh.

Objectives:

- Investigate the trace metals and radionuclides in raw, pasteurized, powder, commercial cow milk and infant formula.
- Human health risk assessment due to trace metals contamination and presence of radionuclides in raw, pasteurized, powder, commercial cow milk and infant formula available in Bangladesh.

Work Progress:

- More than 86 nos. of milk samples of different representative brand were collected from market, super shops and different dairy farms.

- The trace metals (Pb, Cd, Cr, Ni, Cu, Zn, Ag, As, Hg, Se, Bi, Sb, U, Co, Cs, Sr, Ba, Be, Sn, Ag, Ti, V etc.) and essential elements (Ca, Mg, Fe, Mn, K, Na etc.) were analyzed by ICPMS.
- Daily intake of heavy metals (DIM), Human health risk index (HRI) and Total target health quotient (TTHQ) via milk consumption were also analyzed.
- Radionuclides: ^{134}Cs, ^{137}Cs, ^{131}I, ^{89}Sr, ^{90}Sr, ^{210}Pb, ^{226}Ra, ^{228}Ra, ^{129}I, ^{40}K were analyzed
- Data analysis, data interpretation and Paper writing is going on.

Fig. 1: Milk and Milk products collected from different dairy frams, market and super shops

ICPMS

Fig. 2: Microwave Digester and ICPMS

8. Metal contamination and ecological risk of major estuary in Bangladesh: A Base Line Study

Dr. Md Kamal Hossain (PL), Dr. Mohammad Moniruzzaman, Badhan Saha, Afsana Parvin, Afroza Parvin, Priyanka Dey Suchi

Introduction:

Ensure long term water and food security, economic growth and environmental sustainability while effectively reducing vulnerability to natural disasters and building resilience to climate change and other delta challenges through robust, adaptive and integrated strategies, and equitable water governance to aim a prosperous Bangladesh.

One of the major estuary in Bangladesh (Moheskhali, Chattogram)

Objectives:

- Assess the degree of contamination level of the ecosystem as a reference site, and to determine the possible sources of pollutants of the major Estuary.

Work Progress:

- Sample collection has been done of the major 3 estuary of the southern and western part of the Bangladesh and Laboratory analysis almost 60% has completed.

9. Effect of Arsenic-Selenium interaction on some food crops and its possible relevance to arsenicosis disease

Badhan Saha (PL), Dr. Mohammad Moniruzzaman, Dr. Md Kamal Hossain, Afroza Parvin, Afsana Parvin, Priyanka Dey Suchi, Dr. Shahina Akter, Dipa Islam

Introduction:

Arsenic contamination in the environment is a serious public health problem in several regions of the world.In Bangladesh, there are many areas that are affected by arsenic and a number of arsenicosis patients have been identified while in some arsenic-affected areas no arsenicosis patients have been identified yet. The present work is to examine any relevance to the selenium (Se) content in the soil, water, and in an edible plant to the incidence of arsenicosis in some arsenic hotspots of the country where arsenicosis patients have been identified and where no arsenicosis patients have yet been reported.

Objectives:

- To find out any interaction between arsenic and selenium.

- To determine arsenic and selenium content in the soil, water, and plant of arsenic-affected areas where arsenicosis patients are prevalent and where no arsenicosis patients have been identified yet.
- To find out the effect of selenium on some common food crops grown in As-contaminated soils
- To find out the possible relevance of arsenic-selenium interaction to arsenicosis disease.

Work Progress:

- Field experiment has been completed with different food crops to study the interaction between arsenic and selenium.
- Samples (Soil, water &plants) from different arsenic hotspot areas of Manikganj, Munshiganj, Sonargaon, Ishwardi, Chapainawabganj, and Jashore of Bangladesh have been collected.
- Analysis of samples have been completed.
- Data collection, data analysisand data interpretation is going on.
- Scientific paper writing is going on.

Fig. 1: Preparation of growth media for pot experiment with *(Ipomoea aquatica)* to study the interaction between As and Se.

Fig. 2: Pot experiment with Red amaranths (*Amaranthus gangeticus*) to study the interaction between As and Se.

Fig. 3: Talking to local peoples for getting the information about the arsenicosis patient of that area.

Fig. 4: Collection of different information about arsenicosis patient before collection of samples.

10. Development of carboxylate-modified biosorbent material for the removal of synthetic dye and heavy metals from industrial effluents

Afsana Parvin (PL), Dr. Mohammad Moniruzzaman, Dr. Md. Kamal Hossain, Badhan Saha, Afroza Parvin, Priyanka Dey Suchi

Introduction:

Sustainable wastewater treatment is the foremost challengeof the twenty-first century. The conventional methods of wastewater treatment are expensive, require high amounts of energy and reagent, and cause secondary pollution through the production of chemical sludge and disposal of floc residues. An alternative environmentally favourable method can be biosorption methods. Biosorbents are cheaper, more effective alternatives for the removal of metallic elements, especially heavy metals and dyes from aqueous solution. In this research, our target was to develop a suitable (carboxylate-modified) biosorbent for removing synthetic dye and heavy metals from industrial effluent.

Objectives:

- To remove synthetic dye and heavy metals from industrial effluents.
- To assess the potential of modified biosorbent material in removing dye and metals.

Work Progress:

- Biosorbent material from indigenous sources has been collected and prepared.
- Characterization of biosorbent has been carried out.
- Modification of biosorbent material has been done.

- Effectiveness of the modified biosorbent has been examined through Batch biosorption trials.
- Analysis of samples, data collection and data interpretation is going on.

11. Assesing the effect of allantoin to improve the salt tolerance of *Oryza sativa* and *Solanum tuberosum*

Nasima Momtaz (PL), Amena Kibria , Dr. Md. Humayun Kabir, Dr. Tanjina Akhtar Banu, Dr. Md. Salim Khan, John Liton Munshi

Introduction:

Salinity is a major abiotic stress affecting plant growth and yield worldwide (Munns and Tester, 2008). Allantoin (5-ureidohydantoin or 5-ureidoacetolactam), a heterocyclic nitrogenous compound, is one of the intermediates of ureide metabolism in plants. Ureide compounds are generated from catabolism of purines and play an important role in plant nitrogen metabolism (Werner and Witte, 2011). These studies have shown that allantoin may be related to stress tolerance, but we still know very little about exogenous allantoin that helps plants cope with abiotic stresses.

In this research we want to study the effect of allantoin on plant growth and plants physiological change.

Objectives:

- To reduce the impact of salinity on vegetable crop production.
- To measure the yield and yield attributes of vegetative growth of crop under salt stress.
- To quantify the effect of Allantoin on plant growth under saline soil.

Work Progress:

- Stress tolerance level of potato plant on saline has been observed and optimized.
- Application of Allantoin on MS media on potato plant has been successfully completed.
- Observed germination, shoot and root growth of potato plants in MS media with different concentrated NaCl as well as Allantoin (Treatment).

Fig. 1: Potato culture in MS media on different concentrations of NaCl.

Fig. 2: Effects of Allantoin on 21 days Potato plants in MS media with NaCl .

12. Chitosan-Sodium Alginate based plant growth regulator (PGR)

Amena Kibria (PL), Nasima Momtaz, Dr. Md. Monarul Islam, John Liton Munshi, Dr. Md. Sarwar Jahan

Introduction:

The quest for biological methods to prevent the use of chemical products in agriculture has led to the investigation of biopolymers-based materials in recent years. The biomaterials based on the biopolymer Chitosan (CHT) produced the best results out of all of the ones studied. It has a wide range of applications from agriculture to human health care products. It is used to increase plant productivity and extend the commercial life of detached fruits. On the other hand, brown algae play a remarkable economical role, used mainly as source of alginate, a cell wall polysaccharide of brown seaweed with several industrial uses.

Objectives:

- To develop Chitosan-Sodium alginate-based Plant Growth Regulators.
- To develop Chitosan-Sodium alginate-based Organic preservative for fruits and vegetables.

Work Progress:

- Culture of fungi and extraction of chitosan from fungi is going on.
- Sample collection of seaweed from saint martin island has been done.
- Almost 36 methods tried for extraction of sodium alginate from sea weeds.

Fig. 1: Sodium Alginate extraction from Brown Algae

13. Bioremediation of heavy metals in industrial wastewater by using different species of microalgae and hydrophytes

Natasha Nafisa Haque (PL), Mst. Elina Akther Zenat, Dr. Md. Zamilur Rahman, Dr. Md Kamal Hossain, John Liton Munshi

Introduction:

Heavy metal discharge into the environment has become a rapid practice owing to the increasing trend in technology and also their use in different industrial processes. Heavy metal containing waste water is toxic to the aquatic environment and to life due to their bio-accumulating, cytotoxic, mutagenic and carcinogenic effects. Considering the many adverse effects that accompany environmental pollution by heavy metals comes a better and an effective remedial approach, a process known as bioremediation. Microalgae and hydrophytes present a relatively great size for heavy metal ion binding at an eco-friendly rate of production.

Objectives:

- Minimization of waste water containing heavy metals by bioremediation process.

Work Progress:

- For the bioremediation of Hemiatpur, Savar and Narayanganj industrial wastewater, the hydrophytes & *cyanobacteria* were collected from Gopalganj, Dhaka and biological research division, BCSIR labs, Dhaka, respectively. Then the selected hydrophytes were preserved into soil containers for 30 days and using tap water for preservation.
- The *cyanobacteria* was cultured in Zarrouk's liquid medium and CH media for growing Algae with favorable condition.
- The bioremediation process of industrial wastewater by hydrophytes and *cyanobacteria* has been running.

A B

Fig. 1: Different Stage of Wastewater treatment. A. Hydrophytes, B. Microalgae

14. Bio-remediation of fungi responsible for infestation of finished leather

Mst. Elina Akther Zenat (PL), Natasha Nafisa Haque, Mst. Nadira Begum, Dr. Md. Zamilur Rahman, John Liton Munshi, Kanish Fatema , Dr. Md. Abdulla-Al-Mamun

Introduction:

Leather is utilized in making a large number of commercial commodities and it has gained a status symbol as one of the topmost foreign exchange earner and belongs to the elite of society. Leather being a biological product is rich in protein and lipids which acts as a suitable nutrient medium for the growth of microorganisms. This type of leather problem solved by synthetic chemicals and fungicide. But these compounds produce a negative impact on the environment. Besides, the microbes are becoming to these chemicals. Generally, medicinal and antifungal plant extract are uses for bio-remediation process.

Objectives:

- Biological control of finished leather growing fungi by using different bio-control agents.

Work Progress:

- Using different solvent methods for extraction bio-control agents
- Potato dextrose ager (PDA) media has been used for fungus culture.
- Various plant parts samples collection from plant for extraction of bio-control agents.
- Effect of bio-control agents on fungus activities has been done.

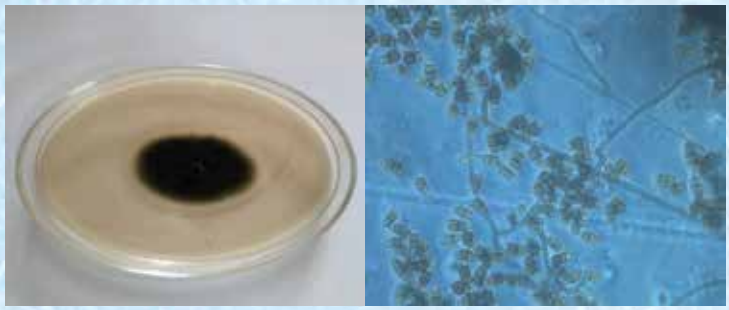

Fig.1: *Curvularia* sp Microschopic view-*Curvularia* sp

Special Allocation Projects:

1. Environmental Performance Evaluation (EPE) of Fixed Chimney, Zigzag and Hybrid Hoffman Brick Kilns Incorporating Gravity Settling and Spray techniques

Dr. Mohammad Moniruzzaman (PI), Badhan Saha

Introduction:

Brick kilns emission consists of black carbon, dust particles, and gases such as VOCs, SO2, NOx, H2S, CO etc. The releases of toxic substances are adversely affecting soil, plants, animals and people in their surroundings environment. Among different kiln technologies, the FCK is the least efficient and most polluting and the Tunnel, the most efficient and less polluting. Other technologies such as Zigzag and HHK are substantially cleaner, consuming less energy and emitting lower amounts of pollutants, but are still being piloted in Bangladesh. An interest created among the brick field

owners to adopt and shift to newer technologies have resulted. About 70 percent of the FCKs have been converted to Zigzag Kilns using local artisans. Some FCKs were accurately converted, but rests of them were not converted accordingly. The environment performances of these kilns are not well known. There is no specific data of emission load of these converted kilns. These kilns are required to be categories according to their energy and environment performances.

Objectives:

- To establish a baseline environment performance of traditional fixed chimney, Zigzag and Hoffmann kilns.
- To independently evaluate the environmental performance (stack emission and ambient air quality) of different types of converted brick kilns built by the public/private entrepreneurs incorporating gravity settling chamber and water spray system.
- To access the emission load of fixed chimney, Zigzag and Hybride Hoffmann kilns after conversion.

Work Progress:

- Baseline data were collected from the selected kilns.
- The stack gases, particulate matter and ambient air of Fixed Chimney, Zigzag and Hybrid Hoffman Brick Kilns were analyzed with and without having Gravity Settling chamber and water spray system. The emission loads, emission factors of these kilns were also calculated.
- The environment performance Evaluation of these kilns was measured.
- Data analysis, data interpretation and Paper writing is going on.

2. *Agrobacterium*-mediated genetic transformation of Alpha zein gene in *Rubus parvifolius*

Shahina Akter (PI), Barna Goswami

Introduction:

Traditional vaccines for pneumonia are expensive, require refrigeration and produce poor mucosal response. In contrast, edible vaccines are cheaper, grown locally using standard methods and do not require capital-intensive pharmaceutical manufacturing facilities. Mass indefinite production would also decrease dependence on foreign supply. The cost of the vaccine is also influenced by the plant-production system, as it has direct impact on the time spent in development and the cost of containment and processing. The present research are aimed to develop a protocol for *Agrobacterium* mediated genetic transformation using Alpha zein gene into Rubus for the production of an edible vaccine.

Objectives:

- To develop edible vaccine using *Rubus* as fruit plant.
- The sequences of *Streptococcus pneumoniae* epitopes have been introduced into a plant expression vector (pTRA) and transferred into *Agrobacterium tumefaciens*.
- One predicted peptide sequences were selected and that was placed in fusion with alpha zein. So the constructs with alpha zein are the sequences for the epitops of *Streptococcus pneumoniae.*

Work Progress:

- In vitro regeneration of *Rubus* are completed
- Genetic Transformation experiments are optimized and ongoing.

3. Effects of CRISPR-Cas system on the evolution and survival of antibiotic resistant bacteria

Md. Murshed Hasan Sarker (PI), Md. Mohiuddin

Introduction:

The emergence of antibiotic resistant microorganisms is a threat to public health. Horizontal transfer of antibiotic resistance genes contributes to the emergence of multidrug resistant bacteria capable of causing untreatable infections. Some bacteria encode a barrier to horizontal gene transfer, referred to as CRISPR-Cas. CRISPR-Cas (Clustered, regularly interspaced, short palindromic repeats-CRISPR associated) is a prokaryotic adaptive immune system found in almost 90% of sequenced archaea and about 40% of bacteria. Nucleic acid invaders targeted by CRISPR-Cas are typically bacteriophages or mobile genetic elements such as plasmids or transposons that often carry virulence factors, including antibiotic resistance genes and toxins. In this study we will evaluates the role of CRISPR/ Cas systems in bacterial pathogens.

Objectives:

- To explore how adaptation rates and mutational diversity depend on CRISPR-Cas.
- To analyze the distribution of drug resistance genes contributing to resistance against β-lactams, carbapenems, and aminoglycosides, as well as the distribution of genes contributing to the acquisition of exogenous genetic materials
- To further investigate the effects of CRISPR-Cas defense on antibiotic resistance gene transfer.

Work Progress:

- Laboratory works are on going.

4. Extraction of alkaline protease enzyme and its industrial application in tannery

Dr. Md. Ahashan Habib (PI), Dr. Tanjina Akhtar Banu

Introduction:

The complete leather manufacturing process is divided into three fundamental sub processes: preparatory, tanning and crusting stage. The process of leather tanning involves the use of different chemicals, many of which are released as wastes. In addition the process consumes between 50-150 liters of water per kg of leather produced. Reports on enzyme based dehairing from different laboratories showed highly encouraging results leading to substantial reduction or total elimination of sulfide and lime released in to the environment. Microorganisms have a potential to produce enzymes, production cost of the enzyme is the critical issue for further application at industrial level. In addition, the removal of these wastes could minimize environmental pollution.

Objectives:

- Isolate alkaline protease producing bacteria from selected sampling sites.
- Characterize the enzyme and evaluate its potential application for dehairing of skin.
- Develop and optimize enzyme production processes through solid-state fermentation.
- Test the enzyme under application conditions and evaluate sulfide concentration and total pollution load and compare with the conventional dehairing method.

Work Progress:

- Experiments are ongoing.

Achievements and Activities:

Published Paper

1. M. Murshed Hasan Sarkar, Mohammad Fazle Alam Rabbi, Shahina Akter, Tanjina Akhtar Banu**,** Barna Goswami, Iffat Jahan, M. Saddam Hossain, Eshrar Osman, Mohammad Samir Uzzaman, M. Ahashan Habib, Abu Sayeed Mohammad Mahmud, Firoz Kabir, Kazi Nadim Hasan, M. Mizanur Rahman, M. Abdul Khaleque, Sharif Akhteruzzaman, M. Salim Khan,"Genome Sequence of a SARS-CoV-2 P.1 Variant of Concern (20J/501Y.V3) from Bangladesh", *Microbiology Resource Announcements*, **2021**, 10 (27): e00524-21.

2. Tanjina Akhtar Banu, M. Murshed Hasan Sarkar, Shahina Akter, Barna Goswami, Iffat Jahan, Eshrar Osman, Mohammad Samir Uzzaman, M. Ahashan Habib, Abu Sayeed Mohammad Mahmud, Mohammad Mohi Uddin, Tasnim Nafisa, M. Maruf Ahmed Molla, Mahmuda Yeasmin, Arifa Akram, M. Salim Khan, "Genome Sequencing of the SARS-CoV-2 Delta (B.1.617.2) Variant of Concern Detected in Bangladesh". *Microbiology Resource Announcements*, **2021**, 10 (48): e00849-21.

3. M. Nazmul Hoque, Md. Murshed Hasan Sarkar, M. Shaminur Rahman, Shahina Akter, Tanjina Akhtar Banu, Barna Goswami, Iffat Jahan, M. Saddam Hossain, A. K. Mohammad Shamsuzzaman, Tasnim Nafsa, M. MarufAhmed Molla, Mahmuda Yeasmin, Asish Kumar Ghosh, Eshrar Osman, S. K. Saiful Alam, Mohammad Samir Uzzaman, Md Ahashan Habib, Abu Sayeed Mohammad Mahmud, Keith A. Crandall, Tofazzal Islam & Md. Salim Khan. "SARS-CoV-2 infection reduces human nasopharyngeal commensal microbiome with inclusion of pathobionts", *Scientific Reports*, **2021**, 11 (1): 24042.

4. Atia Mamud, Badhan Saha, Shahid Akhtar Hossain. and Md. Tanvir Ahmed Chowdhury, "Alleviation of arsenic accumulation in rice by applying silicon-rich rice husk residues in Bangladesh soil", *Bangladesh Journal of Scientific and Industrial Research,* **2021**, 56 (3): 195-206.

5. Md. Mizanur Rahaman, Md. Murshed Hasan Sarkar, M. Shaminur Rahman, M. Rafiul Islam, Israt Islam, Otun Saha, Shahina Akter, Tanjian Akhtar Banu, Iffat Jahan, Md. Ahasan Habib, Barna Goswami, Latiful Bari, Md Abdul Malek, Md. Salim Khan,"Genomic characterization of the dominating Beta, V2 variant carrying vaccinated (Oxford−Astra Zeneca) and nonvaccinated COVID-19 patient samples in Bangladesh: A metagenomics and whole genome approach", *J. Med. Virol*, **2022**, 94 (4): 1670-1688.

6. Barna Goswami, Nasima Momtaz, M. I. Hoque, · R. H. Sarker, "Performance of F1 progenies developed through crosses between Brassica carinata A. Braun A(♀) and Brassica rapa L (♂)", *Genet. Resour. Crop Evol*, **2022.**

7. Sadia Afrin**,** Barna Goswami, Saidur Rahman, Mohammad Nazrul Islam Bhuiyan, Kazi Asma Ahmed Shamima & Nemai Chandra Nandi, "Antimicrobial Potential of Coriandrum Sativum, Lactuca Sativa and Mentha Spicata against Antibiotic Resistant Microorganisms", *Journal of Herbs, Spices & Medicinal Plants*, **2022**, 28 (2): 193-205.

8. Barna Goswami, Salim Khan, Tanjina Akthar Banu, Shahina Akter, Mousona Islam and Ahashan Habib, "*In vitro* mass propagation of withania somnifera (l.) Dunal an important medicinal plant of Bangladesh", *Bangladesh Journal of Botany*, **2022**, 51(2): 191-197.

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11. Surovi Kabir, Abdul Kaium, Md. Tazul Islam Chowdhury, Mohammed Ariful Islam, Simana Akter Bhuiya, Md. Wadud Ahmed, Md. Moniruzzaman & Md. Sirajul Islam Khan, "Environmental pollution, ecological and human health risk assessment of heavy metals in rice farming system near the Buriganga River in Dhaka, Bangladesh", *International Journal of Environmental Analytical Chemistry*, Taylor & Francis, **2022**, DOI: https://doi.org/10.1080/03067319.2022.2064752.

12. Ferdouse Zaman Tanu, Azizul Hakim, Afroza Parvin, Mohammad Moniruzzaman and Mosammat Aklimatun Nasrin, "Imbalanced Nutrient Accumulation in the Coastal Soils Induced By Salinity Intrusion", *Polish Journal of Soil Science*, **2022**, LV/1, 37-49. DOI: 10.17951/pjss/ 2022.55.1.37

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16. Chapol Kumar Roy, Yuki Hoshiko, Shotaro Toya, Toshinari Maeda, "Effect of different concentrations of sodium selenite on anaerobic digestion of waste sewage sludge", *Environ Technol Innov*, **2022**, 27, 102403.https://doi.org/10.1016/j.eti.2022.102403

Accepted Process

1. Development of in-situ Arsenic Detection Kit for Aqueous Medium, Dr. Md. Kamal Hossain, Afroza Parvin, Badhan Saha, Dr. Mohammad Moniruzzaman, Dr. Samina Ahmed accepted by the office. Date: 24/11/2021 (Vide letter No. 39.02.0000.043.37.846.21/215)

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

1. Ruhul Amin, Senior Scientific Officer, Biological Research Division, Pursuing Ph.D degree from Charite, Germany.
2. Badhan Saha, Senior Scientific Officer, pursuing Ph.D at University of Dhaka, Bangladesh.
3. Mousona Islam, Senior Scientific Officer, pursuing Ph.D in Saitama University, Japan.
4. Mst. Nadira Begum, Senior Scientific Officer, Pursuing Ph.D in University of Dhaka.

Industrial Tours/ Dissemination:

Industrial Tours:

Name of the Scientists and Designation	Place	Date
Dr. Mohammad Moniruzzaman, PSO Badhan Saha, SSO	PRAN Dairy Ltd. (PIP-I) and PRAN Dairy Ltd. (PIP-II)	24 May, 2022
Dr. Mohammad Moniruzzaman, PSO Badhan Saha, SSO	Mymensingh Agro Ltd.	25 May, 2022
Dr. Mohammad Moniruzzaman, PSO Badhan Saha, SSO	Agricultural Marketing Co. Ltd.	26 May, 2022
Dr. Mohammad Moniruzzaman, PSO Badhan Saha, SSO	PRAN Agro Ltd. (NAL) PRAN Agro Ltd. (PABL Unit 2)	27 May, 2022

Dissemination:

Name of the Scientists and Designation	Place	Date
Dr. Md. Ahsan Habib, PSO Mr. Tapan Ch. Mollick, Jr. Tech	Pakundia, Kishorgonj	03-04 November, 2021
Natasa Nafisa Huque, RC Abdulah Al Mamun, Sr. Lab. Attnd.	Baliakandi, Rajbari	07-08 November, 2021
Mr. John Liton Munshi, CSO Md. Modon Miah, Jr. Tech.	Tungipara, Gopalgonj	11-12 November, 2021
Natasa Nafisa Huque, RC Abdulah Al Mamun, Sr. Lab. Attnd.	Sibpur, Narsindi	11-12 November, 2021
Mr. John Liton Munshi, CSO Md. Modon Miah, Jr. Tech.	Joypurhat Sadar, Joypurhat	18-19 November, 2021
Dr. Jamilur Rahaman, SSO Md. Majedur Rahaman, Sr. Gard.	Bagmara, Rajshahi	21-22 November, 2021
Mr. John Liton Munshi, CSO Md. Majedur Rahaman, Sr. Gard.	Damurhuda, Chuadanga	02-03 December, 2021
Dr. Md. Ahsan Habib, PSO Mr. Tapan Ch. Mollick, Jr. Tech	Meherpur Sadar, Meherpur	05-06 December, 2021
Md. Mohi Uddin, RC Md. Monirul Islam, Lab. Attnd	Moheshpur, Jenaidah	09-10 December, 2021
Dr. Jamilur Rahaman, SSO Md. Modon Miah, Jr. Tech.	Kaligonj, Satkhira	12-13 December, 2021
Dr. Md. Ahsan Habib, PSO Mr. Benazir Ahmed, Deputy Sec.	Dasmina, Potuajhali	19-20 December, 2021
Mr. John Liton Munshi, CSO Md. Modon Miah, Jr. Tech.	Barguna Sadar, Borguna	23-24 December, 2021
Mr. John Liton Munshi, CSO Md. Modon Miah, Jr. Tech.	Sundargonj, Gaibandha	26-27 December, 2021
Dr. Md. Ahsan Habib, PSO Mr. Benazir Ahmed, Deputy Sec.	Kaunia, Rangpur	29-30 December, 2021
Dr. Md. Ahsan Habib, PSO Mr. Benazir Ahmed, Deputy Sec.	Ruma, Bandarban	13-14 January, 2022

Dr. Md. Ahsan Habib, PSO Md. Monirul Islam,	Kumarkhali, Kustia	20-21 January, 2022
Mr. John Liton Munshi, CSO Md. Majedur Rahaman, Sr. Gard	Lohagora, Norail	27-28 January, 2022
Mr. John Liton Munshi, CSO Md. Majedur Rahaman, Sr. Gard	Gournadi, Barisal	06-07, February, 2022
Dr. Md. Ahsan Habib, PSO Mr. Benazir Ahmed, Deputy Sec.	Rajashali, Bandarban	27-28 February, 2022
Mr. John Liton Munshi, CSO Md. Abdulah Al Mamun, Sr. Lab. Attnd.	Indurkani, Pirojpur	03-04 March, 2022
Md. Mohi Uddin, RC Mr. Tapan Ch. Mollick, Jr. Tech	Kishorganj, Nilphamari	08-09 March, 2022

Guidance to Research Work (Ph.D/M.Phill /MS/NCST & BCSIR Fellow):

Sl. No	Title of research	Research Category	Name of the Student	Name of the Institution	Name of Supervisors
1.	Establishment of suitable regeneration protocol of some foreign fruits	Research Fellow	Sabrin Afroz Riya	Jagannath University	Dr. Md. Salim Khan, CSO
2	Transformation of Alpha zein, Gamma Zein and Ds redzein gene into Raspberry plant as an initiative for the development of an Edible Vaccine	MS	Rabeya Basury	Jagan nath University	Dr. Md. Salim Khan, CSO Dr. Shahina Akter, PSO
3.	Isolation of Protease Producing Bacteria from tannery waste	MS	Tannisa Chowdhury	Bangabandhu Seikh Mujibur Rahman Science and Technology University, Gopalgonj.	Dr. Md. Murshed Hasan Sarker, SSO
4.	Isolation of Amylase Producing Bacteria from rice mill soil	MS	Razib Biswas	Bangabandhu Seikh Mujibur Rahman Science and Technology University, Gopalgonj	Md. Murshed Hasan Sarker, SSO
5	Development of molecular biomarker for heavy metal pollution targeting metallothionein gene in selected four fishes from different environmental condition	Professor Nurul Afsar Post graduate Fellowship	Ishrat Jahan	University of Dhaka	Dr. Mahmuda Begum, SSO

6	Microplastics in Fish Feed: An alarming Issue In Agricultureal Sector of Bangladesh	Professor Nurul Afsar Post graduate Fellowship	Ismat Jahan	University of Dhaka	Dr. Nahid Sultana, SSO
7	Microplastics of some cultured and captured fish species of Bangladesh	MS (NCST Fellow)	Rafsana Rahman Tista	University of Dhaka	Dr. Nahid Sultana, SSO
8	Comparative analysis of biomass, nutrient composition and microbial contamination in natural and artificial culture system of *Tubifex* warm	MS	Jannatul Ferdous Mitu	University of Dhaka	Dr. Nahid Sultana, SSO
9	Isolation, characterization and identi fication of agarwood microflora	MS	Akhi Akhter	Jagannath University	Dr. Nahid Sultana, SSO
10	Ecological and health risk assessments of fishes in industrial contaminated water of Bangladesh	MS	Md. Mahamudul Hassan Khan	Department of Chemistry, BUET	Dr. Mo hammad Moniruzzaman, PSO and Dr. Md Kamal Hossainn, PSO
11	Bioaccumulation of heavy metals toxicity in fruits with corresponding health risk assessment	MS	Farzana Yesmin	Department of Chemistry, BUET	Dr. Md Kamal Hossain, PSO and Afroza Parvin, SSO
12	Heavy metal accumulation in water, sediments and fish (muscle) in the Tetulia river, Bangladesh	MS	Kaushik Das Karmakar	Department of Oceanography, University of Dhaka	Dr. Md Kamal Hossain, PSO
13	Spatial distribution of utrients and physio-chemical properties of sea water in the surrounding area off St. Martins Island	MS	Md. Shahriar Siam	Department of Oceanography, University of Dhaka	Badhan Saha, SSO
14	Micro remediation of heavy metals in Environment	MS	Pinky Rani Sarkar	Department of Environme ntal Science, Bangladesh University of Professional (BUP)	Badhan Saha , SSO
15	In-vitro regeneration of Arabian date palm and Avocado	MS	Dewan Nishat Afrin	Jagannath University	Dr. Md. Salim Khan, CSO Dr. Tanjina Akhtar Banu, PSO

Participation in Training /Conference:

Training:

1. **Badhan Saha (SSO)**, participated in training program on "Operation and Maintenance of Gas Chromatography (GC) held on 22-26 August, **2021** at BCSIR Dhaka Laboratories, Bangladesh Council of Scientific and Industrial Research.
2. **Priyanka Dey Suchi (SO)**, participated in training program on "Operation and Maintenance of Gas Chromatography (GC) held on 22-26 August, **2021** at BCSIR Dhaka Laboratories, Bangladesh Council of Scientific and Industrial Research.

3. **Afroza Parvin (SSO),** participated in the training program on "Operation and Maintenance of Nuclear Magnetic Resonance Spectrometer" held on 05-09 September, **2021** at Bangladesh Council of Scientific and Industrial Research.
4. **Afsana Parvin (SO),** participated in the training program on "Operation and Maintenance of Nuclear Magnetic Resonance Spectrometer" held on 05-09 September, **2021** at Bangladesh Council of Scientific and Industrial Research.
5. **Badhan Saha (SSO),** participated in training program on "Gas Chromatography-Mass Spectrometry (GC-MS) held on14-18 November, **2021** at BCSIR Dhaka Laboratories, Bangladesh Council of Scientific and Industrial Research.
6. **Badhan Saha (SSO),** participated in training program on **"**Strengthening and Management of Official Website" held on 29 November, **2021** at BCSIR Dhaka Laboratories, Bangladesh Council of Scientific and Industrial Research.
7. **Priyanka Dey Suchi (SO),** participated in training program on **"**Strengthening and Management of Official Website" held on 29 November, **2021** at BCSIR Dhaka Laboratories, Bangladesh Council of Scientific and Industrial Research.
8. **Afroza Parvin (SSO),** participated in the training program on "Dilute Solution Viscometry Using Automated Micro-Viscometer" held on 08 March, **2022** at BCSIR Dhaka Laboratories, Bangladesh, Bangladesh Council of Scientific and Industrial Research.
9. **Afsana Parvin (SO)**, participated in the training program on "Dilute Solution Viscometry Using Automated Micro-Viscometer" held on 08 March, **2022** at BCSIR Dhaka Laboratories, Bangladesh, Bangladesh Council of Scientific and Industrial Research.
10. **Priyanka Dey Suchi (SO),** participated in the training program on "Dilute Solution Viscometry Using Automated Micro-Viscometer" held on 08 March, **2022** at BCSIR Dhaka Laboratories, Bangladesh, Bangladesh Council of Scientific and Industrial Research.
11. **Badhan Saha (SSO),** participated in on line training program on "Chemical Secuirity training for Chemical and Pharmaceuticals Industry in Bangladesh" held on 15-17 March, **2022** by CRDF Global.
12. **Afsana Parvin (SO),** participated in the training program on "Method Validation for ISO 17025/2017" held on 31 August, **2021** at BCSIR Dhaka Laboratories, Bangladesh Council of Scientific and Industrial Research.
13. **Priyanka Dey Suchi (SO),** participated in training on "Operation and Maintenace of UV-Vis-NIR Spectrometer" held on12-16 September, **2021** at Bangladesh Council of Scientific and Industrial Research.
14. **Afsana Parvin (SO),** participated in the training program on "NIS for transparent data generating of particle size analyzer" held on 16 September, **2021** at BCSIR Dhaka Laboratories, Bangladesh, Bangladesh Council of Scientific and Industrial Research.
15. **Mst. Elina Akther Zenat (SSO),** has successfully completed training course on Operating and maintenance of "Dumas Protein Analyzer & Rapid Fat Analyzer" held on 24-28 October, **2021**.
16. **Natasha Nafisa Haque (RC),** has successfully completed training course on Operating and maintenance of "Dumas Protein Analyzer & Rapid Fat Analyzer " held on 24-28 October, **2021** organized by P&D.
17. **Showti Raheel Naser (SO),** successfully completed the training of 'Strengthening Management of Official Website; held on 29 November, **2021** at BCSIR Dhaka Laboratories.
18. **Sanjana Fatema Chowdhury (SO),** successfully completed the training of 'Strengthening Management of Official Website; held on 29 November, **2021** at BCSIR Dhaka Laboratories.

19. **Afsana Parvin (SO)**, participated in seminar/workshop on "Right to Information" held on 10 March, **2022** at BCSIR Dhaka Laboratories, Bangladesh Council of Scientific and Industrial Research (BCSIR).
20. **Priyanka Dey Suchi (SO),** participated in the training program on "Chemical Security Inventory Management Systems Training for Academia and Chemical Industry" held on 18-19 May, **2022** organized by CRDF Global.
21. **Barna Goswami (SSO),** completed in training Field Emission Scanning Electron Microscope (FESEM) organized by P&D.
22. **Showti Raheel Naser (SO),** successfully completed the training of 'Basic Principle Applications, Operation and Maintenance of HPLC; held on 25 January **2022** at BCSIR Dhaka Laboratories.
23. **Sanjana Fatema Chowdhury (SO)** successfully completed the training of 'Basic Principle Applications, Operation and Maintenance of HPLC; held on 25 January **2022** at BCSIR Dhaka Laboratories .
24. **Dr. Shahina Akter (PSO),** participated in Learning Session on Computational drug discovery organized by BCSIR Dhaka Laboratories on 7 march, **2022**.
25. **Priyanka Dey Suchi (SO),** participated in seminar/workshop on "Right to Information" held on 10 March, **2022** at BCSIR Dhaka Laboratories, Bangladesh Council of Scientific and Industrial Research (BCSIR).
26. **Badhan Saha (SSO),** participated in a virtual workshop on "Open-Source Research for Advanced Know-Your-Customer (KYC)/Customer Due Diligence (CDD) Workshop" held on 11-13 May, **2022**, Bangladesh.
27. **Md Kamal Hossain (PSO),** participated in the training program on "Chemical Security Inventory Management Systems Training for Academia and Chemical Industry" held on 18-19 May, **2022** organized by CRDF Global.
28. **Afsana Parvin (SO)**, participated in the training program on "Chemical Security Inventory Management Systems Training for Academia and Chemical Industry" held on 18-19 May, **2022** organized by CRDF Global.
29. **Dr. Mahmuda Begum (SSO),** participated in the training on Public Procurement during 05 June-09 June **2022** at Ministry of Planning.

Conference:

1. **Dr. Salim khan,** participated in annual plant tissue culture conference organized by Bangladesh Association on Plant tissue Culture and Biotechnology, held on May 28, **2022.**
2. **Md Kamal Hossain,** Umme Sarmeen Akhtar, Kyung Byung Yoon: "Titanium di Oxide (TiO_2) Based Nanostructure: Synthesis, Characterization and photocatalytic Application" in "International Conference on Physics" organized by Bangladesh Physical Society, 19-21 May, **2022**. Oral presentation. Abstract no. NM-04, page 33.
3. **Dr. Tanjina Akhtar Banu,** Shahina Akter, Sahida Yesmin, Barna Goswami, Md. Ahashan Habib and Md. Salim Khan **"** Transformation of pneumococcal surface protein A (PsPA) epitopes into strawberry plants as an initiative for the development of edible vaccine**"** in annual plant tissue culture conference May 28, **2022** at University of Dhaka, Dhaka-1000, abstract no-15, page no-16.
4. **Afroza Parvin,** Mohammad Moniruzzaman, Sirajul Hoque, Md. Kamal Hossain, Badhan Saha, Afsana Parvin, and Priyanka Dey Suchi, "Properties of indigenous humic substance (HS) in Bangladesh and interaction of HS with heavy metal: future green technology for lead and zinc removal from aqueous solution" in "International Conference on Physics" organized by Bangladesh Physical Society, 19-21 May, **2022**. Poster presentation. Abstract no. PP-116, page 203.

5. **Afsana Parvin,** Mohammad Moniruzzaman, Md. Kamal Hossain, Badhan Saha, Afroza Parvin, Priyanka Dey Suchi, and Sirajul Hoque "Solid-phase redistribution of lead (Pb) and cadmium (Cd) in contaminated surface soils with time" in "International Conference on Physics" organized by Bangladesh Physical Society, 19-21 May, **2022**. Poster presentation. Abstract no. PP-115, page 202.
6. **Barna Goswami,** participated in annual plant tissue culture conference organized by Bangladesh Association on Plant tissue Culture and Biotechnology, May 28, **2022**.
7. **Sanjana Fatema Chowdury,** participated in annual plant tissue culture conference organized by Bangladesh Association on Plant tissue Culture and Biotechnology, May 28, **2022**.
8. **Showti Raheel Naser,** participated in annual plant tissue culture conference organized by Bangladesh Association on Plant tissue Culture and Biotechnology, May 28, **2022**.
9. **Dr. Shahina Akter,** participated in Biotechnology Outreach Conference organized by SABP, 14-15 June, **2022.**
10. **Dr. Salim Khan,** participated in Biotechnology Outreach Conference organized by SABP, 14-15 June, **2022.**

Award:

1. **Dr. Chapol Kumar Roy (SSO)**, Obtained a Ph. D. degree in the Department of Biological Functions and Engineering, Graduate School of Life Science and Systems Engineering, Kyushu Institute of Technology, Japan under the supervision of Prof. Dr. Toshinari MAEDA.
2. **Dr. Nahid Sultana (SSO)**, awarded Ph.D from Department of Zoology, University of Dhaka on August, 2021.
3. **Dr. Mahmuda Begum (SSO)**, awarded Ph.D from School of Life Science, University of Nottingham, UK on December, 2021.
4. **Md Kamal Hossain (PSO)**, awarded the "Best Presenter Award" in "International Conference on Physics" organized by Bangladesh Physical Society, 19-21 May, 2022.

Number of Analytical (Ad-Hoc) Problem Solved:

Name of the Division	Routine type	Research Type	Total
Biological Research Division	1667	11	1678

Special contribution to Nations:

1. Sequencing of more than 1000 whole-genomes of SARS-CoV-2 strains.

In May 2020, under the initiative of honourable minister of Science & Technology, Arch. Yeafesh Osman, BCSIR has undertaken a project, to sequence 1200 SARS-COV-2 samples from eight divisions of Bangladesh. The research team has carefully established a statistically driven comprehensive plan in broad sampling and collecting associated patient data from across the country in collaboration with NILMRC (National Institute of Laboratory Medicine & Referral Centre, Bangladesh). To investigate the genetic diversity, a total of 1200 whole genomes of SARS-CoV-2 strains were sequenced by genomic Research Lab, BCSIR under the leadership of Dr. Salim Khan. Out of 1200 sequenced cases very good quality 857 sequencing data was submitted in GISAID (Global Initiative on Sharing All Influenza Data) which comprises 81% of all sequenced data generated in Bangladesh.

2. Environment monitoring activities on metro-rail (DMRT) and other projects

Soil and Environment Research section is under the Biological Research Division, established in 2010 through the ADB Projects. This is comparatively very new but highly potential section in BCSIR Dhaka Laboratories. From the very beginning this section is closely work with Government mega projects. This section is always very conscious to full-fill the dream of government election manifesto. This section assess the in-situ air quality as an independent monitoring team (IMG) of Dhaka Mass Rapid Transport (DMRT) projects and another preferential mega project of Government extension of 3rd Terminal of Dhaka International airport. This section also assess the indoor air quality of various multinational factories like Rahim Afroz, Globatt, Pran RFL, Titas Gas field and various cement factories.

Major Instruments

Atomic Absorption Spectrophotometer (AAS)

UV-VIS Spectrophotometer

Ambient Air Quality Monitoring System

Stack Emission Monitoring Instrument

Potentiometric Titrator

Mobile Ambient Air Quality with Elemental Monitoring Station

Photo Gallery

Technology Dissemination

Tungipara

Meherpur

Laboratory Work

NGS Machine room (NovaSeq 6000, NextSeq 500, MiniSeq, Microarray Iscan hybridization station) and scientists were working

Field Work: Air Quality Monitoring

Air quality monitoring at different construction sites of Dhaka Mass Rapid Transit Development Project

Environment monitoring and sample collection from BM depot fire hazard areas Shitakundo (06.06.2022)

Ph.D Award Ceremony

Dr. Chapol Kumar Roy awarded Ph.D

Short biography of BRD Scientists

John Liton Munshi (February, 1997- present)

Office	Biological Research Division			Blood group	**A+**
Position	Chief Scientific Officer			Degree obtained	MS, M.Sc (1988)
Contact	john_liton@yahoo.com			Mobile	01711 933465
Paper nos	24	Process no.	3	Patent no.	1

John Liton Munshi earned his both BSc and MS degree in Botany from the University of Dhaka. He is specialized in Bio-technology, Industrial algae farming & its bi-products. He has authored or coauthored 24 publications. He is a life member of BAS, BAAS, and NITUB. Now, he is scientists in charge of Biological Research Division since 1916

Dr. Md. Salim Khan (June, 1997- present)

Office	Biological Research Division	Blood group	**B+**
Position	Chief Scientific Officer	Degree obtained	Ph.D (2006)
Contact	k2salim@yahoo.com	Mobile	01712201504

Dr. Md. Salim Khan completed MSc in Genetics 1989 from Rajshahi University and he completed his M.Phil degree from the University of Dhaka in 1996. Dr. Md Salim Khan working in BCSIR, as a Scientific Officer since 1997 till present as CheifScientific Officer. His research areas are Biotechnology, Genomics and Molecular Biotechnology. He achieved Ph.D degree in Biotechnology specially on Tissue Culture and Virus and viriod detection in 2006, Dhaka University under DAAD Sandwich Program, Hamburg University, Germany. He has been working on invitro regeneration, potato virus dectetion, molecular biology and genome sequencing for more than 25 years.

Dr. Mohammad Moniruzzaman (June, 2006 - present)

Office	Biological Research Division	Blood group	**B+**
Position	Principal Scientific Officer	Degree obtained	Ph.D (Environment, 2018)
Contact	monirbcsir@gmail.com, monir-swe@bcsir.gov.bd	Mobile	01816702021
Citation 372	h index 11	i10 index 12	

Dr. Mohammad Moniruzzaman awarded Ph.D. degree from University of Dhaka in 2018. He got Bangabandhu Fellowship on Science & ICT for his doctorate research. He worked as a Program Director of Annual Development Program (ADP) funded by Ministry of Science and Technology in 2010. Dr. Moniruzzaman worked as a consultant for Clean Air and Sustainable Environment (CASE) Project, Department of Environment, funded by World Bank from 2017 to 2019. He is now working as a Head of Independent Monitoring Group for Environment monitoring and mitigation measure of Dhaka Mass Rapid Transit Development Project (DMRT) and Hazrat Shahjalal International Airport Expansion Project. His current research mainly focused on the GIS, Air Quality Modeling, Microplastic pollution and Environmental Impact Assessment (EIA). His credit to publish more than 52 papers in internationally reputed journal.

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 340	H - index 10	i10 - index 10	

Dr. Md. Kamal Hossain earned his BSc (2001), MS (Soil, Water and Environment, 2002) from Dhaka University and a doctoral degree (Ph.D., 2015) in Chemistry from Sogang University, South Korea (Prof. Kyung Byung Yoon). The Ph.D. dissertation title is "Order Uniformly Crystalline Mesoporous TiO2 Polymorphs and Periodic Mesoporous Organosilicas: Novel Synthesis, characterization and Photocatalytic Activity." His current research is focused on the development of new mesoporous materials, environmental science, marine pollution, climate change, and nanomaterials. He is credited with publishing more than 30 papers, including Chem. Mater. (IF 10.35), Marine Science Bulletin (IF 7.35), Catalysis Today (IF-6.32), 3 patents (WIPO), and 3 industrial processes. Dr. Hossain is also a professional member of the American Chemical Society (3224699), CSC, BAS, EDAPHOS, AD Scientific Index-2022, and INGSA.

Dr. Md. Ahashan Habib (2006- present)

Office	Biological Research Division	Blood group	**O+**
Position	Principal Scientific Officer	Degree obtained	Ph.D (2014)
Contact	ahashan73@yahoo.com	Mobile	+8801711206709

Dr. Md. Ahashan Habib has completed his BSc and MS degree from Department of Botany, University of Dhaka. He obtained his Ph.D degree from Department of Botany, University of Dhaka in 2014.Dr. Habib working in BCSIR, as a Scientific Officer since 2006 to present as Principal Scientific Officer. His research areas are Biotechnology, Genomics and Molecular cytogenetics. He is skilled in molecular techniques like PCR, Real Time PCR, Cloning, chromosome karyotype analysis etc. Till now he has supervised 4 MS thesis student and has published 30 scientific articles in many national and international journals.

Dr. Shahina Akter (2006- present)

Office	Biological Research Division	Blood group	**O+**
Position	Principal Scientific Officer	Degree obtained	Ph.D (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 Ph.D degree from Department of Microbiology, University of Dhaka. She had the opportunity to work at Plant Biotechnology in UAS Bangalore, Karnataka, India.She got a training program on “Bioinformatics Training Course” at Senate Building, University of London, UK. She has achieved RTFDCS fellowship, given by CCSTDS, Chennai, India and Bangabandhu Fellowship on Science and Technology. Dr. Shahina has more than 16 years research experience on Biotechnology, Genomics and Bioinformatics (Human Whole Genome, Metagenomics, Covid 19 whole genome sequencing), Microbiology, Molecular Biology, and Cytogenetics. Till now she has supervised 4 MS thesis research and has published 30 scientific articles in many national and international journal of repute.

Dr. Tanjina Akhtar Banu (2006- present)

Office	Biological Research Division	Blood group	**B+**
Position	Principal Scientific Officer	Degree obtained	Ph.D (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 Ph.D 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 atraining 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 6 MS thesis student and has published 25 scientific articles in many national and international journals.

Badhan Saha (December, 2009- present)

Office	Biological Research Division	Blood group	**B+**
Position	Senior Scientific Officer	Degree obtained	MS, Ph.D (On going)
Contact	badhan_swe@yahoo.com	Mobile	01911102565

Badhan Saha earned a 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 Program Associates of an Annual Development Program (ADP) from July 2009 to June 2010. Now he is doing his Ph.D 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 food chain. He has authored or co-authored 40 publications. He has two accepted processes. He is a life member of EDAPHOS, NITUB, BAAS, SSSB, and NAPD.

Dr. Nahid Sultana (December, 2009- present)

Office	Biological Research Division			Blood group	**A+**
Position	Senior Scientific Officer			Degree obtained	Ph.D (2021)
Contact	nahid.bcsir@gmail.com			Mobile	01847235694
Paper nos	15			Process no.	1

Dr. Nahid Sultana earned her both BSc and MS degree from the Department of Zoology, University of Dhaka. She obtained Ph.D Degree on "Relationship between plankton population and the survival of epidemioc Vibrio cholerae in Bangladesh" from Department of Zoology, University of Dhaka. She was awarded Bangabandhu Fellowship on Science and Technology for conducting her Ph.D 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 published15 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 Zoological Society of Bangladesh.

Dr. Chapol Kumar Roy (2009-Present)

Office	Biological Research Division	Blood group	**A+**
Position	Senior Scientific Officer (SSO)	Degree obtained	Ph.D (2022)
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 Ph.D degree from Department of Biological Functions and Engineering, Graduate School of Life Science and Systems Engineering, Kyushu Institute of Technology, Japan under the supervision of professor Dr. Toshinari MAEDA. 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 training program national and internationally. He has achieved Bangabandhu Fellowship on Science and Technology. Dr. Roy has more than 12 years research experience on Biotechnology, Microbiology, Growth analysis of Microalgae and Fungi, and Molecular Biology. Till now he has supervised 2 MS thesis research and has published 13 scientific articles in many national and international repute journals.

Dr. Md. Zamilur Rahman (July, 2006- present)

Office	Biological Research Division			Blood group	**O+**
Position	Senior Scientific Officer			Degree obtained	Ph.D (2018)
Contact	jewel.haidar@gmail.com			Mobile	01913465003
Paper nos	15	Process no.	3	Patent no.	0

Dr. Md. Zamilur Rahman earned his Ph.D 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 Applied Botany Section of Biological Research Division.

Mst. Nadira Begum (2006-Present)

Office	Biological Research Division			Blood group	**O+**
Position	Senior Scientific Officer			Degree obtained	MS (2002)
Contact	nbegum470@gmail.com			Mobile	01679259177
Paper nos	22	Process no.	2	Patent no.	-

Mst. Nadira Begum earned her both BSc and MS degree in from Department of Botany, University 0f Dhaka. Currently she is pursuing her Ph.D in Department of Botany, University 0f Dhaka .She is specialized in Mycology, Plant Pathology , Microbiology and Algae culture. She has authored and coauthored 22 publications.

Dr. Mahmuda Begum (December, 2011 - present)

Office	Biological Research Division			Blood group	**A+**
Position	Senior Scientific Officer			Degree obtained	Ph.D (2021)
Contact	mahmudabegum.bcsir@gmail.com mahmudabegum@bcsir.gov.bd			Mobile	01721313869
Paper nos	15			Patent no.	0

Dr. Mahmuda Begum is currently working as a SSO at the Zoology Section of BRD, BCSIR Dhaka Laboratories. She obtained her BSc (Hons.) and MS degree in Zoology (Fisheries) from the University of Dhaka. She received her Ph.D in Life Science from the University of Nottingham, UK in 2021. She was awarded the Vice-Chancellor's Scholarship for Research Excellence, UN, UK and Bangabandhu S & T Fellowship, Bangladesh to accomplish her Ph.D degree. Her research interest mainly focuses on evolutionary genetics, environmental molecular ecology and biotechnology including aquaculture, fish microbiology and nutrition. In her Ph.D thesis, she establishedSNPs-based molecular markers to assess phenotypic and genotypic evolution in fish. Her current research projects concern the DNA barcoding, development of molecular biomarker in fish and their microbes. She has published at least 15 research articles in peer-reviewed national and international journals. She is an active member of FSBI, BSP, BAS and ZSB.

Dr. Md. Murshed Hasan Sarkar (2011- present)

Office	Biological Research Division	Blood group	**A+**
Position	Senior Scientific Officer	Degree obtained	Ph.D (2017)
Contact	murshedhasan-raj@bcsir.gov.bd	Mobile	+8801715717691

I have completed my B.Sc. and MS from Department of Microbiology, University of Dhaka. I also did my Ph.D. from Chiba University, Japan. I was a visiting student in late William E. Paul labs, National Institute of Allergy and Infectious. Diseases (NIAID) lab, National Institute of Health, Bethesda, Maryland from Date 22 October 2013 to 21 November. I am serving as a Scientific Officer at Bangladesh Council for Science and Industrial Research (BCSIR) Laboratories, Rajshahi from 1 July 2011 to till date. I have been promoted as a Senior Scientific Officer Bangladesh Council for Science and Industrial Research (BCSIR). I had served as Research Officer at International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) from October 05, 2010 to June 30, 2011 in the Enteric & Food Microbiology under the Laboratory Sciences Division.

Mousona Islam (2011- present)

Office	Biological Research Division	Blood group	**A+**
Position	Senior Scientific Officer	Degree obtained	Ph.D (on going)
Contact	mousonaislam@yahoo.com	Mobile	-

Mousona Islam has completed her BSc and MS degree from Department of Botany, University of Dhaka. Currently She is pursuing her Ph.D in Saitama University, Japan specialization on Plant Stress Physiology. She has several years of experience in plant biotechnology especially on recombinant DNA technology and genetic transformation, cytogenetics and bioinformatics. She had opportunity to attend atraining program on "Bioinformatics Training Course" at Senate Building, University of London, UK. She has joined in BCSIR in 2011 as Scientific officer. She has co-supervised many MS thesis students and has published 14 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	MS (2011)
Contact	elinazenat@gmail.com			Mobile	01710181071
Paper nos	07	Process no.	-	Patent no.	-

Mst. Elina Akther Zenat earned her both BSc and MS degree in Botany from the National University. She is specialized in Michology and Algae Culture. She has coauthored07 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. Her research 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 one accepted process. She authored or coauthored 10 (ten) research articles in peer reviewed journals.

Barna Goswami (2015- present)

Office	Biological Research Division	Blood group	**A+**
Position	Senior Scientific Officer	Degree obtained	MS (2012)
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 attended on many training program national and internationally. She has experience onvarious molecular techniques like PCR, Real Time PCR and Next generation sequencing (NGS).Till now she has published 25 scientific articles in many national and international journal of repute.

IffatJahan (2015- present)

Office	Biological Research Division	Blood group	**AB+**
Position	Senior Scientific Officer	Degree obtained	MS (2012)
Contact	iffatjahan.ifst@bcsir.gov.bd	Mobile	+88056810752

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. She is a life member of DUSSA and EDAPHOS.

Shanzida Islam (December, 2018- present)

Office	Biological Research Division			Blood group	**O+**
Position	Scientific Officer			Degree obtained	MS
Contact	shanzida.shanzi@gmail.com			Mobile	01815005733
Paper nos	06	Process no.	0	Patent no.	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 coauthored 06 publications. She is a life member of NITUB.

Nasima Momtaz (October, 2018- present)

Office	Biological Research Division	Blood group	**O+**
Position	Scientific Officer	Degree obtained	MS (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 05 publications. She is a life member of Bangladesh Botanical Society (BBS).

Priyanka Dey Suchi (March, 2021- present)

Office	Biological Research Division	Blood group	**A+**
Position	Scientific Officer	Degree obtained	MS
Contact	priyanka_suchi@yahoo.com	Mobile	01865018673

Priyanka Dey Suchi earned BSc and MS degree in Soil, Water & Environment from University of Dhaka. She worked as a Research Fellow in Soil and Environment section at BCSIR from the year of 2015 to 2019. During this tenure she worked under two R&D projects. Her research interests are Arsenic mitigation, Heavy metals remediation, Air Pollution mitigation, Environmental Impact Assessment. She authored or coauthored 5 publications

Sanjana Fatema Chowdhuray (2021-present)

Office	Biological Research Division	Blood group	**B+**
Position	Scientific Officer	Degree obtained	MS
Contact	sanjanafatema18@gmail.com sanjanafatema@bcsir.gov.bd	Mobile	+8801517162172

I have completed my B.Sc. and MS from Department of Genetic Engineering and Biotechnology, Shahjalal University of Science and Technology, Sylhet. I have also obtained a parallel second major degree in Computer Science and Engineering from the same university. I worked as a Research Assistant at one of the UGC funded project in my department. I am also a member of International Society for Computational Biology (ISCB). I have experiences in bioinformatics, genomics, molecular biology techniques, and several microbial techniques. I took part in several offline and online training programs on programming language, drug designing, CRISPR-Cas technology and so on. I have authored and co-authored in five publications in reputed international and national journals.

Showti Raheel Naser (2021-present)

Office	Biological Research Division	Blood group	**B+**
Position	Scientific Officer	Degree obtained	MS
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. I also have working experiences with animal model.

Natasha Nafisa Haque (November, 2018- present)

Office	Biological Research Division			Blood group	**O+**
Position	Research Chemist			Degree obtained	MS (2014)
Contact	natashahaque86@gmail.com			Mobile	01768442798
Paper nos	01	Process no.	-	Patent no.	-

Natasha Nafisa Haque earned his both BSc and MS degree in Botany from the National University. She is specialized in Industrial algae farming & its bi-products. She has coauthored 01 publication.

Mohammad Mohi Uddin (2019- present)

Office	Biological Research Division	Blood group	**B+**
Position	Research Chemist	Degree obtained	MS
Contact	mohiuddin.bcsir48@gmai.com	Mobile	01812330948

Mohammad Mohi Uddin has completed both BSc and MS degree in Botany from the Nation University. He has joined in BCSIR in 2019 as Research Chemist of regarding field. He has research experience in Biotechnology like tissue culture and skilled in molecular techniques like PCR. He has attended on some conference program national and internationally.He has authored or coauthored 3 publications.

CHEMICAL RESEARCH DIVISION

Chemical Research Division is one of the largest research divisions of BCSIR Dhaka Laboratories. The main objectives of this division are to explore the natural resources of the country. Production of chemicals, both organic & inorganic, organic & inorganic synthesis, herbs processing's & herbal products, waste management from chemical and other industries as well as development of process for products from industrial wastes, production of different kinds of gum and adhesives from locally available raw materials are also the objectives of this division. Most recent a Synthesis Laboratory is founded in this division. Synthesis is creating new substances with diverse biological applications, such as anti-bacterial and anti-fungal activities, anti-tumor and anti-cancer activities, anti-oxidant activities, anti-inflammatory activities and other therapeutic and medicinal properties. Chemical synthesis is responsible for all organic and inorganic-based products that are developed to benefit civilization. Chemical research division is now focusing on synthesis different types molecules for industrial uses.

- Number of Scientists: 12
- Total ongoing R & D: Ten (10), MOST Special allocation: One (01)
- Analytical Services : 453

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.

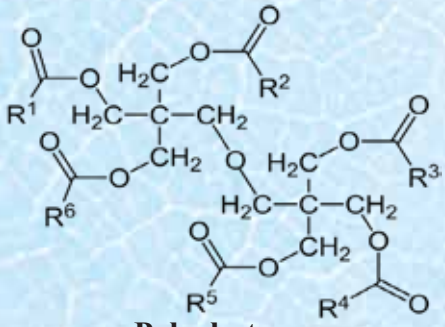
R&D Project:

1. Process for the production of esters and its derivatives from locally available chemicals and their bioactivity observation

Dr. Shahin Aziz (PL), Fatema Tuz Zohora, Dr. Most. Hosney Ara Begum, Dr. Shahana Parveen

Introduction:

Esters are widespread in nature. Ester group can be synthesized in a number of different ways. The esters occur both in plants and in animals. In general esters have many uses in both living world and industries such as fragrances in foods, for insect communication, in transparent plastics, in cosmetic formulations, nail polish remover, plasticizer, in glues as solvents.



Polyolester

Objectives:

- To synthesize different esters and its derivatives from locally available chemical with using low cost easy available techniques.
- These will cut down foreign currency.

Work Progress:

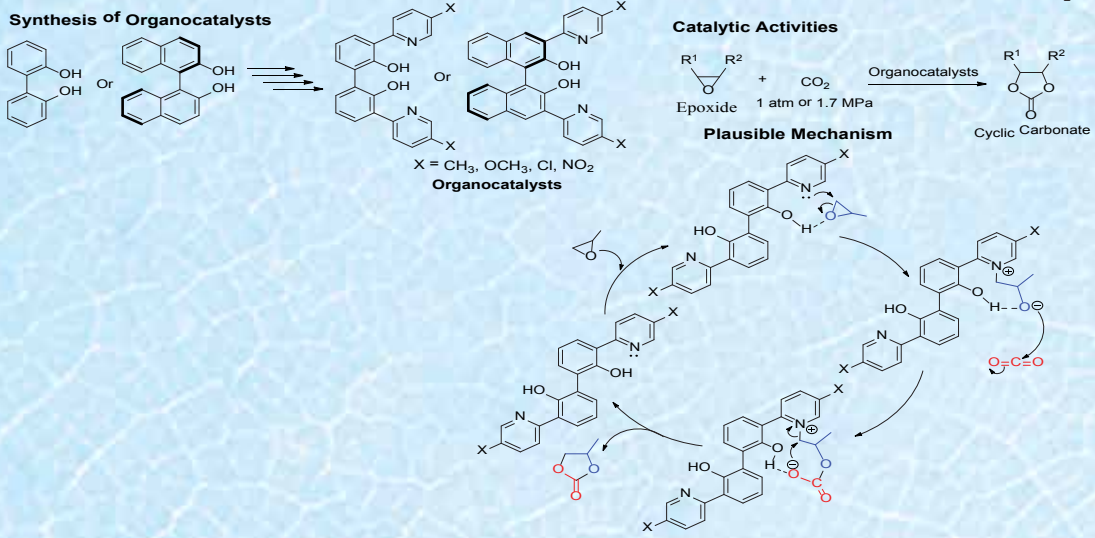
- Iso Propyl Acetate ester preparation was done.
- The prepared esters was characterized as per standard method.

2. Biphenyl/Binaphthyl-Bipyridyl based organocatalysts for catalytic conversion of CO_2 into cyclic carbonate

Dr. Md. Monarul Islam (PL), Dr. Bikash Dev Nath (Post Doc. Fellow), Dr. Mohammad Moniruzzaman, Md. Hemayet Hossain, Muhahammad Abdullah Al-Mansur, Khondoker Shahin Ahmed

Introduction:

Carbon dioxide is one of the main greenhouse gases responsible for the global warming. Now days, tons of CO_2 are produced every day from different sources such as transportation, electricity production, industrial, commercial and residential areas, agricultural sectors, land use and forestry etc. The conversion of CO_2 into value-added organic compounds is an exciting research area and numerous research going on to utilize CO_2 as a renewable raw material and a number of important catalytic reactions have been reported (Scheme 1), and conversions of CO_2 to value-added chemicals.



Scheme 1: Synthesis of organocatalysts and their activities in the catalytic conversion of CO_2 and epoxides into cyclic carbonates

Objectives:

- Development of a suitable organocatalyst and to study the catalytic activities of the organocatalysts for the conversion of CO_2 and epoxides into cyclic carbonates
- The conversion of CO_2 into value-added organic compounds under solvent free condition (green chemistry).

Work Progress:

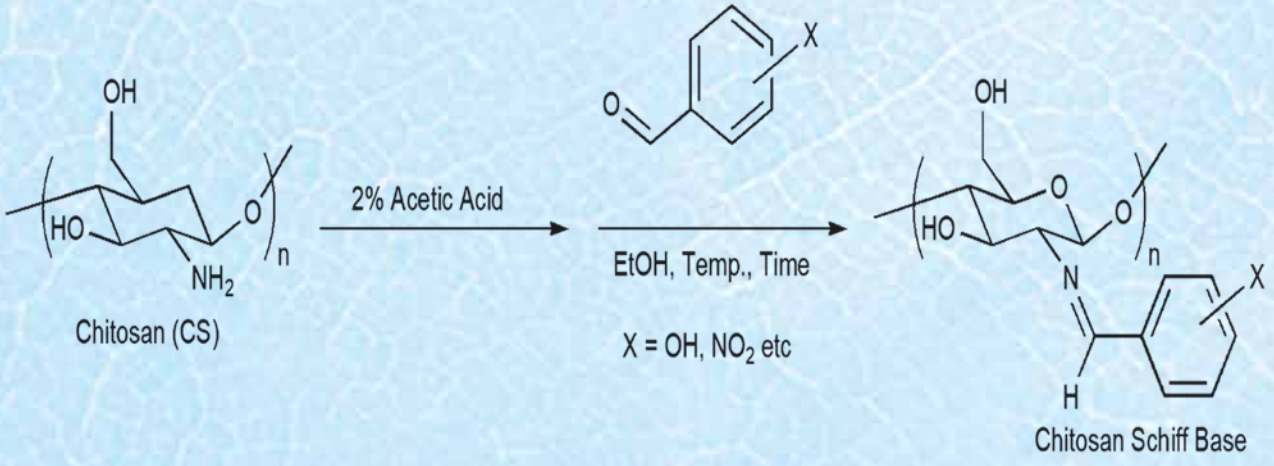
- Reactions are carrying out in laboratory to get the target compounds.

3. Synthesis of biological active chitosan-derivatives as natural preservatives (Phase-1)

Dr. Md. Monarul Islam (PL), Shyama Prosad Moulick, Rashedul Islam, Md. Rezaul Karim, Md. Hemayet Hossain, Md. Amirul Haque, Mohammad Mahbubur Rahman, Abhijit Chowdhury, Mahmuda Hakim

Introduction

Chitosan of β (1→4) linked 2-amino-2-deoxy-β-Dglucopyranose (N-acetylglucosamine) (Scheme 1), is a second abundant polysaccharide obtained by alkaline deacetylation of chitin. Chitosan has gained much attention because of its satisfying properties as non-toxic, biocompatible and biodegradable. Schiff bases of chitosan can be easily obtained by the reactions of the free amino groups of chitosan with an active carbonyl compound such as aldehyde or ketone. Chitosan-Schiff bases (CSB) 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.



Scheme 1: Synthesis of Schiff-base derivatives of Chitosan.

Objective

- Production chitosan based derivatives from local shrimp processing waste.
- To study the antimicrobial and anti-oxidant activity of the prepared chitin and chitosan based derivatives against specific microbs or fungi.
- Study the effect of chitosan based derivatives on the Shelf Life of fruits, vegetables and fish.

Work Progress

- Ortho-hydroxy and para-hydroxy based Schiff-base derivatives of chitosan are prepared and confirmed by FTIR.

4. Production of graphene from graphite and/or carbon

Mohammad Amirul Hoque (PL), Dr. Syed Farid Uddin Farhad, Shirin AkterJahan, Dr. Mohammad Nazrul Islam Bhuiyan, Dr. Toufiq Ahmed, Dr. Md. Monarul Islam, Nushrat Jahan Ethane, Mahmuda Hakim

Introduction:

Graphene is a sudden and revolutionary invention of modern science. It shows extremely high tensile strength and it is 300 times stronger than Steel. It shows extremely high electrical conductivity so it is called superconductive material. It is 1300 times more conductive than a cupper. It is very lightweight and 1000 times lesser weight than thin paper. It is a single-layer carbon atom and almost opaque. Due to its properties a huge number of chemical, apparatus, and equipment, is possible to develop with this material. It is being used for water purification, chemical synthesis, electronic circuit designing, environmental pollution control, etc. But the processing technique of Graphene is somewhat expensive and so the material is still expensive.

Objectives:

- Preparation of Graphene Oxide from Graphite and its Characterization.
- Preparation of Graphene from Graphene Oxide and its Characterization.
- Preparation of Graphite from Carbon and its Characterization.

Work Progress:

- One patent application has been submitted to the authority on Graphene Oxides preparation
- One Industrial process application has been submitted to the authority on Graphene Oxides preparation
- One scientific article is ready for submission in an international journal.

5. Non-ionic emulsifier based on poly-functional ester of fatty acids and polyhydroxylic alcohols and their applications

Mohammad Amirul Hoque (P.L), Dr. Mohammad Nazrul Islam Bhuiyan, Dr. Toufiq Ahmed, Dr. Md. Monarul Islam, Ferdaushi Jahan, Nushrat Jahan Ethane, Murshid Jaman Chowdhury, Dr. Ashish Kumar Sarker

Introduction:

A huge number of imported fatty acids- ester-based poly-functional non-ionic emulsifiers are being analyzed in different laboratories of BCSIR. The project proposal has been offered to save the foreign currencies by reducing the import through industrialization in the country. the esterification of short-chain carboxylic acids with short-chain alcohols. But very little literature is observed for long-chain fatty acids and polyfunctional alcohols. This is because; the products are very demandable in the commercial market. So, the technical information is kept secret. On the other hand, the esterification process of higher fatty acids with polyfunctional alcohols is very tough due to very high activation energy.

Objectives:

- Reaction setup for poly-functional ester of fatty acids and polyhydroxylic alcohols and finding of appropriate reaction conditions.
- Searching of their diversified industrial applications.
- Investigation of biodegradability, microbiological and toxicological Activity.

- Serial production of different poly-functional ester of fatty acids and polyhydroxylic alcohols at least 12 useful products and their applications.

Work Progress:

- Few batches of nonionic emulsifier have been prepared based on Oleic acid and characterization and application is in progress.

6. Production of useful laboratory chemicals as $(NH_4)_2C_2O_4$, $Ca(C_2H_3O_2)_2$, Na_2MoO_4, $NH_4CH_3CO_2$, NH_4C1, for research & industrial use

Nushrat Jahan Ethane (PL), Md. Hemayet Hossain, Khondoker Shahin Ahmed, Dr. Pizush Kanti Biswas

Introduction:

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, $(NH_4)_2C_2O_4$, $Ca(C_2H_3O_2)_2$, Na_2MoO_4, $NH_4CH_3CO_2$, NH_4Cl using local raw materials as well as industrial wastes. Development of the process will help us to make the chemicals available not only in proper grade but also in very reasonable price.

Objectives:

- The main objective of this project is to develop the process for the production of laboratory chemicals like $(NH_4)_2C_2O_4$, $Ca(C_2H_3O_2)_2$, Na_2MoO_4, $NH_4CH_3CO_2$, NH_4Cl using locally available raw materials.
- Successful completion and industrialization of this project generate employment for our unemployed men and women and contribute in poverty alleviation in our country.

Work Progress:

- A Process for the production of ammonium oxalate and production of calcium acetate have been verified by BCSIR authority
- A Process for the Production of ammonium chloride and production of sodium molybdate have been submitted for verification.
- A Process for the Production of ammonium acetate is ready for submission.

7. Formulation, evaluation and comparative study of herbal skin care cosmetics from indigenous sources

Ferdoushi Jahan (PL), Md. Abdul Momen, S.M. Mahmudul Hasan, Sahana Parveen, Badhan Saha, Khondoker Shahin Ahmed, Md. Ahedul Akbor, Rasheda Akter

Introduction:

Nature is recognized as the most valuable blessing to the human being, since all one needed to exist in this universe is provided in nature. Hence, from the ancient time, human beings used typical natural ingredients for their daily requirements such as medicines as well as cosmetics. Nowadays men and women are very much willing to look them beautiful. They have a tendency to use beauty products that includes herbs to look younger and more charming. Cosmetics alone are not sufficient for proper skin care, so the addition of active ingredients is necessary to check the damage and ageing of the skin. Recently, herbal cosmetics have gained more popularity and more acceptability among the people than synthetic ones due to their lesser or almost nil side effects.

Objectives:

- To develop cost effective and quality herbal skin care cosmetics from indigenous sources.
- To examine quality and comparative study of developed product related frequently used skin care cosmetic products available in market.

Socio-economic importance of the project:

- Effective formulation of local quality products will reduce the dependency on foreign cosmetic products and will save millions of foreign currencies.
- Industrialization of this project in large scale will generate employment and will contribute in our economy.
- By this study we can give information about marketed cosmetics products which are friendly for consumer and the environment.

Work Progress:

- Formulation and evaluation of Herbal Body Wash – Leased out.
- Formulation of Skin Care Gel- Submitted.

8. Preparation of natural antioxidants from indigenous sources *(Phyllanthus emblica, Moringa oleifera, Ficus racemosa, Ceriops decandra)* for use in food & cosmetic industries

Khondoker Shahin Ahmed (PL), Md. Hemayet Hossain, Ferdoushi Jahan, Nushrat Jahan Ethane, Dipa Islam, Mohammad Mahbubur Rahman, Dr. Md. Murshed Hasan Sarkar, Mohammad Mohi Uddin

Introduction:

Antioxidant is a new type in naturopathy and at present it has huge demand in food supplementation, cosmetic and pharmacological industry. Antioxidant reduces cell damages caused by free-radical which are responsible for various ailment like ageing, cancer, coronary heart disease, diabetes mellitus, neurodegenerative disorders, inflammation etc. Natural antioxidants are mainly found in plants as Polyphenols. Polyphenols especially, flavonoids and other phenolic compounds are widely distributed in medicinal plants. From literature review we can see that, *Phyllanthus emblica, Moringa oleifera, Ficus racemosa, Ceriops decandra etc.* plants are good source of natural antioxidant.

Objectives:

- Extraction, fractionation, purification and characterization *(in-vitro and in-vivo)* of natural Antioxidants from indigenous plant sources
- Standardization of natural Antioxidants for use in food & cosmetic industries

Work Progress:

- Profiling of polyphenolic compounds in *Moringa oleifera* (leaves, flowers and seed husk) *Ficus racemosa (fruits)* and *Phyllanthus emblica* and determination in vitro antioxidant activities was done.
- *Moringa oleifera* leaves, flowers and seed husk contain seven, six and nine polyphenolic compounds. On the other hand, *Ficus racemosa* fruits also contain nine polyphenolic compounds. In addition, *Phyllanthus emblica* contain five polyphenolic compounds.
- On the basis of our results, *Moringa oleifera, Ficus racemosa* and *Phyllanthus emblica* shows good antioxidant activities.

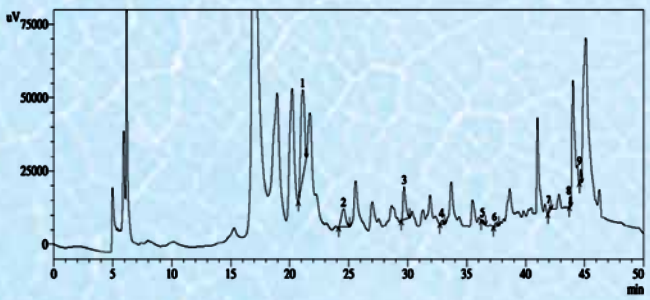


Figure: HPLC chromatogram of *F. racemosa* Ethanol extract. Peaks: 1, Catechin hydrate; 2, (-)-Epicatechin; 3, Rutinhudrate; 4, trans-Ferulic acid; 5, Rosmarinic acid; 6, Myricetin; 7, Quercetin, 8, trans-Cinnamic acid; and 9, Kaempferol.

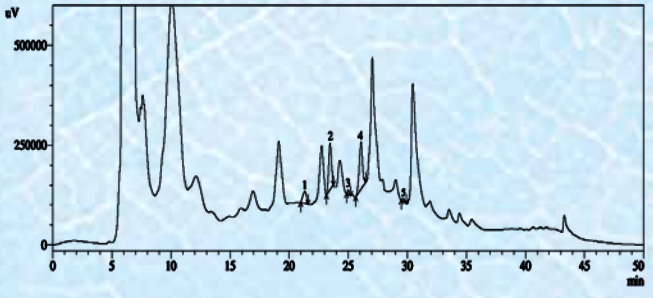


Figure: HPLC chromatogram of *P. emblica* Ethanol extract. Peaks: 1, Catechin hydrate; 2, Catechol; 3, Caffeic acid; 4, Syringic acid; 5, Rutin hydrate.

9. Cowdung and chitosan coated fertilizer for control release of NPK

Fatema Tuz Zohora (PL), Dr. Md. Monarul Islam, Dr. Shahin Aziz, Sharkar Md. Mahamudul Hassan, Badhan Saha

Introduction:

Control Release Fertilizer (CRF) has drawn the attention of scientists as it release nutrients to plant for a long period of time and reduces fertilizer loss. Countries like Bangladesh, with huge number of population need CRF to secure food supply to its population as our land is decreasing day by day. The total land area of Bangladesh is estimated to be about 14.84 million hectares (ha) of which 8.29 million ha are used for agriculture. The steady increase in population growth, food demand and continuous reduction in cultivated land per capita induce steady intensification of fertilizer application. About 40–70% of nitrogen, 80–90% of phosphorus, and 50–70% of potassium of the applied normal fertilizers is lost to the environment and cannot be absorbed by plants, which not only causes large economic and resource losses but also very serious environmental pollution.

Fig. Double coated controlled released fertilizer.

Socio-economic importance of the project:

- Government has to bear tk 6000 to 9000 crore subsidy on urea as price adjustment for imported urea each year. If CRF is properly introduced among our farmers, our government can save a lot foreign currency.
- Scientists and officials say, a 30% cut in urea use to grow rice would save huge foreign exchange.

Objectives:

- To formulate cowdung and chitosan coated fertilizer for control release of NPK to ensure adequate uptake of nutrient by the plant.
- To apply the double coated fertilizer in the soil and observing the result.
- To reduce extensive environmental damage resulting from leach out of agricultural wastes during and after irrigation.

Work Progress:

- Literature review done and raw materials are collected.
- Double coated CRF is prepared for characterization.
- Batches of CRF have been prepared to observe its release pattern in soil.

10. Fabrication of Biodegradable Packaging Material from Polysaccharide

Kamrun Nahar (PL), Md. Rezaul Karim, Sharkar Mohammad Mahamudul Hassan

Introduction:

Today the biggest challenge in our lives is to deal with waste. It is great concern to us that, urban areas of Bangladesh generate 633,129 tons/year of plastic waste. The piling plastic wastes not only in the nonbiodegradable form, but also the toxic chemicals leach out of plastic and are found in the blood and tissue of nearly all of us.Exposure to them is linked to cancers, birth defects, impaired immunity, endocrine disruption and other ailments. To remove these concern issues, here we have reported a biodegradable packaging material which is produced using local raw materials as well as industrial food wastes to become our environment green.

Fig. Pectin silica based biodegradable Film

Objectives:

- To fabricate the biodegradable nanocomposite film from different polysaccharide
- To determine the physical, chemical and mechanical properties of the films for application of packaging material
- Successful completion and industrialization of this project generate employment for our unemployed men and women and contribute in poverty alleviation in our country.

Work Progress:

- Literature survey and some raw materials have been collected and purified them well
- There are still some requirements of chemicals and instrument
- Successfully fabricated some biodegradable films which have been now under characterization

Special Allocation project:

1. Chemical and electrochemical synthesis of graphene oxide nano-materials and its applications

Mohammad Amirul Hoque (PI), Nushrat Jahan Ethane

Introduction:

Graphene is a miraculous invention of the 21st century. It was invented suddenly but the invention was revolutionary for the advancement of modern science because of its excellent Physico-chemical properties. It has extremely high tensile strength and also extremely high electrical conductivity. It is very lightweight due to its atomically thick two-dimensional transparent films. It is a single-layer carbon atom and almost opaque. Due to its properties a huge number of chemicals, apparatus, and equipment, are being designed and developed with this material. It is being offered to use for water purification, chemical synthesis, electronic circuit designing, environmental pollution control, etc. But the processing technique of Graphene is very expensive and so the materials developed based on these materials are also very expensive.

Several production processes for the production of Graphene have been developed so far. Among them, some processes are cheaper but the product purity is not so good. In this experiment, we will try to make cheaper production costs of Graphene by applying some special techniques that are applied to other chemical processing industries. Such as reuse of raw materials, recovery of byproducts, conduction of reaction at low temperature and short time, reduction of production steps, etc.

Objectives:

a. Preparation of Graphene Oxide from Graphite and its Characterization

b. Preparation of Graphene from Graphene Oxide and its Characterization

c. Preparation of some materials to design some commercially important products e.g., Conducting Graphene sheets, Nano-composite materials, Electrode and sensor development, Electronic circuit design etc.

Work Progress:

a) Graphite + Oxidizing agent ----------> Graphene oxide--------(1.a)
Electrochemical

b) Graphite ----------> Graphene oxide--------(1.b)
Environment-friendly

c) Graphene oxide ----------> Reduced Graphene oxide (Graphene) -----(2)
Reduction

Achievements and Activities:

1) Paper Published

1. Ayesha Siddika, Munira Sultana, MS Bashar, Samia Tabassum, Shahin Aziz, Md. Aftab Ali Shaikh, Improved performence of dye sensitized solar cell by exploration of ohotoanode and ruthenium based dye. *Optical Materials,* **2022**, 125, 112042.

2. Sharika Farhana, Shahin Aziz, Sharjana Rahman, Sadia Afrin, Mohammad Nazrul Islam Bhuiyan, Sharif Al-Reza, "Chemical Composition of Fixed Oil and in vitro Antimicrobial Activity of Andrographis paniculata Root, *Journal of King Saud University – Science,* **2022**, 34, 101921.

3. Bikash Dev Nath, Md. Monarul Islam, Md. Rezaul Karim, Shofiur Rahman, Md. Aftab Ali Shaikh, Paris E. Georghiou, and Melita Menelaou, "Recent Progress in Metal-Incorporated Acyclic Schiff-base Derivatives: *Biological Aspects" Chemistry Select,* **2022**, 7 (14), e202104.

4. Xiaoyu Mao, Yiwei Liu, JinZeng ,Xiaohui Wang, Md. Monarul Islam, Ming Chen, Qing Chen, and Xing Feng "Synthesis and Photophysical Properties of Quinoxaline-Based Blue Aggregation-Induced Emission Molecule" *Can. J. Chem.,* **2022**, 100 (50), 370–377.

5. Yiwei Liu, Xiaoyu Mao, Xiaohui Wang, Jie Bai, Jun Zhang, Xing Feng, Md. Monarul Islam, Mark R. J. Elsegood, Chuan-Zeng Wang, Takehiko Yamato "Pyrene-based asymmetric hexaarylbenzene derivatives: Synthesis, crystal structures, *and photophysical properties" J.Lumin.* **2022**, 243, 118653.

6. Raju Kumar Das, Al Mizan, Fatema Tuj Zohra, Sobur Ahmed, Khondoker Shahin Ahmed and Hemayet Hossain, Extraction of a novel tanning agentfrom indigenous plant bark and its applicationin leather processing, *Journal of Leather Science and Engineering,* **2022**, 4, 18.

7. Tarek Hasan, Esrat Jahan, Khondoker Shahin Ahmed, Hemayet Hossain, Syed Mumtahin Mannan Siam, Nusrat Nahid, Tanoy Mazumder, Md. Sadikur Rahman Shuvo, A F M Shahid UdDaula, Rutin hydrate and extract from *Castanopsis tribuloides* reduces pyrexia via inhibiting microsomal prostaglandin E synthase-1, *Biomedicine & Pharmacotherapy* **2022**, 148, 112774.

8. Susmita Paul, Kamrun Naher, Sanzida Yeasmin, Rabindra Nath Acharrya, Mimi Golder, Khondoker Shahin Ahmed, Hemayet Hossain, Shrabanti Dev & Asish Kumar Das. Phytochemicals, Antioxidant, and Chemopreventive Potential of *Tamarix Indica* Leaf Extracts, **(2021)**, *Journal of Herbs, Spices & Medicinal Plants,* DOI: 10.1080/10496475.2021.2015506.

9. A.M. Swaraz, Fariha Sultana, Md. Wasim Bari, Khondoker Shahin Ahmed, Mehedi Hasan, Md. Monirul Islam, Mohammad Amirul Islam, Mohammed A. Satter, Md. Hemayet Hossain, Md. Shofiqul Islam, Md. Iqbal Khan, Md. Obayed Raihan "Phytochemical profiling of *Blumea laciniata* (Roxb.) DC. and its phytopharmaceutical potential against diabetic, obesity, and Alzheimer's", *Biomedicine & Pharmacotherapy* 141 **(2021)** 111859.

10. Pintu Miah, Surovi Binte Sharmin Mohona, Md. Mizanur Rahman, Nusrat Subhan, Ferdous Khan, Hemayet Hossain, Shazid Md. Sharker, Md. Ashraful Alam, Supplementation of cumin seed powder prevents oxidative stress, hyperlipidemia and non-alcoholic fatty liver in high fat diet fed rats, *Biomedicine & Pharmacotherapy,* **2021**, 141, 111908.

11. Md. Nazmul Hasan Zilani, Md Aminul Islam, Partha Biswas, Md Anisuzzman, Hemayet Hossain, Jamil A. Shilpi, Md Nazmul Hasan, Md Golam Hossain, Metabolite profiling, anti-inflammatory, analgesic potentials of edible herb *Colocasia gigantea* and molecular docking study against COX-II enzyme, *Journal of Ethnopharmacology,* **2021**, 281, 114577.

12. Shrabanti Dev, Rabindra Nath Acharyya, SheulyAkter, Md. Abdullah Al Bari, Kaniz Asma, Hemayet Hossain, Kishore Kumar Sarkar, Nripendra Nath Biswas and Asish Kumar Das, "Toxicological screening and evaluation of anti-allergic and anti-hyperglycemic potential of *Sonneratia caseolaris* (L.) Engl. fruits," *Clinical Phytoscience,* **2021**, 7, 69.

13. M. R. Sarkar, A. Hossin, A. S. M. M. Al-Hossain, K. M. Y. K. Sikdar, S. Z. Raihan and M. H. Hossain, Enhancement of dissolution profile of poorly aqueous soluble atorvastatin calcium by binary and ternary solid dispersion techniques, Bangladesh *J. Sci. Ind. Res.* **2021**, 56(3), 165-176.

14. Ferdoushi Jahan, Afroza Akter Happy, 'Revolutionizing plant-based extracts for skin care and therapeutics', Book Chapter: Nanotechnology for the Preparation of Cosmetics Using Plant-Based Extracts, *Micro and Nano Technologies,* **2022**, 75-130.

b) Process Accepted

1. Nushrat Jahan Ethane (SSO), Md. Hemayet Hossain (PSO), Dr. Pizush Kanti Biswas (PSO), "Production of Iron(III) Chloride (Anhydrous) from Scarp Iron" accepted by the office, Member Development, BCSIR, Dhaka. Ref. No. 39.02.0000.043.37.415.19/1304 Date: 24.01.2022.
2. Ferdoushi Jahan (SSO), Md. Abdul Momen (RC), Sahana Parveen (CSO), "Production of Hand Sanitizer Gel" accepted by the office, Member Development, BCSIR, Dhaka. Ref. No. 39.02.0000.043.37.815.20/64 Date: 16.11.2021.
3. Ferdoushi Jahan (SSO), Md. Abdul Momen (RC), Md. Hemayet Hossain (PSO), S.M. Mahmudul Hasan (SSO), "Formulation Hair and Scalp Cleanser" accepted by the office, Member Development, BCSIR, Dhaka. Ref. No. 39.02.0000.043.37.816.20/1305 Date: 25.04.2022.
4. Dr. Shahin Aziz (PSO), Dr. Most. Hosney Ara Begum (CSO), Dr. Sahana Parveen (CSO), Fatema Tuz Zohora (SO), "Production of Amyl Acetate' accepted by the office, Member Development, BCSIR, Dhaka. Ref:39.02.0000.043.37.808.20 /1238; Date: 04.11.2021.

c) Patent Submitted

Mohammad Amirul Hoque, Dr. Syed Farid Uddin Farhad, Dr. Mohammad Nazrul Islam Bhuiyan, Dr. Md. Monarul Islam and Md. Khabir Uddin Sarker "Process for the Easy and Cost-Effective Production of Graphene Oxide from Graphite via Chemical Oxidation method".

Guidance to research work (PhD/M.Phill/ M.Phill/ M.S/ NCST & BCSIR Fellow):

Sl No.	Title of Research	Research Category	Name of the Student	Name of the Institution	Name of Supervisor
01.	Chemical and Biological Investigation on different Plant parts of *Eclipta Alba* (Linn.) Hassk	M. Phill Research	Shirin Akhter Banu	Islamic University, Kushtia	Dr. Shahin Aziz, PSO, and Dr. Sharif Morshed Al Reza
02.	Chemical and Biological Investigation on different Plant parts of *Adiantum Flabellulatum* Linn .	M. Phill Research	Taslima Akhter	Khulna University, Kushtia	Dr. Shahin Aziz, PSO and Dr. Seikh Jamal Uddin,
03.	Chemical and Biological Investigation on different Plant parts of *Andrographis Paniculata* (Burm. F.) Wall. Ex Nees	Ph.D Research	Sharika Farhana	Islamic University, Kushtia	Dr. Shahin Aziz, PSO and Dr. Sharif Morshed Al Reza.
04.	Synthesis and biological studies of pyrimidine-based *Schiff* bases derivatives	Postdoc Fellow	Dr. Md. Wahidul Islam Ratul	BCSIR	Dr. Md Monarul Islam
05.	Non-ionic emulsifier based on poly-functional ester of fatty and Poly-hydroxylic alcohols and their applications.	Postgraduat e Fellow	Rabeya Akter	BCSIR	Dr. Md. Monarul Islam & Mohammad Amirul Hoque
06.	Biphenyl/Binaphthyl-Bipyridyl Based Organocatalysts for Catalytic Conversion of CO_2 into Cyclic Carbonate	Postdoc Fellow	Dr. Bikash Dev Nath	BCSIR	Dr. Mohammad Moniruzzaman & Dr. Md Monarul Islam

07	Evalution of phytochemical and pharmacological activity of *Spilanthes acmella*	M. Pharm	Dilara Yeasmin Jhumur	Jagannath University	Md. Hemayet Hossain
08	Evalution of phytochemical and pharmacological activity of *Murraya koenigii*	M. Pharm	Shormila Sultana Sathe	Jagannath University	Md. Hemayet Hossain
09	Isolation and characterization of polyphenolic compound from different medicinal plants and their effects on antibiotic resistant bacteria	M.S thesis	Anti Islam	Khulna University	Khondoker Shahin Ahmed
10	Polyphenolic content on different solvent extract of Betel *(Piper betle)* leaves for use as natural preservativ	M.S thesis	Tahimina Benta Sharaj	Jagannath University	Khondoker Shahin Ahmed

Participation in training/ symposium/ workshop/ Conference

1. Dr. Shahin Aziz, attended a Webinar on "A lecture Series on crystallography, organized by Bangladesh Crystallographic Association (BCA), Dhaka, Bangladesh at 31 July, 2021.
2. Dr. Shahin Aziz, selected as evaluator from Resister, Dhaka University, for University teacher research project funded by UGC at dated 17.11.2021.
3. Nushrat Jahan Ethane, SSO, has participated training Program on “NIS for transparent data generating of particle size analyzer” held on 16 September, 2021 at BCSIR Dhaka Laboratories, Bangladesh Council of Scientific and Industrial Research (BCSIR).
4. Nushrat Jahan Ethane, SSO, has participated training Program on “Basic Principle, Applications, Operation and Maintenance of HPLC” held on 25 January 2022 at BCSIR Dhaka Laboratories, Bangladesh Council of Scientific and Industrial Research (BCSIR).
5. Md. Abdul Momen, RC, participated training program on “Learning Session on Computational Drug Discovery” held on 07 March, 2022 at BCSIR Dhaka Laboratories, Bangladesh Council of Scientific and Industrial Research (BCSIR), Dhaka-1205.
6. Fatema Tuz Zohora (SO), participated in training on “Dilute solution viscometry using automated micro-viscometer” held on 08 March, 2022 at Bangladesh Council of Scientific and Industrial Research (BCSIR), Dhaka-1205.
7. Fatema Tuz Zohora (SO), participated in training on “X-ray Diffractometer”, held on 02-06 January, 2022 at BCSIR Dhaka Laboratories, Bangladesh Council of Scientific and Industrial Research (BCSIR).
8. Fatema Tuz Zohora (SO), participated in training on “NIS for transparent data generating of particle size analyzer”, held on 16 September, 2021 at BCSIR Dhaka Laboratories, Bangladesh Council of Scientific and Industrial Research (BCSIR).
9. Fatema Tuz Zohora (SO), participated in training on “Method validation for ISO 17025/2017” held on 31 August, 2021 at BCSIR Dhaka Laboratories, Bangladesh Council of Scientific and Industrial Research (BCSIR).
10. Khondoker Shahin Ahmed, SO, has participated training program on “Gas Chromatography-Mass Spectrometry (GC-MS)” held at Central Analytical & Research Facilities (CARF), BCSIR, Dhaka, Bangladesh, 14-18 November, 2021.

11. Khondoker Shahin Ahmed, SO, has participated training program on "Liquid Chromatography-Tandem Mass Spectrometry (LC-MS/MS)" held at Central Analytical & Research Facilities (CARF), BCSIR, Dhaka, Bangladesh, 10-14 October, 2021.
12. Md. Hemayet Hossain, PSO, has participated training program as trainer on "Liquid Chromatography-Tandem Mass Spectrometry (LC-MS/MS)" held at Central Analytical & Research Facilities (CARF), BCSIR, Dhaka, Bangladesh, 10-14 October, 2021.
13. Khondoker Shahin Ahmed, SO, has participated training program on Operation and maintenance of "Nuclear Magnetic Resonance Spectrometer" held at BCSIR, Dhaka, Bangladesh from 05-09 September, 2021.
14. Khondoker Shahin Ahmed, SO, has participated training program on "Method Validation for ISO 17025/2017" held at BCSIR Dhaka Laboratories, Bangladesh, on 31 August, 2021.
15. Khondoker Shahin Ahmed, SO, has participated training program as trainer on Operation and maintenance of "Gas Chromatography (GC)" as a Trainer at BCSIR, Dhaka, Bangladesh, from 22-26 August, 2021.
16. Md.Rezaul Karim (RC), participated in training on "Rheometer,Microviscometer, Refarctometer with Density Module" by Planning & Development (P&D) Division held on 03-07 April, 2022 at BCSIR Dhaka Laboratories.
17. Dr. Md. Monarul Islam participated in 77th training programme of NITUB on the "use, maintenance and trouble-shooting of nuclear magnetic resonance (NMR) spectroscopy"organized by Network of Instrument Technical personnel and User scientists of Bangladesh (NITUB) at Institute of National Analytical Research and Service (INARS), BCSIR, Dhaka, December19-23, 2021.
18. Dr. Md. Monarul Islam participated in Bangladesh-US Training Program (Virtual) on Strengthening Chemical Security and Secure Chemical Management at Different Public and Private Sectors in Bangladesh, November 25-26, 2021.
19. Dr. Md. Monarul Islam performed as a trainer on Gas Chromatography-MASS Spectrometry (GC-MS) organized by Central Analytical and Research Facilities (CARF), Dhaka held from 14 to 18 November, 2021.
20. Dr. Md. Monarul Islam participated in a training on "ISO 17025 and method validation" organized by BCSIR Dhaka Laboratories held on 31 August, 2021.
21. Dr. Md. Monarul Islam performed as a trainer on Gas Chromatography (GC) organized by Planning & Development (P&D) Division, Dhaka held from 22 to 26 August, 2021.
22. Dr. Md. Monarul Islam participated in a training on "Project Appraisal, EIA and Formulation of DPP" organized by National Academy for Planning and Development (NAPD) at Dhaka held from 25 July to 12 August, 2021.

Number of Analytical (Ad-Hoc) Problems Solved:

Name of the Division	Routine type	Research Type	Total
Chemical Research Division	395	58	453

Special Contribution to the Nations:

Chemical Research Division of BCSIR Dhaka Laboratories is providing analysis services to different industries by determining the specific standards of Hand Sanitizer, Gel, and Hand Rub etc by the GC machine from April 2020. It is to be noted that Corona virus (COVID-19) has now become epidemic all over the world and many companies in Bangladesh are currently producing Hand Sanitizer, Gel, and Hand Rub etc. As a result, it is important to continue the analysis service at CRD, BCSIR.

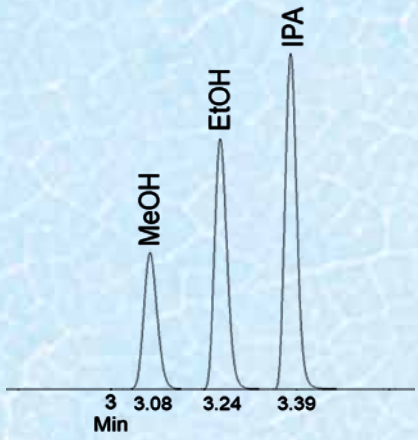


Figure: GC-chromatogram of methanol (MeOH), ethanol (EtOH) and isopropyl alcohol (IPA) mixture (1:1:1).

Inauguration of Synthesis Laboratory

A Synthesis Laboratory was inaugurated by Professor Dr. Md. Aftab Ali Shaikh, Chairman, Bangladesh Council of Science and Industry (BCSIR) at Chemical Research Division, BCSIR Dhaka Laboratories on May 17, 2022. High-officials, directors and in-charge of different units were present at the program. On the occasion of inauguration, a seminar on Synthesis of Small Molecule was held at IFST auditorium, BCSIR. Prof. Dr. Md. Aftab Ali Shaikh, Chairman of the council was present as a Chief Guest and Mr. Shah Abdul Tarique, Secretary & Member (Finance) was present as a special guest of the seminar. The seminar was chaired by Dr. Md. Sarwar Jahan, Director, BCSIR Dhaka Laboratories. Dr. Md. Monarul Islam, SSO, presented the key note article.

Product Photo:


Herbal Body Wash


Anti-Bacterial Handwash


Ultrasound Gel

Skin Care Cream


Hand Sanitizer Gel

Shaving Foam


Baby Liquid Detergent

Isopropyl Acetate Ester

Some sophisticated instruments in Chemical Research Division


Fig (a): UV_Vis Spectrophotometer


Fig (b): Fluorescence Spectrophotometer


Fig (c): Rotary Evaporator

Short biography of CRD Scientists

Md. Hemayet Hossain (June, 2006- present)

Office	Chemical Research Division	Blood group	**B+**
Position	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 2006 citation (h-index: 22) and one book chapter. He has 6 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).

Sharkar Mohammad Mahamudul Hassan (June, 2006- present)

Office	Chemical Research Division	Blood group	**O+**
Position	Senior 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 10 publications. He has 12 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+**
Position	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 34 research articles in peer-reviewed journals and three review articles in a wide range of chemistry and get 671 citation (h-index: 11). He has two accepted processes. He is a life member of BCS, BAAS, NITUB, DUCCA; and Founding Member of National Young Academy of Bangladesh (NYAB).

Mohammad Amirul Hoque (July, 2006- present)

Office	Chemical Research Division	Blood group	**A+**
Position	Senior Scientific Officer	Degree obtained	MS (2001)
Contact	amirul.bcsir@yahoo.com	Mobile	01720060000

Mohammad Amirul Hoqueearned his both BSc and MS degree fromApplied Chemistry and Chemical Technology department (Organic Chemistry) from the University of Dhaka. He is perusing his Ph.D in (Advanced Materials Science of Graphene) from same department. He Joined in BCSIR in 2006 and worked 10 years in Synthetic polymers and now he is working in Organic synthesis laboratory. His research is mainly focused on the design, synthesis and development of advanced materials. He also worked as a Guest Researcher in National Institute of Advanced Industrial Science and Technology (AIST) Osaka Japan. He worked on Biomaterial Science, especially Synthesis of Lactic acid-based Biopolymers in (2009-2010). He has authored or coauthored 12 publications and accepted 12 process of which 5 is leased out and One Patented. He is a life member of BCS and GACA.

Ferdoushi Jahan (June, 2006- present)

Office	Chemical Research Division			Blood group	**A+**
Position	Senior Scientific Officer			Degree obtained	M.S. (2004)
Contact	ferdoushi.bcsir@gmail.com			Mobile	01913071452
Paper nos	13	Process no.	20	Leased out Process no.	18

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,Herbal cosmetics and toiletries. She is a member of Cosmetics and Toiletries Products Committee of BSTI and BCS (Bangladesh Chemical Society). Currently she is pursuing her Ph.D. from Jahangirnagar University.

Nushrat Jahan Ethane (June, 2006- present)

Office	Chemical Research Division			Blood group	**O-**
Position	Senior Scientific Officer			Degree obtained	M.Sc. (2000)
Contact	nushrat_je@yahoo.com			Mobile	01552338938
Paper nos	3	Process no.	10	Leased out Process no.	0

Nushrat Jahan Ethane completed her B.Sc. (Hon's) and M.S.degree in Chemistry from National University. Her research is mainly focused on Inorganic Synthesis. She is a life member of BAAS.

Shyama Prosad Moulick (October, 2018- present)

Office	Chemical Research Division	Blood group	**AB+**
Position	Scientific Officer	Degree obtained	MS (2014)
Contact	moulik.shyama@gmail.com	Mobile	01923722052

Shyama Prosad Moulick completed his B.S. (Hon's) and M.S degree in Chemistry (Organic Chemistry) from the University of Dhaka.

Research Interest:

Natural Products Research, Organic Synthesis

Fatema Tuz Zohora (November, 2018- present)

Office	Chemical Research Division	Blood group	**A+**
Position	Scientific Officer	Degree obtained	MS (2014)
Contact	zohorapopy.acce@gmail.com	Mobile	01318639225

Fatema Tuz Zohora earned her both BSc and MS degree in Applied Chemistry and Chemical Engineering (ACCE) from the University of Dhaka. Currently, she is focused on fruity ester synthesis and agricultural chemistry. She has participated in 01 international conference. She has authored 01 publication and 01 accepted process.

Md. Rezaul Karim (May, 2019- present)

Office	Chemical Research Division	Blood group	**B+**
Position	Research Chemist	Degree obtained	M.Sc. (2019)
Contact	rezaulkarimchembuet@gmail.com	Mobile	01569110265

Md. Rezaul Karim received his both B.Sc. and M.Sc. degree in Chemistry (Physical Chemistry) from Begum Rokeya University, Rangpur and Bangladesh University of Engineering & Technology (BUET). Currently his research is mainly focused on the development of new advanced polymeric soft materials like hydrogels and fabrication of biodegradable packaging materials. He participates 06 national and international conferences. He has authored 02 publication.

Md. Abdul Momen (May, 2019- present)

Office	Chemical Research Division			Blood group	**A+**
Position	Research Chemist			Degree obtained	M.S. (2018)
Contact	mdabdulmomen1994@gmail.com			Mobile	01521219122
Paper nos	2	Process no.	6	Leased out Process no.	4

Md. Abdul Momen completed his B.S. (Hon's) and M.S degree in Chemistry (Physical Chemistry) from University of Dhaka. His research is mainly focused on Essential Oil, Herbal cosmetics and toiletries. He is a member of BCS (Bangladesh Chemical Society).

Rashedul Islam (November, 2021- present)

Office	Chemical Research Division	Blood group	**B+**
Position	Research Chemist	Degree obtained	B.Sc. (2018)
Contact	riju3295@gmail.com, riju3295@bcsir.gov.bd	Mobile	01639419360

Rashedul Islam completed his B.Sc. (Hon's) degree in Chemistry and MS in Chemistry (Inorganic Chemistry) from Jahangirnagar University. He has participated in 01 international conference.

Research Interest

- Synthesis and Characterization of Chitosan derivatives.
- Aquatic Geochemistry, Environmental Biogeochemistry.

Best Performance Award to Chemical Research Division (CRD) for the R&D Activities in the Year 2021-2022

FIBRE & POLYMER RESEARCH DIVISION (F&PRD)

Scientists of F&PRD

FIBRE & POLYMER RESEARCH DIVISION (F&PRD)

Fibre & Polymer Research Division (F&PRD) is one of the largest divisions of BCSIR Dhaka Laboratories. It is a highly specialized research laboratory conducting R&D works on different branches of Polymer Chemistry and providing services to the large scale polymer-based industries of Bangladesh. R&D activities of the division are mainly focused on cellulosic fibres, plastics & microplastics, composite materials, textiles, jute, rubber, bitumen, paint, dyes & pigments, plastic & rubber waste management as well as their utilization, textile effluent treatment, etc. The ultimate objective of the division is to develop modern and appropriate technologies for sustainable industrialization of Bangladesh based on available raw materials. At present 12 scientists of this division are conducting 09 R&D projects and have published 07 papers & 02 patents in 2021-2022. This division has 07 very important research fields/ sections-

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

R&D Projects:

1. Production of polyvinyl chloride (PVC) solvent cement and composite materials using waste PVC and acrylic polymers

Shahin Sultana (PL), Zahidul Islam, and Md. Khabir Uddin Sarker

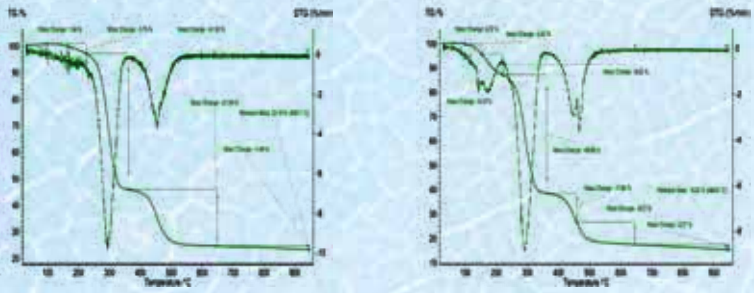
Waste PVC (wPVC) polymers are available from power plant of Bangladesh. These are used as filler materials in the cooling system of power plant and rejected as wPVC after four years. These are rigid PVC films and these waste PVC can be utilize to make value added composite materials. With the help of this project we want to utilize wPVC to make value added products to reduce import of such products and to meet our local demand.

Objectives:

- To produce wPVC solvent cement for PVC pipes jointing and fittings.
- To produce natural fibers reinforced composite materials using wPVC and acrylic polymers.

Work Progress:

- Production of solvent cements using wPVC and virgin PVC for pipes jointing and fittings have been developed.
- Two papers have been published on wPVC and plasticized wPVC based composite materials.
- One patent on solvent cement has been submitted.



2. Synthesis of thermoset polyester for preparation of filler and composite materials

Shahin Sultana (PL), Mohammad Majedul Haque, Muhammad Saiful Islam and Md. Khabir Uddin Sarker

Introduction:

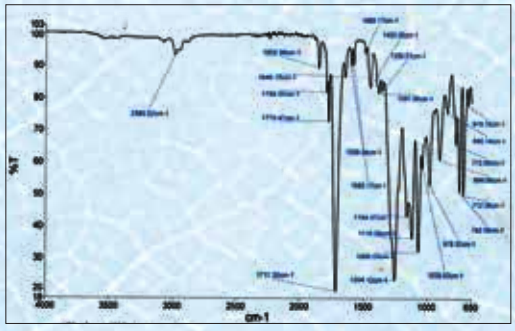
Unsaturated polyester resin (UPR) is prepared from one or more diol with saturated and unsaturated acids or anhydrides. The UPRs are thermosetting resins and commonly used in the automotive and bathroom accessories, in non-metallic auto-body fillers, tiles for roofs, electrical equipments, shower stalls, navy boats, swimming pool, pipes, ducts, water tanks, trays, composite materials etc. A huge quantity of UPR and UPR based products are imported in our country every year. The successful completion of the project will definitely impart a positive impact on our economy and environment sectors.

Objectives:

- To synthesize unsaturated polyester resin (UPR)
- To produce UPR based car body filler
- To produce acrylic modified UPR based natural/inorganic fiber reinforced composite materials.

Work Progress:

- Unsaturated polyester resin (UPR) has been synthesized.
- UPR based composite materials have been prepared and characterized
- One paper is ready for submission.
- To produce UPR based car body filler is in progress.



3. Current status of macro and microplastics in Bangladesh: Impact and recycling

Muhammad Saiful Islam (PL), Md. Rashed Hasan, Zahidul Islam, Swapan Kumer Ray, Shahin Sultana, A.H.M. Shofiul Islam Molla Jamal

Introduction:

Due to superior thermo-mechanical properties, plastic-items have given us a comfortable life-style. However, they are problematic due their non-biodegradable nature. The waste plastics are detrimental for soil fertility, flora and fauna of

the rivers as well of the seas. They cause deadlock into the sewerage lines, make piles of wastes on river bed and exist in the nature years after years. Microplastics (MPs) are another emerging contaminant of concern. They come into the environment as microbeads, microfibers, pellets, and also formed in the environment from macroplastics by the action of UV radiation, weathering effects, wear & tear, and microbes.

Objectives:

- To evaluate macro- and microplastics in different environmental compartments
- To investigate mechanical and chemical recycling of plastic waste
- To study the conversion of waste plastics into their respective monomers/basic chemicals

Work Progress:

- Effects on quality of terephthalic acid prepared by depolymerization of post-consumer recycled PET plastic bottles through repeated use of sulfuric acid hydrolysis liquor.
- Abundance, characteristics, and spatial-temporal distribution of synthetic microfibers including fragmented microplastics in the sea salts along the Cox's Bazar coastal area, Bangladesh.
- Pervasiveness and characteristics of microplastics in surface water and sediment of the Buriganga River, Bangladesh.

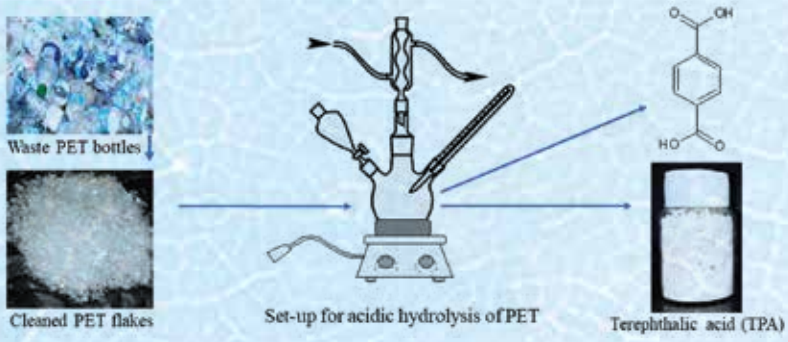


Fig. 1: Analytical set-up for the conversion of waste PET (polyethylene terephthalate) into its monomer terephthalic acid (TPA)

4. Development of phosphorus based bio-polymer flame retardant for composites and plastic materials

Dr. Mohammad Majedul Haque (PL), Riyadh Hossen Bhuiyan, Md. Jaynal Abedin, Md. Khabir Uddin Sarker, and Swapan Kumar Ray

Introduction:

1. Waste coconut fiber was used to produce soda lignin.
2. Soda lignin was used to produce phosphorylated lignin.
3. FT-IR, TGA, SEM-EDX and Antioxidant activity was done for produced phosphorylated lignin and compared with unmodified soda lignin.

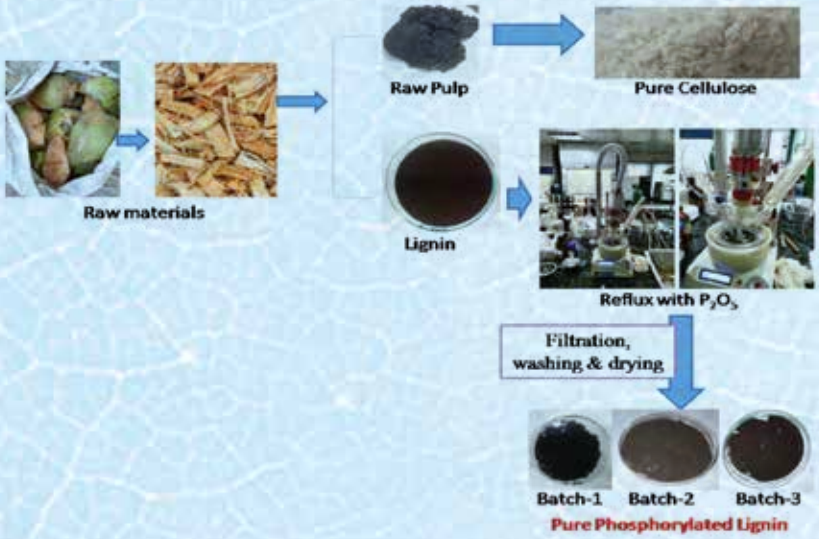
The addition of flame retardants in plastic and composite products improves their thermal properties. So, fire/heat stability of plastic and composite materials increased. This will support to plastic and composite industries in Bangladesh.

Objectives:

- Produce phosphorylated lignin from soda lignin in an easy way.
- Compare thermal properties and antioxidant activity of prepared phosphorylated soda lignin with unmodified.
- These results can help to develop a phosphorus based bio-polymer flame retardant for plastic and composite applications.
- Development of phosphorus based bio-polymer flame retardant for composites and plastic materials.

Work Progress:

Waste coconut fiber was collected from Dhaka city to produce Soda lignin. Collected coconut fiber was washed and dried. The dust free, clean and dried coconut fiber was cut into small pieces. Then lignin was isolated by applying soda process. This lignin was subjected to produce phosphorylated lignin by applying phosphorylation method. FT-IR, TGA, SEM-EDX and Antioxidant activity was done for produced phosphorylated lignin and compared with unmodified soda lignin and observed significant results.



5. Preparation of polyacrylic acid (PAA) based nanocomposites for the removal of heavy metals from textile effluent

Shamima Akther Eti (PL), Riyad Hossain Bhuiyan, Lutfun Naher Hilary, Md. Jaynal Abedin

Introduction:

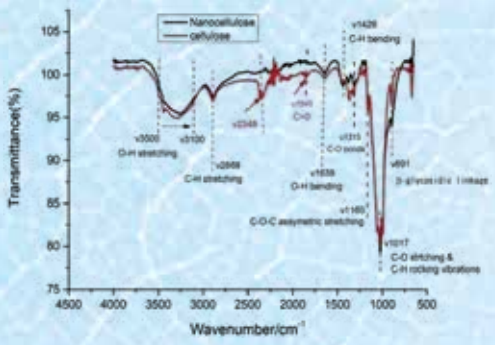
Removal of contaminants in textile effluent, such as heavy metals, has become a severe problem in the world. Numerous technologies have been developed to deal with this problem. As an emerging technology, nanotechnology/polymer-based nanocomposites have attracted much attention due to their intrinsic environmentally harmless and degradable properties. Particularly, polymer-based nanocomposites often present superior physical, chemical and mechanical properties, as well as superior compatibility, as compared with single polymers for removing heavy metals from textile effluent, by incorporating the advantages of both counterparts in the composites. By successful implementation of this project will help ensure the environmental sustainability.

Objectives:

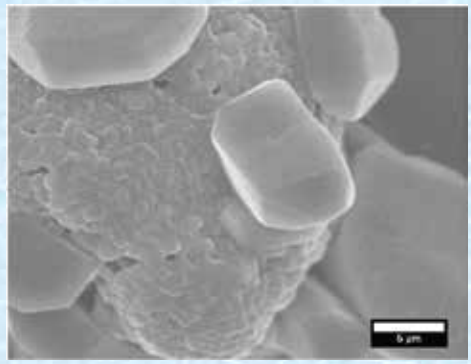
- Synthesis of Polyacrylic Acid (PAA) based nanocomposites from jute & other cellulosic fibre.
- Adsorption Study for removal of heavy metals
- Feasibility studies of the prepared products to ensure proper effluent management.

Work Progress:

- Cellulose based composite was synthesized by using cellulose as raw materials.
- The synthesized composite was characterized by means of state of the art technologies.
- Adsorption performance study has been carried out to the efficiency of the synthesized cellulose based composite with aqueous solution.
- Composite showed efficiency for the removal of heavy metals such as Pb and Cd.



ATR-FTIR spectra of cellulose-PAA composite



FE-SEM of cellulose-PAA composite at Mag.=2000X

6. Development and application of industrially important cellulose derivatives (HPMC, MC, CMC & Cellulose acetate) from lignocellulosic biomass (Jute etc.)

Mohammad Mahbubur Rahman (PL), Zahidul Islam, Muhammad Saiful Islam, Swapan Kumer Ray, Md. Abdullah Al-Mansur, Dipa Islam, Dr. Toufic Ahmed, Dr. Sarwar Jahan

Introduction:

Cellulose, a well-known fascinating biopolymer is the naturally most abundant renewable and biodegradable resource on the earth. In this project our aim is to synthesize industrially important cellulose derivatives hydroxypropyl methylcellulose (HPMC), methyl cellulose (MC), carboxymethyl cellulose (CMC) and cellulose acetate from lignocellulosic biomass considering its applications in construction, food, pharmaceutical and personal care industries. In this project we will also use ionic liquids (ILs) and their double salts (DSILs) for dissolution and modification of cellulose. ILs provide an attractive alternative to traditional solvents for both industrial and laboratory purpose on account of their potential as 'green' solvents.

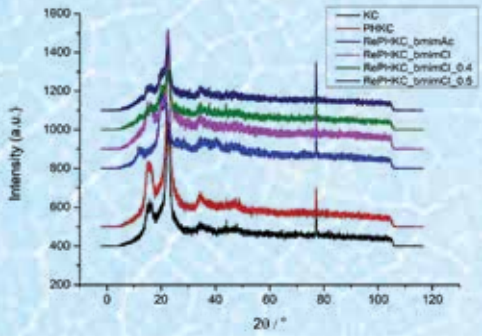
Objectives:

- Isolation and purification of cellulose from lignocellulosic biomass
- Synthesis of cellulose derivatives (HPMC, MC, CMC & cellulose acetate, etc.) from isolated cellulose
- Application of cellulose derivatives in the field of food, pharmaceutical, cosmetic and textile industries and others
- A green approach Ionic liquids (ILs) and their double salts for dissolution and modification of cellulose.

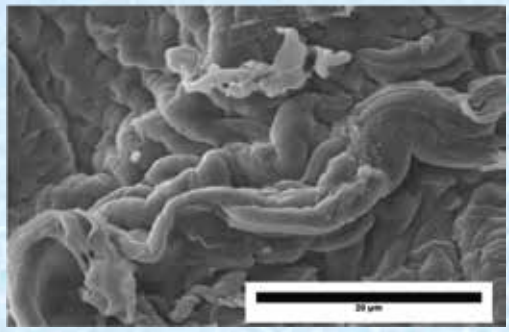
Progress achieved:

1. A novel approach in increasing carboxymethylation reaction of cellulose. Under review.
2. Approach to the synthesis of highly substituted cellulose acetate.Paper writing is in preparation

3. Dissolution of cellulose in ionic liquids and regeneration. Paper writing is in preparation
4. Investigated the physicochemical properties of double salt ionic liquids of ([Bmim]Cl+[Bmim][OAc]-system for cellulose dissolution. Paper writing is in preparation
5. Interaction of non-ionic surfactant and cellulosic polymer in aqueous solution. Paper writing is in the progress.Paper writing is in preparation



XRD pattern of cellulose and regenerated cellulose



SEM image of regenerated cellulose

7. Production of activated carbon from lignocellulosic biomass

Mohammad Mahbubur Rahman (PL), Shamima Akter Eti,Dr.Mohammad Majedul Haque, Khondoker Shahin Ahmed, Md. Saiful Quddus, Dr. Mohammad Moniruzzaman

Introduction:

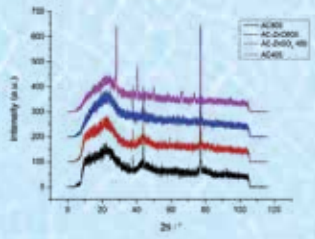
Biomass is widely considered to be one of the most important renewable resources, which can provide value-added chemicals, fuels and materials for our society. The production of chemicals and fuels from biomass has recently attracted much attention from scientists and engineers in recent years. In the present study, our aim is to produce highly porous N-doped activated carbon and metal oxide nanoparticles modified activated carbon which has been the most commonly used adsorbent for the removal of heavy metals and dyes from the industrial effluents.

Objectives:

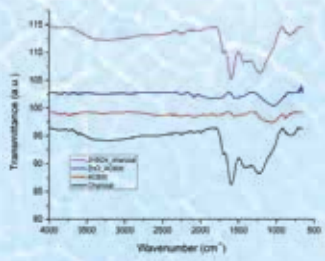
- Synthesis of noble N-doped porous carbon for the efficient removal of textile dyes from an aqueous solution.
- Synthesis of metal oxide nanoparticles modified activated carbon for heavy metal adsorption.

Progress achieved:

1. Activated carbon (AC) has been prepared from waste coconut fiber.
2. N-doped porous carbon has been prepared
3. ZnO nanoparticles modified activated carbon has been prepared.
4. The adsorbent has been characterized by ATR-FTIR and XRD etc.



XRD pattern of activated carbon



FTIR spectra of activated carbon

8. Development of lignin-based hydrogel by emulsion polymerization

Swapan Kumer Ray (PL), Riyadh Hossen Bhuiyan, Rashed Hasan, Md. Jaynal Abedin and Md. Saiful Islam

Introduction:

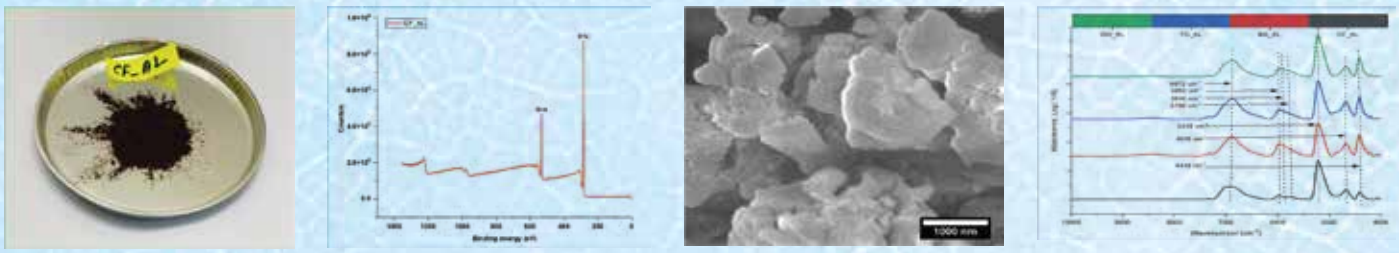
Hydrogels are three-dimensional natural/synthetic polymeric networks and contain cross-linked polymeric chains in their structure. These are highly hydrophilic and could be found as a colloidal gel, in which water is the dispersion medium. The hydrogels made from natural polymers have advantages of inherent biocompatibility and biodegradability in comparison to synthetic polymers. Such natural polymer-based hydrogels can be used in the fields of food, cosmetics, pharmaceuticals, biomedical implants, control release agrochemical formulations, e.g. fertilizers, pesticides, etc. Lignin, a highly complex aromatic biopolymer, has a great potential for the preparation of functional hydrogels for different industrial applications.

Objectives:

- Development of alkali-lignin based hydrogel by emulsion polymerization technique.
- Development of import substitute product formulation for cosmetics and agricultural applications.
- Utilization of available lignocellulosic resources through green chemical approach.

Work Progress:

- Alkali-lignin has been isolated from waste lignocellulosic biomass through green chemical approach and characterized by different physicochemical methods, e.g. particle size analysis by dynamic light scattering, elemental analysis, XPS analysis, FT-MIR-NIR analysis, TG/DSC analysis, 1H-NMR analysis, etc.
- Several batches of hydrogel were synthesized by emulsion polymerization technique. Optimization of the reaction conditions is in progress. Formulation of a control release agrochemical is in progress.
- Writing up of paper, process and patent are in progress.



(a) Coconut fibre alkali-lignin (b) XPS analysis (c) FE-SEM analysis (d) FT-NIR analysis

Fig. 1: Properties of Coconut fibre alkali-lignin (CF_AL)

9. Development of bitumen emulsion using bio-based polymeric emulsifier for paving and roofing applications

Swapan Kumer Ray (PL), Riyadh Hossen Bhuiyan, Zahidul Islam, Md. Saiful Islam, Md. Abdullah Al-Mansur and Md. Shahriar Bashar

Introduction:

Bitumen is manufactured from the distillation of crude oil during petroleum refining. It is a highly complex viscoelestic material and very difficult to handle and apply it in different working fields. There are more than 250 known applications of bitumen, with the majority of bitumen being used worldwide in paving and roofing applications. To

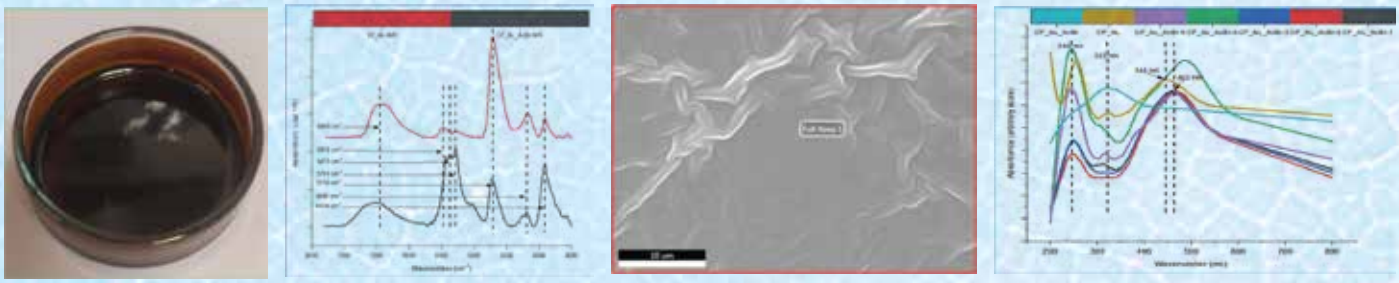
minimize the environmental pollution, bitumen emulsion (bitumen dispersed in water in the presence of a synthetic emulsifier) is increasingly used in the construction sectors instead of raw bitumen. Natural polymer, lignin based bitumen emulsion can be considered as an eco-friendly substitute to synthetic emulsifier based emulsion.

Objectives:

- Development of novel bio-based polymeric emulsifier for bitumen emulsification.
- Utilization of available waste renewable resource for green & value added import substitute product formulation.
- Development of eco-friendly technology for sustainable pavement construction through cold technique.
- Development of roof treatment material to prevent water infiltration into the roof of the buildings.

Work Progress:

- Submicron alkali-lignin particle has been modified chemically and characterized by different physicochemical methods, e.g. FT-MIR-NIR, SEM-EDX, XPS, ^{1}H-NMR, Microviscometry techniques, etc.
- Several batches of surfactants were synthesized using the modified lignin. Characterization of the surfactant and product formulation are in progress
- Writing up of paper, process and patent are in progress.



(a) Modified alkali-lignin (MAL) (b) FT-NIR of MAL (c) SEM of MAL (d) UV-Vis of MALsa

Fig. 1: Properties of Modified Coconut fibre alkali-lignin (MAL)

Special Allocation Project:

Thermochemical conversion of municipal and agricultural waste biomasses with green chemistry principle: Development of NPK fertilizer from waste liquors

Swapan Kumer Ray (PI) and Riyadh Hossen Bhuiyan

Introduction:

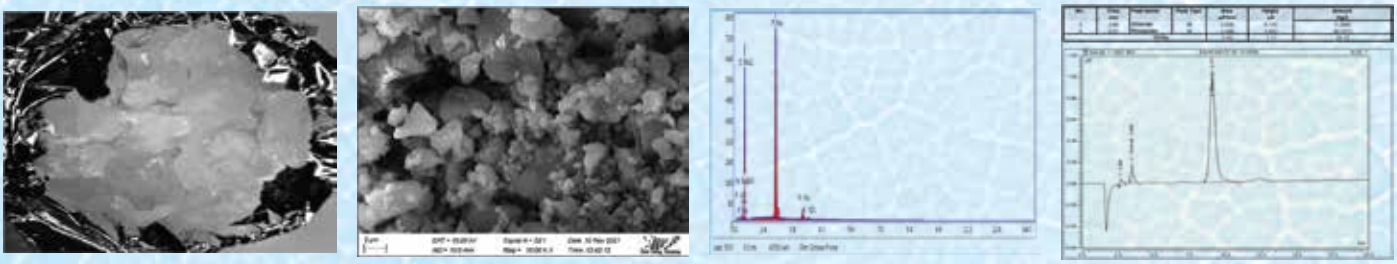
As a promising field of research and development, a lot of studies have been conducted on the conversion of lignocellulosic biomasses and their waste forms in different universities and R&D organizations all over the world. But, there are no work yet done to prepare NPK-fertilizers in solid and liquid froms from black/waste liquors obtained from the thermochemical conversion processes. So, a new dimension on the domain of biomass conversion following the green chemistry principles is of paramount importance. The technology developed under the project will support to ensure sustainable development by reducing environment pollution generated by waste materials.

Objectives:

- Development of a new thermochemical conversion process of municipal and agricultural waste biomasses applying green chemistry principle.
- Development of recycling facility of black/waste liquors and production of nitrogen, phosphorus and potassium containing fertilizer in solid and liquid forms.
- Development of a technical system for the management and utilization of waste biomasses in city area to control environmental pollution.

Work Progress:

- Four types of lignocellulosic biomass have been converted thermochemically into their structural components, e.g. cellulose, hemicelluloses and lignin and NPK-fertilizers have been prepared. A third generation material-driven biorefinery system has been developed based on the work done.
- Characterization of the fertilizers have been done by FT-IR, SEM-EDX, XPS, XRD, Ion chromatographic analyses, etc.
- Writing up of paper, process and patent are in progress.



(a) NPK-fertilizer (b) SEM of NPK-fertilizer (c) EDX analysis of NPK-fertilizer (d) Ion chromatogram of NPK-fertilizer

Fig. 1: Properties of NPK-fertilizer crystallized from waste liquor

Achievements and Activities:

Paper Published:

1. Shahin Sultana, Khaleda Akter, Md. Khabir Uddin Sarker, Riyadh Hossen Bhuiyan, Mohammad Majedul Haque, and Md. Rafiqul Islam, "Color Fastness and Tensile Properties of Cotton Fabric Dyed with Extract from Albizia Procera Sawdust," *Fibers and Polymers,* **2022**, (accepted paper).
2. Shahin Sultana, Md. Khabir Uddin Sarker, Zahidul Islam, and Muhammad Saiful Islam,"Comparative Analysis of Compression Molded Products of Recycled Waste Poly(Vinyl Chloride) Fill Materials and Virgin Poly(Vinyl Chloride)," *Journal of Engineering and Technological Science,* **2022,** 54 (4): 220412.
3. Shahin Sultana, Mehedi Mannan, Md. Jaynal Abedin, Zahidul Islam, Husna Parvin Nur, Purabi Rani Samaddar, "Physico-Mechanical and Thermal Properties of Thermoplastic Poly(Vinyl Alcohol) Modified Thermosetting Urea Formaldehyde Resin", *Advances In Materials Science,* **2021**, 21 (4): 53 – 66.
4. Lutfun Naher Hilary, Shahin Sultana, Zahidul Islam, Md. Khabir Uddin Sarker, Md. Jaynal Abedin and Mohammad Majedul Haque "Recycling of waste poly(vinyl chloride) fill materials to produce new polymer composites with propylene glycol plasticizer and waste sawdust of Albizia lebbeck wood." *Current Research in Green and Sustainable Chemistry,* **2021**, 4: 100221.

5. Swapan Kumer Ray, Riyadh Hossen Bhuiyan, Muhammad Saiful Islam, Md. Jaynal Abedin, Zahidul Islam, Md. Rashed Hasan, "Combined Use of Natural Rubber, Biomass and Plastic Wastes in Bitumen Modification and Flexible Pavement Construction", *RILEM Book series,* **2021**: 27.
6. Mithun Saha, Pallabi Sikder, Aditi Saha, Sharha Shah, Sharmin Sultana, Tushar Emran, Ananna Banik, Zahidul Islam, Muhammad Saiful Islam, Shazid Md. Sharker, and Hasan Mahmud Reza, "QbD Approach towards Robust Design Space for Flutamide/ PiperineSelf-Emulsifying Drug Delivery System with Reduced Liver Injury", *AAPS PharmSciTech,* **2022**, 23 (62): 1-14.
7. Uswatun Hasanaha, Muhammed Shah Miran, Mohammad Mahbubur Rahman, Md. Mominul Islam, "Simultaneous reductions of production loss and environmental burden through the treatment of loose leather with non-toxic manganese dioxide nanoparticles", *Journal of Cleaner Production,* **2021**, 318: 128541.

Patents:

1. Swapan Kumer Ray, Riyadh Hossen Bhuiyan, Muhammad Saiful Islam, Rashed Hasan and Zahidul Islam, "A new process for the construction of moisture and heat resistant rubberized bituminous pavement with waste thermoplastic coated aggregates", Submitted by the office of the Patents and Design and Trademarks, Motijheel, Dhaka, No. P/BD/2021/000233, Date: 19.07.2021.
2. Shahin Sultana, Zahidul Islam, Lutfun Naher Hilary, Md. Jaynal Abedin, and Md. Rashed Hasan, "A process for the production of polyvinyl alcohol modified resorcinol formaldehyde resin" has been accepted at 28 December, 2021. Patent application No. 205/2020, Serial No. 1006583.

Scientists pursuing M.S/ M.Phil/ PhD Courses in 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. Mohammed Abdul Aziz, Professor and Dr. Md. Saiful Islam, Professor) and working on "Synthesis and characterization of modified acrylic polymers and natural fiber reinforced polymer composites" in 2016-2017 session.
2. Swapan Kumer Ray, PSO Fibre & Polymer Research Division pursuing his Ph.D degree in the department of Chemistry, University of Dhaka, Bangladesh under the supervision of Professor Dr. Md. Qamrul Ehsan and Professor Dr. Md. Tanvir Muslim, titled on "Preparation of submicron lignin particles from different lignocellulosic biomass and their modification" in 2018-2019 session.
3. Md. Mahbubur Rahman, SSO Fibre & Polymer Research Division pursuing Ph.D degree in the department of Chemistry, University of Dhaka, Bangladesh under the supervision of Professor Dr. Md. Abu Bin Hasan Susan, titled on "Ionic Liquids and Their Double Salts for Dissolution and Modification of Cellulose" in 2016-2017 session.
4. Shamima Akther Eti, SSO, Fibre & Polymer Research Division pursuing Ph.D degree in the department of Soil, Water & Environment, University of Dhaka, Bangladesh under the supervision of Professor Dr. Shahid Akhtar Hossain titled on "Development of Polyaluminum Chloride-Based Coagulants from Aluminum Scrap for the Treatment of Textile Wastewater" in 2017-2018 session.

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

SN	Title of Research	Research Category	Name of the Student	Name of the Institution	Name of supervisors
1.	Synthesis and characterization of natural rubber modified unsaturated polyester resin and composite materials	MS Thesis	Md. Ashraful Haque	Department of chemistry, University of Dhaka	Shahin Sultana, PSO and Dr. Md. Ershad Halim, Professor
2.	Identification, abundance and spatial distribution of microplastics in beach sediments of Kutubdia and St. Martin's Island, Bangladesh	MS Thesis	Kamrunnahar Kanak	Department of Oceanography, University of Dhaka	Muhammad Saiful Islam, SSO
3.	Pervasiveness of microplastic contamination in the digestive tract of fishes from mangrove ecosystem in Sundarbans, Bangladesh	MS Thesis	Marhaba Matluba	Department of Oceanography, University of Dhaka	Muhammad Saiful Islam, SSO
4.	Spatiotemporal distribution of microplastic debris in the surface beach sediment of Kuakata coast, Bangladesh	MS Thesis	Md. Shawon Hossen	Department of Oceanography, University of Dhaka	Muhammad Saiful Islam, SSO

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

1. Shahin Sultana (PSO), participated in the training course on "36th Understanding Training Course on ISO/IEC 17025:2017" conducted by Bangladesh Accreditation Board (BAB), in Dhaka from 09/11/2021 to 11/11/2021.
2. Swapan Kumer Ray, PSO, participated in the In-house training program titled "X-Ray Photoelectron Spectrometer" organized by Planning and Development Division, BCSIR on 19-23 September, 2021 at Institute of Glass and Ceramic Research and Testing, BCSIR, Dhaka.
3. Shamima Akther Eti (SSO), participated in the training program on "Fourier Transform Infrared Spectrophotometer (FT-IR) & Universal Testing Machine (UTM)" organized by BCSIR , Dhaka held in 08-12 May, 2022.
4. Shamima Akther Eti (SSO), participated in the training program on "BET Sorptometer" organized by Central Lab, BCSIR , Dhaka held in 07-11 November, 2021.
5. Muhammad Saiful Islam, SSO, participated in the training program on "Field Emission Scanning Electron Microscope (FESEM)", organized by P&D, BCSIR at BTRI, held on 20-24 March, 2022.
6. Muhammad Saiful Islam, SSO, conducted the training program on "Rheometer, Microviscometer, Refractometer with Density Module" organized by P&D, BCSIR, held on 03-07 April, 2022.
7. Riyadh Hossen Bhuiyan, SO, participated in the training program on "Basic principle, applications, and operation & maintenance of HPLC, organized by BCSIR Dhaka Laboratories, held on 25 January, 2022.
8. Riyadh Hossen Bhuiyan, SO, conducted the training program on "Rheometer, Microviscometer, Refractometer with Density Module" organized by P&D, BCSIR, held on 03-07 April, 2022.

9. Zahidul Islam, SO, conducted the training program on "Dilute Solution Viscometry Using Automated Microviscometer" organized by BCSIR Dhaka Laboratories, held on 08 March, 2022.
10. Zahidul Islam, SO, participated in the training-workshop program on "Patent Drafting" organized by BCSIR, held on 15 June, 2022.
11. Md. Rashed Hasan, SO, participated in the training program on "Basic principle, applications, and operation & maintenance of HPLC, organized by BCSIR Dhaka Laboratories, held on 25 January, 2022.

Number of Analytical (Ad-Hoc) Problem Solved:

Name of the Division	Routine type	Research type	Total
Fibre & Polymer Research Division	860	203	1063

Special Analytical Services to the Industries/Institutions:

1. Food grade quality of plastics to support food safety in Bangladesh.
2. Biodegradability analysis of Plastics to support Ministry of Jute, BJMC, Dept. of Jute, BSTI and Dept. of Environment.
3. Quality analysis of geo-textiles to support Water Development Board and Bangladesh Army.
4. Quality analysis of Natural Rubber to support Bangladesh Forest Industrial Development Corporation.
5. Quality analysis of Bitumen and Bitumen Emulsions to support BSTI, Importers and Construction Firms.

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

Product Pictures

Urea-Formaldehyde Molding Powder

Terephthalic acid (TPA) monomer from waste PET plastic

Modified Bitumen

Polymeric antioxidant

NPK-fertilizer (solid)

NPK-fertilizer (liquid)

Major instruments-

Gel Permeation Chromatograph

Simultaneous Thermal Analyzer

Reaction Calorimeter

Universal Strength Tester

Flow synthesis system

Accelerated solvent extractor

Brief Biography of the Scientists of F&PRD:

Shahin Sultana (June, 1999- …)

Office	Fibre & Polymer Research Division	Blood group	**O+**
Position	Principal Scientific Officer	Degree obtained	M.Phil (2005)
Contact	shasultana@gmail.com	Mobile	+8801715100985

Shahin Sultana obtained M. Phil in Chemistry from Bangladesh University of Engineering and Technology (BUET). She earned both MSc and BSc (Hons) degree in Chemistry from Jahagirnagar University. Her research interests are in the area of polymer chemistry, fiber chemistry, polymer and recycled polymer based composite and biocomposite materials. She has published more than 25 research articles in different peer-reviewed journals. She has 01 accepted patent and 09 accepted processes.

Swapan Kumer Ray (June, 2006- …)

Office	Fibre & Polymer Research Division	Blood group	**O+**
Position	Principal Scientific Officer	Degree obtained	MS
Contact	swapanray_bcsir@ymail.com	Mobile	+88-01534149306

Swapan Kumer Ray earned his both BSc and MSc degree in Chemistry from the National University, Bangladesh. He is pursuing his PhD in Chemistry (Lignin Chemistry) in the University of Dhaka under the joint supervision of Professor Dr. Md. Qamrul Ehsan and Professor Dr. Tanvir Muslim. His research work is mainly focused on the development of novel routes for lignin modification, third generation biorefinery, self-healing bitumen, etc. He has over 15 research articles in peer-reviewed journals, 05 industrial processes and 01 patent. He has achieved training on the "Assessor: ISO/IEC-17025" and "Uncertainty of Measurement" from the United Kingdom Accreditation Service (UKAS) from Sunningdale park, Ascot, UK and also from the Bangladesh Accreditation Board (BAB), Dhaka, Bangladesh. He is a life member of Bangladesh Chemical Society (BCS).

Md. Mahbubur Rahman (June, 2006- …)

Office	Fibre & Polymer Research Division	Blood group	**A+**
Position	Senior Scientific Officer	Degree obtained	M.Phil
Contact	Mahbub.bcsir@yahoo.com	Mobile	01911776171

Md. Mahbubur Rahman obtained his B.Sc. (Hons) and M.S degree in chemistry from the University of Dhaka and also awarded Master of Philosophy (M.Phil) in Material Science from Bangladesh University of Engineering and Technology (BUET). He is pursuing Ph.D. on cellulose dissolution and modification by ionic liquids in Material Chemistry Laboratory, Department of Chemistry, University of Dhaka. His research interest in cellulose chemistry, material chemistry and ionic liquids. He has authored or coauthored 12 publications and get 299 citation (h-index:5)& RG score (10.30). He has three accepted process and a patent. He is a life member of BCS, BAAS,DUCAAand DUAA.

Shamima Akther Eti (December, 2009- …)

Office	Fibre & Polymer Research Division	Blood group	**A+**
Position	Senior Scientific Officer	Degree obtained	MS (2003)
Contact	shaeti123@gmail.com	Mobile	01712181711

Shamima Akther Eti earned her both B.sc Hons (4 years) and MS degree in Soil, Water & Environment from University of Dhaka. Now she is doing her PhD in Environmental Science in the same University. She is currently affiliated with Fibre & Polymer Research Division (F &PRD), BCSIR Dhaka Laboratories, Bangladesh Council of Scientific & Industrial Research (BCSIR). Her research focus is in industrial waste management, wasterwater treatment & reuse. Now she is a life member of Dhaka University of Alumni Association & NITUB (Network of Instrument Technical personnel and User scientist of Bangladesh).

Dr. Mohammad Majedul Haque (June, 2006- …)

Office	Fibre & Polymer Research Division	Blood group	**A+**
Position	Senior Scientific Officer	Degree obtained	PhD
Contact	majedulbcsir@gmail.com	Mobile	01914-113880

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. 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 Twelve publications. He has one accepted process.

Md. Khabir Uddin Sarker (June, 2006- …)

Office	Fibre & Polymer Research Division	Blood group	**A+**
Position	Senior Scientific Officer	Degree obtained	MS (2010)
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 four publications. He has nine accepted processes and one patent. He is a life member of BAS and Bangladesh Chemical Society.

Muhammad Saiful Islam (June, 2011- …)

Office	Plastic Technology Research Section, Fibre & Polymer Research Division	Blood group	**B+**
Position	Senior Scientific Officer (SSO)	Degree obtained	MS
Contact	saifulacctdu@yahoo.com	Mobile	01721911715

Muhammad Saiful Islam has earned his both BSc and MS degree in Applied Chemistry and Chemical Engineering from the University of Dhaka. His research interests are in the fields of plastic processing technology, plastic pollution including microplastics and plastic recycling. He has authored or coauthored 25 publications. Currently, he is in-charge of Plastic Technology Research Section and working in the field of plastic pollution, microplastics and their effects. Mechanical recycling; thermo-chemical and chemical recycling of waste plastics for the production of monomer(s) are another important focus of his present research. He is a proficient user of FT-IR/Raman, TGA, DSC, Rheo- and Micro-viscometer, Extruder, Zetasizer, GPC, GC-MS, HS-GC-FID/ECD, HPLC, and LC-MS/MS.

Zahidul Islam (March, 2016- …)

Office	Fibre & Polymer Research Division	Blood group	**AB+**
Position	Scientific Officer	Degree obtained	MS (2010)
Contact	chemizahid@gmail.com	Mobile	01814930871

Zahidul Islam has achieved his both BSc and MSc degree in Chemistry. His research interests are in the field of Thermoplastic and thermosetting resins, Plastic Technology, Microplastics and Biopolymer synthesis. He has 08 publications and 01 Patent in different International Journals.

Riyadh Hossen Bhuiyan (March, 2016- ...)

Office	Fibre & Polymer Research Division	Blood group	**A+**
Position	Scientific Officer	Degree obtained	MS (Thesis) in Inorganic Chemistry
Contact	riyadhbcsir@gmail.com	Mobile	01632072603

Riyadh Hossen Bhuiyan has achieved his both B.Sc (Hons) degree in Chemistry and MSc (Thesis) in Inorganic Chemistry. His research interests are in the field of Lignocellulosic Biomass, Biopolymer synthesis, Organic synthesis, Bitumenous materials and Active pharmaceuticals Ingredient. He has published 08 article and 01 Patent (submitted) in different International Journals.

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

Office	Fibre & Polymer Research Division	Blood group	**O+**
Position	Scientific Officer	Degree obtained	MS
Contact	rashedhasanju33@yahoo.com	Mobile	01816375618

Md. Rashed Hasan has achieved his both BSc (Hons) and MS degree in Chemistry from the Jahangirnagar University. His research interests are in the field of Plastic Technology, Microplastics and Biopolymer synthesis. He contributes to four publications and one patent as co-author.

Mahbub Alam (May, 2022- ...)

Office	Fibre & Polymer Research Division	Blood group	**A+**
Position	Research Chemist	Degree obtained	MS (2020)
Contact	mahbubalamnoyon28@mail.com	Mobile	01515289468

Mahbub Alam earned his both BSc and MS degree in Chemistry (Physical chemisty) from the University of Dhaka. He is interested in cellulose, ionic liquids and its applications.

Atek Reza (May, 2022- ...)

Office	Fibre & Polymer Research Division	Blood group	**O+**
Position	Research Chemist	Degree obtained	B.Sc. Honors
Contact	atekrezachem@gmail.com	Mobile	01521451528

Atek Reza earned his BSc Honors degree in chemistry (physical) from University of Dhaka. His research is mainly focused on the physicochemical and thermophysical properties of pure ionic liquids as well as their double salts. He has published one review paper.

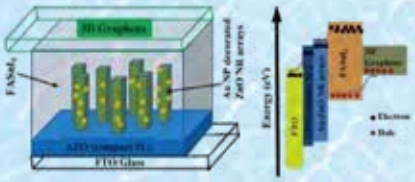
INDUSTRIAL PHYSICS DIVISION (IPD)

Scientists of IPD

Industrial Physics Division

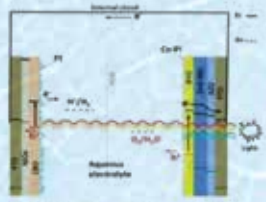
A place of innovative minds

Energy Conversion & Storage

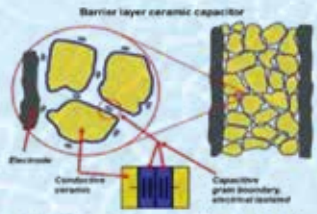


Nanoengineered Pb-free Perovskite Solar Cell

Transparent Conductive Oxides

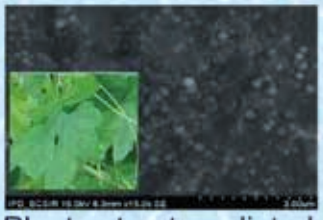


Metal oxides for Solar Fuels

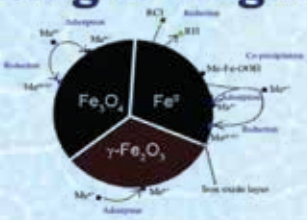


$BaTiO_3$ Ceramic & Thin films for Capacitor

Semiconducting & Magnetic Nanomaterials



Plant-extract mediated Nanoparticles Synthesis



Magnetic nanoparticles for Water Treatment

Nanocrystalline materials for Transformer Core

Physicists in industry and academia have been a prime mover of industrial development as well as technological advances of modern products by translating fundamental discoveries into viable commodities and state-of-the-art tools that improve our way of life. In this era of fast-changing technology, materials and device physicists/engineers experience immense challenges globally to reduce the time and expense required to bring products and services to the end users. With this challenge in mind, Industrial Physics Division (IPD) has been engaged in the cutting-edge R&D activities in the field of materials and energy for sustainable development. Scientists and researchers of this division play a pivotal role to solve problems quickly in a wide range of academic and industrial areas, devising custom-made tools and using unconventional techniques for better understanding the synthesized as well as imported products. Tailoring material properties at the nanoscale as well as adopting advanced and high-precision measurements techniques are the core of IPD activities to fulfill the needs of diverse stakeholders as well as for upholding the country's scientific development strategy.

- Number of Scientists:07
- Total Ongoing R&D: 03
- Special Allocation: 01
- TWAS & RSC grants R&D: 02
- Analytical Services: 20
- Published Papers: 13

R&D Project:

Development of eco-friendly dielectric ceramic materials for energy storage applications

Suravi Islam (PL), Dr. Syed Farid Uddin Farhad, Nazia Khatun, Mohammad Sajjad Hossain, Nazmul Islam Tanvir, Dr. Samia Tabassum, Monika Mahmud

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:

Yttrium doped Barium Titanate (Y-BT) $Ba_{1-x}Y_xTiO_3$ (with x=0.00, 0.01, 0.03, 0.05, 0.07 mmol) sample have been prepared by Sol-gel method. The structural, electrical and optical properties of the synthesized samples were investigated by XRD, FESEM, impedance analyzer and UV-Vis- NIR Spectroscopy. Zr and Bi-Al doped Barium Titanate samples have been synthesized by conventional solid state ceramic technique. Characterization and analysis of the samples are going on.

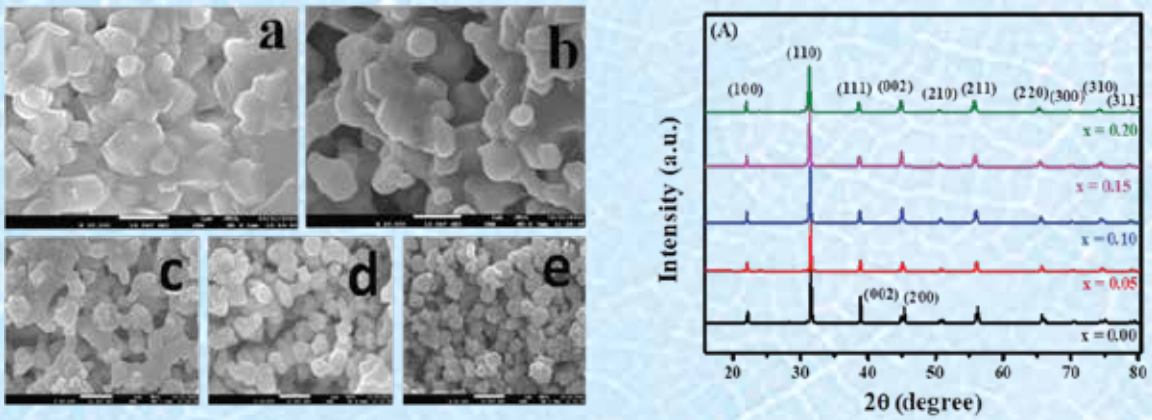


Figure: The surface morphology of ZrBT (where a, b, c, d, e is x= 0.00, 0.01, 0.03, 0.05 and 0.07 respectively and XRD patterns of Zirconium doped Barium Titanate samples.

Fabrication of highly Transparent and Conducting Substrate (TCS) of using low cost and environment friendly materials for consumer electronics

Dr. Syed Farid Uddin Farhad (PL), Suravi Islam , Mohammad Sajjad Hossain, Nazmul Islam Tanvir, Md. Saidul Islam, Nur Amin Bitu and Md. Saidul Islam

Introduction:

Transparent and Conducting Substrates (TCS) is one of the major components for consumer electronics such as flat panel displays, smart phone, touch screen, low-emissivity energy-conserving windows, photo-electrochemical device and more importantly in solar cells. This project focuses on the use of low cost and environment friendly materials for the facile fabrication of highly transparent and conducting substrates/electrodes for optoelectronic and solar cell industry.

Objectives:

- Process and Patent of this innovation have been submitted through competent authority.
- To synthesis Binary/Ternary copper oxide, AZO, SnO_2, NiO_x and Graphene (reduced Graphene oxide (rGO)).
- Optimization of physical and chemical properties of synthesized TCS and study of their performance compared to the commercial TCS.

Work Progress:

❖ Tin (IV) dioxide (SnO_2) thin films have synthesized by spin coating both from SnO_2 nanoparticle sols (NP-sols) as well as precursor $SnCl_2.2H_2O$ sols (PC-sols). The electrical resistivities of annealed thin films were carried out by a four-point-collinear probe using current reversal technique and found in the range of ~200-1500 Ω.cm. UV-VIs-NIR Transmission data revealed that thin films with the average thickness ~250±35 nm showed maximum (81-96)% transmission in visible range. The optical bandgap of pristine and annealed films on quartz substrates was found within 3.78-4.35 eV. The effect of bandgap matched UV-exposure on the thin films was also studied by measuring the contact angles with De-Ionized water. Some characterization results of the deposited products are shown in figure-1 below.

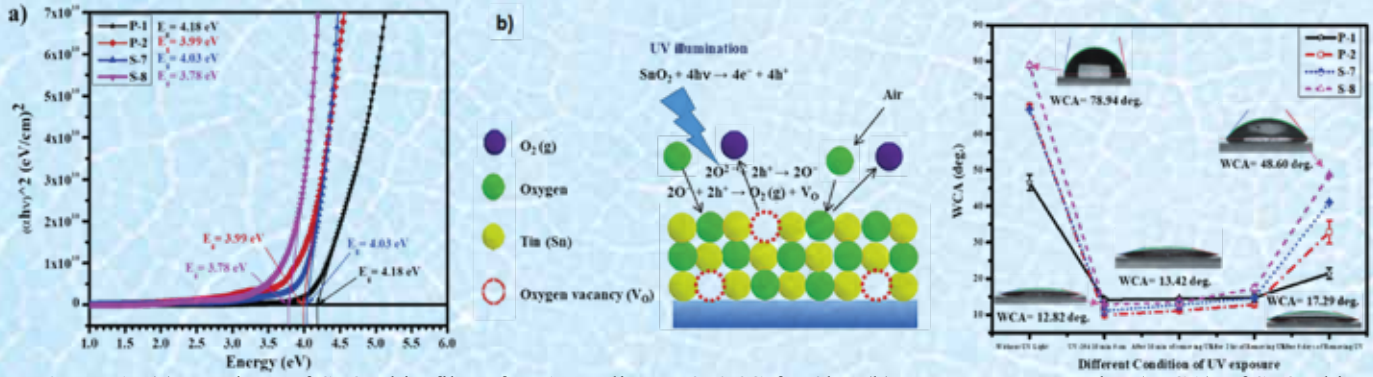


Figure-1: (a) Bandgap of SnO_2 thin film after Annealing at 250 ºC for 2hr, (b) Water contact angles (WCA) of SnO_2 thin film with 254 nm (above the bandgap of SnO^2) LED light illumination (~5 mW/cm^2).

Here, P-1 & P-2 are thin film grown by commercial SnO_2 NPs Sols and S-7 & S-8 are thin film grown by precursor solution derived SnO_2 Sols.

❖ We have designed and fabricated a portable light source with Variable Wavelength, Intensity and Illumination period to characterize our samples. This light source can also be used on any other thin films, photocatalysts etc. where their photophysical or photochemical properties are needed to be determined (figure-2).

❖ Process and Patent of this innovation have been submitted through competent authority.

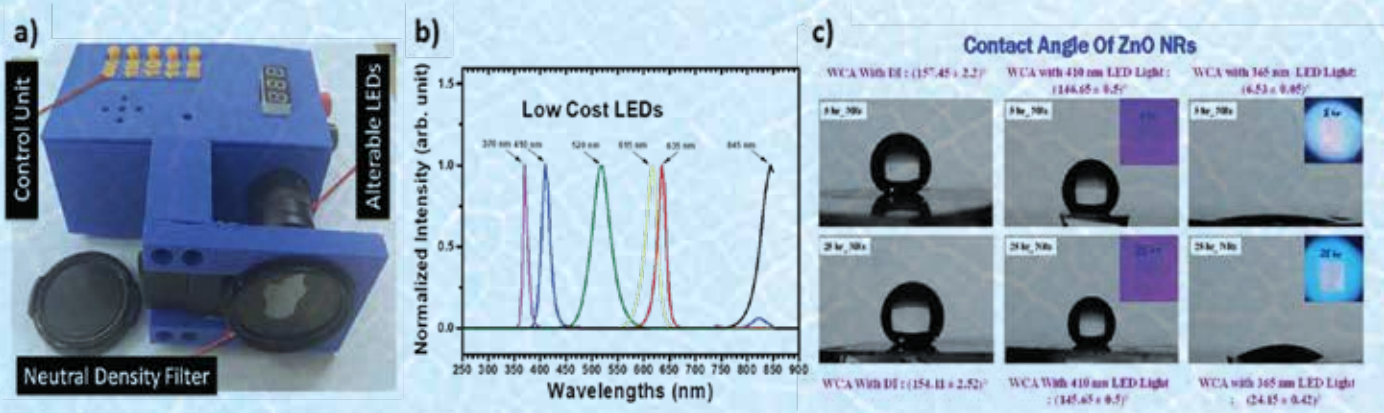


Figure-2: a) The home-built portable light source with Variable Wavelength, Intensity and Illumination Period (VWI light source) for photophysical and photochemical studies, b) Spectral range of the the VWI light source (from UV to Infrared), c) Photo induced surface wettability investigation of ZnO Nanorods using the VWI light source

Development of magnetic material for sensor

Nazia Khatun (PL), Suravi Islam, Dr. Syed Farid Uddin Farhad and Dr. Most. Hosney Ara Begum

Introduction:

A large number of metal Oxides, mixed metal Oxides and ferrites have shown better sensitivity to certain gas and humidity. A great advantage of ferrites is their porosity, which is necessary for the development of high performance sensor. These pores serve as humidity or gass adsorption sites and the sensitivity of sensor depends on the size of these pores. Application of humidity sensors and its use in electronic industries is increasing in our country day by day. On the basis of analysis and results of the prepared samples, developed materials will be employed for practical use for humidity sensors.

Objectives:

- To synthesis magnetic material for humidity sensor application.
- To characterize this material to find optimum condition.
- To study the physical, electrical, dielectric, magnetic properties and sensitivity of the samples.

Work Progress:

- $NiMgFe_2O_4$ ferrites have been synthesized with different composition through a Conventional Ceramic Technique.
- Characterization of samples has been done by XRD, FTIR, FE-SEM, EDS, UV-VIS-NIR spectroscopy, impedance analyzer (with and without humidity environment) and VSM. The material exhibited excellent sensitivity to 10% to 95% RH range owing to chemisorption, physisorption and condensation in micro, meso and macropores. This material revealed low dissipation, fast response (61S) and recovery (80S) times along with low hysteresis loss.

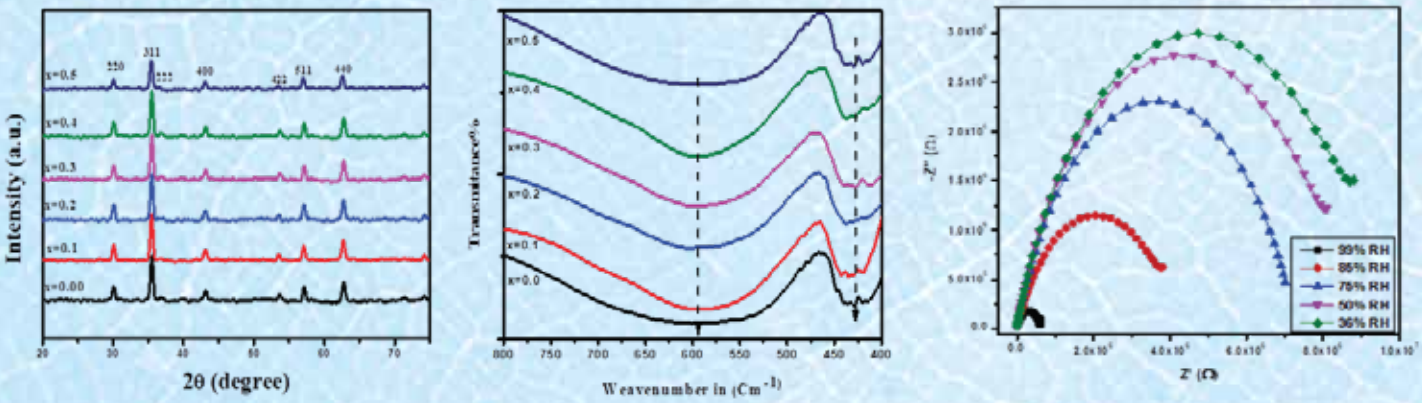


Figure : XRD patterns, FTIR analysis spectrum and Complex impedance plots of $NiMgFe_2O_4$ under different humidity (36%–95%) RH) levels.

Special Allocation Project Title:

Fabrication of Multinary Metal Oxide Photoelectrodes for Sunlight driven Hydrogen Production

Dr. Syed Farid Uddin Farhad (Principal Investigator) & Nazmul Islam Tanvir (Associate Investigator)

Introduction:

A PEC system uses sunlight illuminated semiconductors to split water into hydrogen (a clean solar fuel) and oxygen. Binary metal oxides drown 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 proposal, we aim to utilize solution processable approaches to further develop Bismuth-based multinary metal oxide photo-electrodes at Energy Conversion and Storage Research (ECSR) section, Industrial Physics Division (IPD), BCSIR Dhaka Laboratories.

Objectives:

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

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

Research Papers:-

1. Md Alauddin Hossain, Syed Farid Uddin Farhad, Nazmul Islam Tanvir, Jang Hyo Chang, Mohammad Atiqur Rahman, Tooru Tanaka, Qixin Guo, Jamal Uddin, Md Abdul Majed Patwary , "Facile synthesis of Cu_2O nanorods in the presence of NaCl by SILAR method and its characterization", *Royal Society Open Science,* **2022**, 9, 3, 211899.
2. Rabeya Binta Alam, Md. Hasive Ahmad, Syed Farid Uddin Farhad, Muhammad Rakibul Islam, "Significantly Improved Dielectric Performance of Bio-inspired Gelatin/Single walled Carbon Nanotube Nanocomposite", *Journal of Applied Physics,* **2022**, 131, 12, 124103.
3. Md. Hasive Ahmad, Rabeya Binta Alam, Anwar Ul-hamid, Syed Farid Uddin Farhad, Muhammad Rakibul Islam, "Hydrothermal synthesis of Co_3O_4 nanoparticles decorated three dimensional MoS2 nanoflower for exceptionally stable supercapacitor electrode with improved capacitive performance" *Journal of Energy Storage,* **2022**, 47, 103551.
4. Md. Farhad Hossain, Tapash Chandra Paul, Md. Nazrul Islam Khan, Suravi Islam, Parimal Bala, "Magnetic and dielectric properties of $ZnFe_2O_4$/nanoclay composites synthesized via sol-gel autocombustion", *Materials Chemistry and Physics,* **2021**, 271, 1, 124914.

5. Nazia Khatun, Mohammad Sajjad Hossain, Most. Hosney Ara Begum, Suravi Islam, Nazmul Islam Tanvir, Riyadh Hossen Bhuiyan, Md. Al-Mamun, "Effect of sintering temperature on structural, magnetic, dielectric and optical properties of Ni–Mn–Zn ferrites", *Journal of Advanced Dielectrics,* **2021**, 11, 6 , 2150028.

6. Jannatul Fardush Tanha, Syed Farid Uddin Farhad, Ummey Honey, Nazmul Islam Tanvir, Tarique Hasan, Sadiq Shahriyar Nishat, Alamgir Kabir, Shahran Ahmed, Mahmuda Hakim, Md. Nazrul Islam Khan, Mohammad Moniruzzaman, Imtiaz Ahmed, "A DFT+U Look into Experimentally Synthesised Monoclinic Scheelite $BiVO_4$", *Journal of Applied Physics*, **2021**, 130, 23, 235107.

7. Abul Monsur Mohammed Musa, Syed Farid Uddin Farhad, Md.Abul Gafur, Abu Taleb Md. Kaosar Jamil, "Effects of withdrawal speeds on the structural, morphological, and optical properties of CuO thin films synthesized by dip-coating technique for gas sensing applications" *AIP Advances,* **2021**, 11, 11, 115004.

8. Abu Kowsar, Md. Saidul Islam, Sumon Chandra Debnath, Md. Masum Billah, Khaledun Nahar Babi, Ali Newaz Bahar, Syed Farid Uddin Farhad, "Simulation and performance optimization of high efficiency triple-junction solar cells using MSCS-1D simulator" International Journal of *Renewable Energy Research,* **2021**, 11, 4: 1713-1721.

9. Syed Farid Uddin Farhad, A. K. M. Hasibul Hoque, Nazmul Islam. Tanvir, Suravi Islam, Mukul Hossain, Md. Zunaid Baten, "Enhanced and Tunable Absorption Characteristics of Au-nanoparticle Loaded ZnO Nanorods Grown by Hydrothermal Technique" *IEEE Xplore,* **2021**, 1-5.

10. Ahatashamul Islam, Fariha Tasneem, Zulfiqar Hasan Khan, Asif Rakib, Syed Farid Uddin Farhad, Aminul Islam Talukder, AFM Yusuf Haider, Md Wahadoszamen, "Economically reproducible surface-enhanced Raman spectroscopy of different compounds in thin film" *Journal of Bangladesh Academy of Sciences,* **2021**, 45, 1: 1-11.

11. Maitry Dey, Nipu Kumar Das, Mrinmoy Dey, Syed Farid Uddin Farhad, Md. Abdul Matin, Nowshad Amin, "Impact of Source to Substrate Distance on the Properties of Thermally Evaporated CdS Film" International Journal of Renewable Energy Research, **2021**, 11, (1): 495-503.

12. Md Shehan Habib, Paroma Arefin, "Adoption of Hydrogen Fuel Cell Vehicles and its Prospects for the Future" *Oriental Journal of Chemistry,* **2022**, 38, 3.

13. Md Abdus Salam, Thauhidul Islam, Kawsar Ahmed, Md Shahab Uddin, Md Shehan Habib, Bawadi Abdullah, "Potential Feature of Combined AB5-Type Metal Hydride Tank and PEMFC as a Safer System for Hydrogen Fueling in Bangladesh" *frontiers in Energy Research,* **2021**, 9.

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

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

Sl. No.	Title of research	Research Category	Name of the Student	Name of the Institution	Name of Supervisors
1.	Ni Fe_2O_4/ Na-montmorillonite composites: Investigation on Dielectric and Optical properties during variation of sintering temperature.	M.Sc (Thesis)	Mahbuba Akter Dipty.	Jagannath University, Dhaka	Suravi Islam –P.S.O.
2.	Experimental and Theoretical Investigation of Bismuth based Multinary metal oxides for solar fuels	BCSIR Postgraduate Fellow	Mst. Irin Naher	Industrial Physics Division, BCSIR Labs, Dhaka	Dr. S.F.U. Farhad –P.S.O.
3.	Synthesis and Characterization of Size controlled plasmonic nanoparticles for solar cells, solar fuels, and SERS applications	BCSIR Postgraduate Fellow	Mr. Shah Alam	Central Analytical Research Facilities (CARF), BCSIR	Dr. S.F.U. Farhad –P.S.O.
4.	Fabrication of nanoparticle on thin film of 2D materials (MoS_2) for surface enhance Raman spectroscopy (SERS) applications	M.S. (Thesis)	Ms. Mowtosi Rahman Sharkar	Department of Physics, Dhaka University	Dr. S.F.U. Farhad –P.S.O.
5.	Ag, Au, and Au-Ag hybrid nanoparticles for surface enhance Raman spectroscopy (SERS) applications	M.S. (Thesis)	Mr. Tasnim Akbar Faruquee	Department of Physics, Comilla University	Dr. S.F.U. Farhad –P.S.O.
6.	Synthesis and Characterization of Nickel Oxide incorportated MoS_2 Nanomaterials for Energy Storage Applications	M.S. (Thesis)	Mr. Md. Wahidujjaman Bari	Department of Physics, BUET	Dr. S.F.U. Farhad –P.S.O.
7.	Experimental Insights of CZTS thin-film solar cell deposited by RF magnetron sputtering	Ph.D.	Mr. Ashoke Kumar Sen Gupta	Department of EEE, CUET	Dr. S.F.U. Farhad –P.S.O.

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

Training:-

1. Suravi Islam (PSO) and Dr. S.F.U. Farhad (PSO) attended a 5-day long training on "Operation and Maintenance of Fatigue Testing Machine and Creep Testing Machine" organized PP&PDC, BCSIR, from 22-26 May, **2022.**
2. Suravi Islam (PSO) and Nazia Khatun (SSO), participated in a training on "NIS for transparent data generating of particle size analyzer" BCSIR Dhaka Laboratories, 16 September **2021.**
3. Dr. S.F.U. Farhad (PSO) attended a 5-day long training/workshop on "STI Policy for Socio-Economic Development (SPED)" organized by Perdana Center, Universiti Teknologi Malaysia (UTM) , Malaysia (online), from 30 August- 4 September, **2021.**
4. Dr. S.F.U. Farhad (PSO) and Nazia Khatun, (SSO) attended a 5-day long training on "Operation and Maintenance of X-ray Photoelectron Spectrometer (XPS)" organized IGCRT, BCSIR, from 19-23 September, 2021.
5. Suravi Islam (PSO), participated in a training on "e-Filing" BCSIR Dhaka Laboratories, 12 October 2021.
6. Nazia Khatun (SSO) and Md. Saidul Islam (SO), participated in a training course on "Dilute Solution Viscomitry Using Automated Micro-Viscometer" organized by BCSIR Dhaka Laboratories, 08 March 2022.
7. Dr. Syed Farid Uddin Farhad (PSO), Nazia Khatun (SSO), participated in a training program on "Learning session on Computational drug discovery" BCSIR Dhaka Laboratories, 07 March, 2022.
8. Md Shehan Habib (SO), participated in on inhouse training on wavelength dispersive X-ray Fluorescence Spectrometer (WD-XRF) in Institute of Mining, Mineralogy and Metallurgy (IMMM), BCSIR in 06-10 March, 2022.
9. Md Shehan Habib (SO), participated in a training on "e-Governance and Innovation Action Plan" organized by BCSIR, Dhaka, 27January 2022.
10. Nazmul Islam Tanvir (SO), participated in a training on "Method Validation for ISO17025/2017" BCSIR Dhaka Laboratories, 31 August 2021.
11. Nazmul Islam Tanvir (SO), participated in a training on "Integrating good governance and office management" BCSIR, Dhaka, 19-23 September 2021.
12. Nazmul Islam Tanvir (SO), as a trainer conducting training on "Raman Spectroscopy; Principles, Operation and data Analysis" organized by BCSIR, Dhaka, 31 October to 4 November 2021.
13. Nazmul Islam Tanvir (SO), participated in a training on "Strengthening and Management of Official Website" BCSIR Dhaka Laboratories, 29 November 2021.
14. Nazmul Islam Tanvir (SO), participated in a training on "fire prevention, extinguishing, rescue and emergency evacuation" organized by BCSIR, Dhaka, 28 February.
15. Nazmul Islam Tanvir (SO), participated in a training on "e-Governance and Innovation Action Plan" organized by BCSIR, Dhaka, 18 May 2022.
16. Md. Saidul Islam (SO), participated in a training on "Integrity strategy and good governance" organized by BCSIR Dhaka Laboratories, 01 December 2021.
17. Md. Nur Amin Bitu (RC), participated in a training on "Method Validation for ISO 17025/2017" organized by BCSIR Dhaka Laboratories, 31 August 2021.
18. Md. Nur Amin Bitu (RC), participated in a training course on "Integrating good governance and office management" organized by BCSIR, Dhaka, 19-23 September 2021.

19. Md. Nur Amin Bitu (RC), participated in a training course on "Raman Spectroscopy" organized by Central Analytical and Research Facilities (CARF), BCSIR, Dhaka, 31 October- 04 November 2021.
20. Md. Nur Amin Bitu (RC), participated in a training on "Integrity strategy and good governance" organized by BCSIR Dhaka Laboratories, 01 December 2021.
21. Md. Nur Amin Bitu (RC), participated in a training on "Thermo-gravimetric and Differential Thermal Analyzer (TG/DTA) & Thermos-mechanical Analyzer (TMA)" organized by Planning and Development (P&D), BCSIR, Dhaka, 05-09 December 2021.
22. Md. Nur Amin Bitu (RC), participated in a training on "Raising Public Awareness" organized by BCSIR Dhaka Laboratories, 10 March 2022.
23. Md. Nur Amin Bitu (RC), participated in a Seminar on "তথ্য অধিকার আইন ও বিধিবিধান সম্পর্কে জনসচেতনতা বৃদ্ধিকরণ" organized by BCSIR Dhaka Laboratories, 14 June 2022.

Conference:-

24. **Suravi Islam, Mahbuba Akter Dipty,** M. Shorifullah, Nazia Khatun, S.K. Sen, T.C. Paul, Nazmul Islam Tanvir, P. Bala have been participated in the International Conference on physics 2022, organized by Bangladesh Physical Society (BPS), 19-21 May 2022 and presented an Oral Presentation entitled, "Effect of sintering temperature on Diclectric and Optical Properties of Na-montmo rellonite Supported $Nife_2O_4$ Nanecomposites."
25. **Dr. Syed Farid Uddin Farhad (PSO),** Nazmul Islam Tanvir, Md. Robel Molla, Md. Moniruzzaman presented a paper entitled; "*Facile Synthesis and Characterization of* $BiVO_4$ *and* $CuBi_2O_4$ *for self-sustained photoelectrochemical water splitting devices*" presented (poster ID#18) at Horizons 2021- Energy Storage and Conversion (Applied Physics Reviews-Virtual Conference) August 4-6, 2021.
26. **Dr. S.F.U. Farhad (PSO)** presented an **Invited Talk** entitled "*Oriented and Tunable Bandgap Metal Oxides for Solar Cells and Solar Fuels*" organized by Bangladesh Crystallographic Association (BCA), March 24, **2022**.
27. **Dr. Syed Farid Uddin Farhad (PSO),** Nazmul Islam Tanvir, Md. Robel Molla presented a paper entitled; "*Bismuth based Metal Oxide Photoelectrode Materials for Photoelectrochemical Generation of Solar Fuels*" presented (poster ID#P25) at International Solar Fuels Conference (RSC, UK), July 26-29, **2021**.
28. Nazia Khatun (SSO), **Osman Gani,** Mohammad Sajjad Hossain, Md. Al- Mamun, Suravi Islam, Most. Hosney Ara Begum, Syed Farid Uddin Farhad have been participated in the International Conference on Physics-2021, Organized by Bangladesh Physical Society (BPS), 6-7 August 2021 and presented an oral presentation entitled, "Impact on Y^{+3} ions on structural, magnetic and optical properties of Cobalt Zinc Ferrite".
29. **Nazia Khatun (SSO)**, Sajib Ahamed, Mohammad Sajjad Hossain, Md. Al- Mamun, Suravi Islam, Most. Hosney Ara Begum, Syed Farid Uddin Farhad, Nazmul Islam Tanvir have been participated in the International Conference on Physics-2022, Organized by Bangladesh Physical Society (BPS), 19-21 May 2022 and presented an oral presentation entitled,'Influence of $Y^{+3}$and La^{+3} ions on structural, magnetic, electrical and optical properties of Cobalt ferrites nanoparticles".
30. **Md Shehan Habib (SO),** Nazmul Islam Tanvir, Md. Nur Amin Bitu, Suravi Islam, Md. Saidul Islam, Nazia Khatun, Syed Farid Uddin Farhad, have been participated in the International Conference on Physics-2022, Organized by Bangladesh Physical Society (BPS), 19-21 May 2022 and presented an oral presentation entitled, 'Synthesis and Characterization of $BaTiO_3$ thin film from ball milled derived nanopowder and precursor solution by spin coating'.

31. **Nazmul Islam Tanvir (SO)**, Mohammad Sajjad Hossain, Nazia Khatun, Md. Saidul Islam, Suravi Islam, Md. Nur Amin Bitu and Syed Farid Uddin Farhad have been participated in the International Conference on Physics-2021, Organized by Bangladesh Physical Society (BPS), 6-7 August 2021 and presented an oral presentation entitled "Synthesis and characterizations of ZnO nanoparticles and seed layers for subsequent growth of ZnO nanorods by hydrothermal process".
32. **Md. Nur Amin Bitu (RC)**, Nazmul Islam Tanvir, Md. Saidul Islam, Md. Saidul Islam, Md. Saiful Quddus, Suravi Islam and Syed Farid Uddin Farhad have been participated in the International Conference on Physics-2022, Organized by Bangladesh Physical Society (BPS), 19-21 May 2022 and presented an oral presentation entitled "Comparative Studies on the Properties of Nanoparticle and Precursor Solution Derived Wide Bandgap SnO_2 Thin Films Grown by Spin Coating".
33. **Md. Saidul Islam (SO)**, Nazmul Islam Tanvir, Md. Saidul Islam , Suravi Islam and Dr. Syed Farid Uddin Forhad participated in the International Conference on Physics-2022, Organized by Bangladesh Physical Society (BPS), 19-21 May 2022 and presented a poster entitled "Design and Construction of a Low-cost Light Source with Variable Wavelength, Intensity and Illumination Period for Photophysical and Photochemical Studies".

Award/Grants:

1. **Nazmul Islam Tanvir (SO),** Mohammad Sajjad Hossain, Nazia Khatun, Md. Saidul Islam, Suravi Islam, Md. Nur Amin Bitu and Syed Farid Uddin Farhad have been awarded for best oral presentation at the International Conference on Physics-2021, Organized by Bangladesh Physical Society (BPS), 6-7 August 2021 for the presentation entitled "Synthesis and characterizations of ZnO nanoparticles and seed layers for subsequent growth of ZnO nanorods by hydrothermal process".
2. **Md. Nur Amin Bitu (RC),** Nazmul Islam Tanvir, Md. Saidul Islam, Md. Saidul Islam, Md. Saiful Quddus, Suravi Islam and Syed Farid Uddin Farhad have been awarded for best oral presentation at the International Conference on Physics-2022, Organized by Bangladesh Physical Society (BPS), 19-21 May 2022 for the presentation entitled "Comparative Studies on the Properties of Nanoparticle and Precursor Solution Derived Wide Bandgap SnO2 Thin Films Grown by Spin Coating".

Number of Analytical (Ad-Hoc) Problem Solved: (font: Times New Roman, size 14)

Name of the Division	Routine type	Research Type	Total
IPD	70	200	270

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 (See the right picture at the bottom panel).

Short biography of IPD Scientists

Suravi Islam (June, 1998- present)

Office	Industrial Physics Division	Blood group	**B+**
Position	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 Masters degree in Environmental Management and Development from Australian National University (ANU), Canberra under AusAID scholarship. Her research interests are in the field of solid state physics and material sciences. 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 twenty 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 scientists-in-charge of Industrial Physics Division.

Dr. Syed Farid Uddin Farhad (June, 2006- present)

Office	Industrial Physics Division	Blood group	**O+**
Position	Principal Scientific Officer	Degree obtained	Ph.D. (2016)
Contact	sf1878@my.bristol.ac.uk	Mobile	01881755767

Dr. S.F.U. Farhad is a materials and device physicists, who received both B.Sc. and MS degree in Physics from the University of Dhaka. He earned Ph.D. degree on Metal Oxide-based Solar Cells under a collaborative research project of the Electron microscopy group of School of Physics and Electrochemistry group of School of Chemistry, University of Bristol, UK. His current research focusses on the ecofriendly materials for high-performance solar cells and solar fuels (H2). Dr. Farhad recently received prestigious UNESCO/TWAS and Royal Society Chemistry (RSC), UK research grants in these fields. He has authored or coauthored 40 publications and get 657 citation (h-index:14; i10-index: 19). He has three accepted processes. He is a life 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+**
Position	Senior Scientific Officer	Degree obtained	M.Sc. (Physics)
Contact	naziabcsir@gmail.com	Mobile	+88 01710412484

Nazia Khatun earned her both B.Sc. and M.Sc. degree in Physics from the National University, Bangladesh. She has worked on the field of Material science and Solid State Physics. Her research is mainly focused on the development of magnetic and dielectric material for electrical, electronic and sensor devices. She has authored or coauthored 22 publications. She has one accepted process. She is a life member of BAAS, BPS and BEA.

Md Shehan Habib (March,2016-----)

Office	Industrial Physics Division	Blood group	**O+**
Position	Scientific Officer	Degree obtained	MS (Physics)
Contact	habibshehan@gmail.com	Mobile	01717632399

Md Shehan Habib received BSc and MS in Physics from the University of Dhaka. He joined BCSIR as a scientific officer in March 2016, and currently works at Industrial Physics Division, BCSIR Dhaka Laboratories. He researches applied & experimental physics, thin films & nanotechnology, material characterization, hydrogen energy, hydrogen fuel cell, optoelectronics, semiconductor physics, thin film deposition, semiconductor device physics, materials, chemical industry, optical materials.

Nazmul Islam Tanvir (August, 2016- present)

Office	Industrial Physics Division	Blood group	**B+**
Position	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 12 publications. He has one accepted process.

Md. Saidul Islam (November, 2021-----)

Office	Industrial Physics Division	Blood group	**O-**
Position	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.

Md. Nur Amin Bitu (March, 2021- present)

Office	Industrial Physics Division	Blood group	**B+**
Position	Research Chemist	Degree obtained	M.Sc. (Thesis) (2018)
Contact	E-mail: nabitu.ru@gmail.com	Mobile	+88 01732419987

Md. Nur Amin Bitu earned his both B.Sc. (Honours) and M.Sc. degree in Chemistry (Inorganic Chemistry) from the University of Rajshahi. His research is mainly focused on Green Chemistry, Coordination Chemistry, Solid State Chemistry, Electrochemistry, Optics, and Materials Science. He has authored or coauthored 23 publications in different reputed journals.

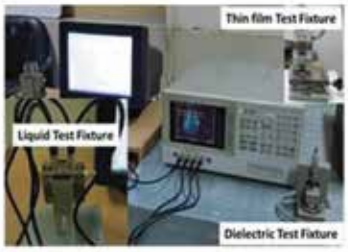
BCSIR Scientist Mr. Md. Nur Amin Bitu, Research Chemist, Industrial Physics Division (IPD), BCSIR has been awarded for the best oral presentation at the International Conference on Physics-2022, Organized by Bangladesh Physical Society (BPS and presented it to the honorable Chairman of BCSIR Professor Dr. Md. Aftab Ali Shaikh.

Dr. S.F.U Farhad, PSO, Industrial Physics Division, BCSIR Dhaka Laboratories receiving National Integrity Strategy (NIS) award in Fiscal Year 2021-2022

Major Instruments of Industrial Physics Division

SEM with Ultra-dry EDX

UV-VIS-NIR Spectrometer

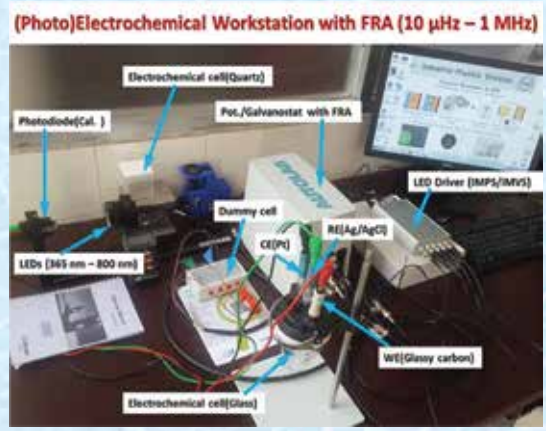


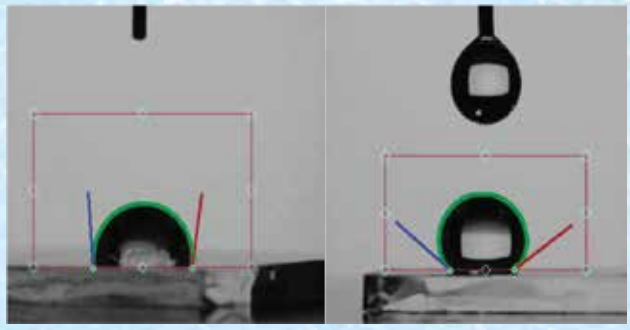
Precision Impedance Analyzer

Source Measure Unit

Tesla meter(0.1 µT – 29.99 T)(Left)
Magnetic Susceptibility Balance(Right)

Planetary Ball Mill(Left)
Programmable HT Furnace(Right)



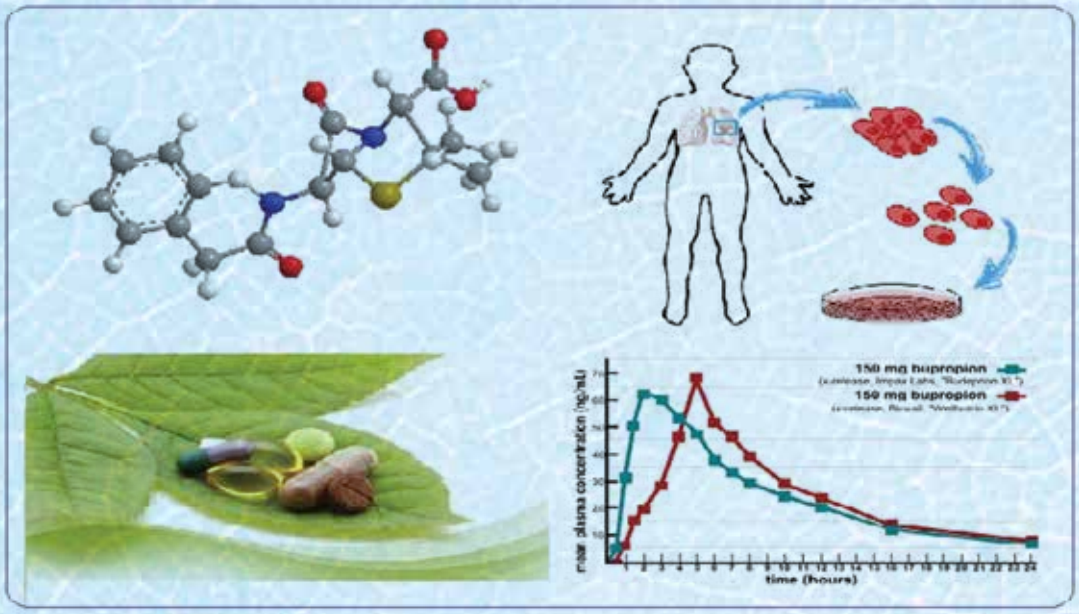


WCA: 97° **WCA: 144°**

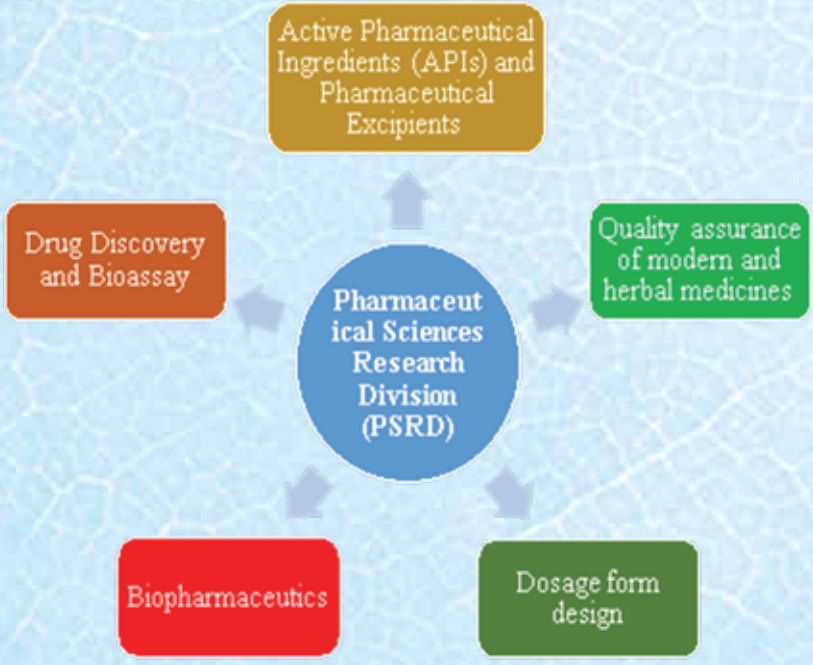
PHARMACEUTICAL SCIENCES RESEARCH DIVISION (PSRD)

Scientists of PSRD

Pharmaceutical Sciences Research Division (PSRD)



Pharmaceutical industry is the third largest tax paying industry in Bangladesh and contributes almost 1.0% of total GDP. Domestically, pharmaceutical companies produce around 98% of the drugs and only about 2.0% life-saving hi-tech medicines (vaccine, anticancer drug, blood and biosimilar product etc.) are imported. Regardless 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. Pharmaceutical Sciences Research Division is working to overcome the aforementioned problems by establishing modern research facilities on Pharmaceutical Sciences and bioequivalence studies.



Scientists of Pharmaceutical Sciences Research Division are working at different field of Pharmaceutical sciences. To ensure quality medicine, Pharmaceutical Sciences Research Division is also providing analytical services on different quality parameters of drugs.

- Number of Scientists: 10
- Total R & D : 09; Ongoing (05), Completed (04)
- ADP Project: 01

Research and Development (R&D) Projects:

1. Isolation and characterization of novel bioactive metabolites from the medicinal plant *Sarcolobus globosus* and it's associated endophytic fungi

Dr. ADA Shahinuzzaman (PL), Dr. Md. Hossain Sohrab, Dr. Farhana Afroz, Satyajit Roy Rony, Fatema Moni, Shammi Akhter, Md. Najem Uddin

Introduction:

Sarcolobus globosus (বাওয়ালী লতা) is a native mangrove plant in Asia with medicinal properties. This has been traditionally used to kill dogs, cats, and wild animals. The plant's extracts have been implicated with several activities including cytotoxicity, thrombolytic activity, Neuromuscular blocking activity, cardiotonic activity, etc. This places the plant as a good mining source for drug lead discovery for anti-cancer compounds, treatment for the myocardial infraction, irregular heart rhythms, analgesics, etc. Hence, we want to screen for anti-cancer compounds, thrombolytic compounds, ion channel blockers, and anti-bacterial from *Sarcolobus globosus* and their associated endophytic fungi.

Objectives:

- Collection, culture, and molecular identification of endophytic fungi from the mangrove plant *Sarcolobus globosus* followed by metabolomics profiling of *Sarcolobus globosus* and its' fungi,
- Structural elucidation of pure compounds through NMR and high-resolution mass spectrometry.
- Computational prediction and identification of the mechanism of action of all compounds with active groups for potential bioactivity.
- Validation of bioactivity and mechanism of action through in vitro assays, e.g. cell-based assays and patch clamping.

Work Progress:

- Six fungi have been isolated from the plant.
- Large scale fungi culture and metabolite isolation is in progress

2. Identification of Endophytic Fungi by Amplicon Sequencing based Molecular Characterization

Saima Mollick (PL), Dr. Md. Hossain Sohrab, Dr. ADA Shahinuzzaman, Dr. Farhana Afroze, Nadira Begum, Fatema Moni, Md. Ariful Haq

Introduction:

New viral diseases, multidrug-resistant microorganisms, and infections by various pathogens are emerging as new threats to mankind. Recently drug discovery strategies heavily relied on microorganism where nearly 80% of the world's antibiotics have their origins. Endophytic fungi have been recognized as a novel source of bioactive secondary metabolites. Their bioactive potential was first recognized when the world's first multibillion-dollar anticancer drug, paclitaxel (Taxol), was obtained from *Taxomyces andreanae,* an endophytic fungus isolated from the yew plant, *Taxus brevifolia.*

The project is an effort through a basic and applied research to develop a suitable method to identify novel microbes from natural source and to support the pharmaceutical sectors to develop newer drug and medicine.

Objectives:

- To isolate and identify endophytic fungi from medicinal plants with potential bioactivity.
- To develop a suitable method for fungi identification which will be efficient, rapid and low cost.

Work Progress:

- 11 endophytic fungi has been isolated from the plants *Pandanus tectorius* and *Porteresia coarctata*.
- All the fungal strains have been purified and small-scale culture of each of them are done.
- Chemical screening of fungal extract is performed by TLC and are subjected to in-vitro bioassay e.g. cell-based assays and antimicrobial assay etc.
- Morphological and molecular identification of the isolated fungi are going on.

3. Isolation and profiling of bioactive metabolites from the tropical mangrove species *Sonneratia caseolaris* and its associated fungal endophytes

Md. Ariful Haq (PL), Dr. Farhana Afroz, Dr. ADA Shahinuzzaman, Shammi Akhter, Saima Mollick, Md. Najem Uddin, Fatema Moni

Introduction:

This project is an effort through a combination of basic and applied research to search bioactive compounds (e.g.: anti-microbial, anti-cancer etc.) from tropical mangrove species *Sonneratia caseolaris* and its associated fungal endophytes.

Objectives:

- Collection, isolation, and identification of endophytic fungi from the mangrove plant *Sonneratia caseolaris.*
- Isolation and profiling of metabolites from endophytic fungi of *Sonneratia caseolaris,*
- Structural elucidation of bioactive compounds through spectroscopic methods.
- Evaluation of bioactivity of isolated metabolites/compounds through in vitro bio-assays, e.g. cell-based assays and antimicrobial assay etc.

Work Progress:

- 07 no. of endophytic fungal strains are isolated and purified.
- Small scale cultivation of the purified fungi are completed and fungal metabolites are extracted.
- Molecular and morphological identification of the purified fungal extracts are ongoing.
- Bioactivity screening of isolated metabolites/compounds through in vitro bio-assays, e.g. cell-based assays and antimicrobial assay etc is going on.

4. Development and Characterization of neutralizing antibodies against SARS-CoV-2 infection

Dr. ADA Shahinuzzaman (PL), Dr. Md. Hossain Sohrab, Dr. Farhana Afroz, Satyajit Roy Rony, Suriya Sharmin, Fatema Moni, Shammi Akhter, Md. Najem Uddin, Md. Ariful Haq

Introduction:

Several strategies of intervention to SARS-CoV-2 infection are being sought. This includes treatment with anti-inflammatory drugs, viral enzyme blockers, antibodies to prevent cytokine storm etc. Although preventive measures such as wearing masks and vaccination is a preferred choice to avoid infection, yet short span of antibody

production, arrival of new viral variants has challenged such schemes strongly. Yet another approach is to explore potentials of virus neutralizing antibodies to prevent disease progression and fatality. Our Aim is to identify and characterize neutralizing antibodies against locally circulating viral variants and screen in-vitro for their efficacy in preventing cell entry of pseudovirus SARS-CoV-2.

Objectives:

- Identification of antibody producing genes through RNA sequencing and protein sequencing
- Development of pseudotyped SARS-CoV-2 virus like particle
- *In-vitro* neutralization Assay for confirmation of neutralizing antibody activity

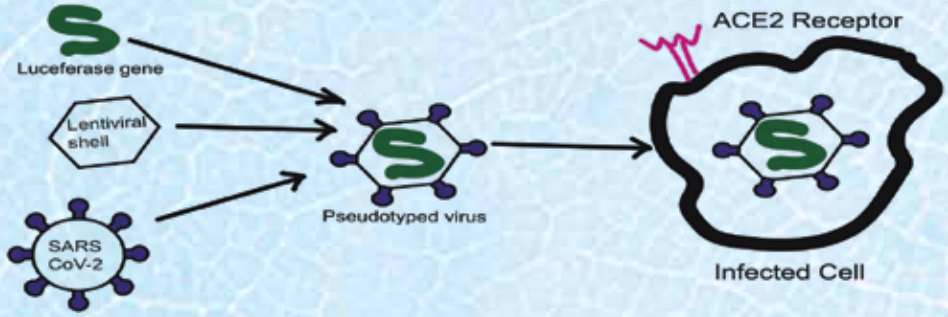


Figure: Virus Neutralization Assay

Work Progress:

- Sequence Specific Enrichment of antibody specific genes is going on.

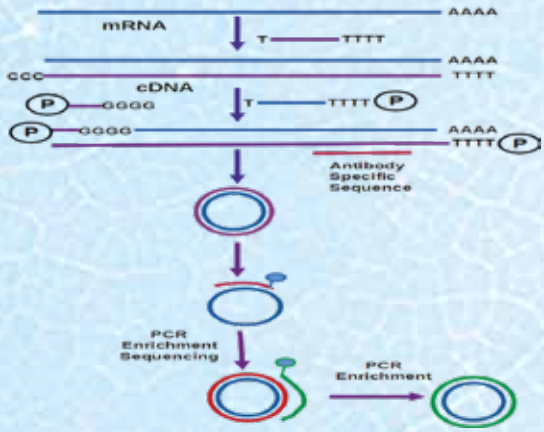


Figure: Antibody gene sequencing and antibody specific gene enrichment for cloning

5. Isolation and characterization of anti-hemolytic and urease inhibitor from *Tarmarindus indica* and *Allium sativum* extracts

Md. Najem Uddin (PL), Dr. Farhana Afroz, Satyajit Roy Rony, Dr. ADA Shahinuzzaman, Suriya Sharmin, Md. Ariful Haq

Introduction:

Currently, multi-drug resistance developed in bacterial pathogens is a common treatment failure in Bangladesh. This situation necessitates alternative therapy in restricting the antibiotic resistant infectious organisms. Therefore, researchers need to pay attention on the development of antibiotics against resistant pathogens and at the same time the management of resistant pathogens since broad spectrum antibiotics are extensively used in our country. In this regard

we will investigate some of our indigenous medicinal plants *(Tamarindus indica, Emblica officinalis, Physalis minima, Asparagus racemosus, Urena lobata, Coccinia grandis, Azadirachta indica, Abroma augusta, Mimosa pudica, Aquilaria sinensis)* to find alternative new leads for drug development of infections caused by antibiotic resistant pathogenic bacteria.

Objectives:

- To find out leads to inhibit the growth of multi-antibiotic resistant *Proteus* isolates.
- To isolate anti-hemolytic drug for preventing *Proteus* toxin mediated hemolysis.
- To isolate Urease inhibitor to prevent *Proteus* induced urinary stones.

Work Progress:

- Isolation and identification of *Proteus* isolates from UTI patients are done.
- Characterization of some pathogenic factor of isolated *Proteus* isolates are done.
- Antimicrobial susceptibility test against isolated *Proteus* isolates are done.
- *In vitro* and *in vivo* antihemolytic assay and Urease inhibitor activity assay using some traditional medicinal plant are completed.
- Isolation, purification, structure elucidation and characterization of compounds from crude extracts/fractions is going on.
- One manuscript is under review and another one is under draft.

6. Isolation of bulk amount of active compounds from *Lawsonia alba* Lamk.

Shammi Akhter (PL), Dr. Md. Hossain Sohrab, Satyajit Roy Rony, Suriya Sharmin, Md. Ariful Haq

Introduction:

Drug discovery from medicinal plants has mainly relied on biological activity-guided isolation methods which have led to the discovery of important drugs. Plants synthesize numerous natural organic bioactive compounds having complex chemical structures. There have been many spectacular amount of latest preparations have been white from natural deposit, several of those isolations were supported the uses of the agents in ancient medicines. *Lawsonia Alba* Lamk. (mehedi) is now deliberated as a appreciated source of inimitable natural products for development of medicines against uncountable diseases and also for the growth of industrial products.

Objectives:

- To explore the possibility developing medicinal and cosmetic importance of henna plants as well as new process/product from it.
- To isolate selective compounds from *Lawsonia alba* Lamk. which is responsible for natural color.
- Value addition of isolated active compounds (dye).

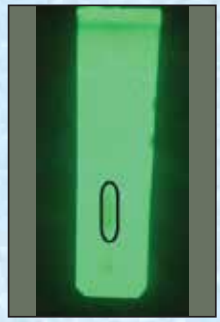
Work Progress:

- Active compound of the plant has been isolated (The structures of the pure compounds were determined by UV-Visible Spectroscopy, melting point and NMR data analysis 1H, 13C, COSY, HSQC and HMBC).
- Extraction methodology has been developed.

- Some bioactive compounds have been isolated from column chromatography. Further identification is ongoing.
- Preliminary bioassay (antimicrobial activity, DPPH scavenging activity, cell cytotoxicity) have been done.
- 01 manuscript is in under review stage and another 01 is drafted.

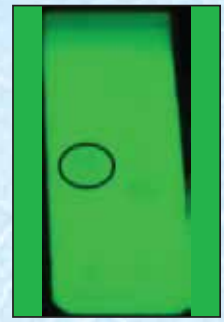
Isolated Compound

PTLC



TLC screening of isolated compound

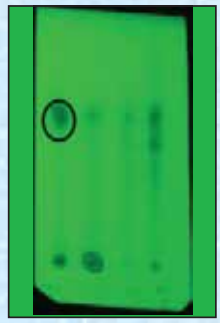
LA -41



254 nm

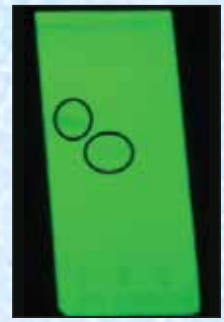
LA 41(5)

LA 40(l)

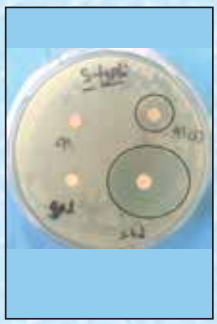


254nm

LA 33 (i)



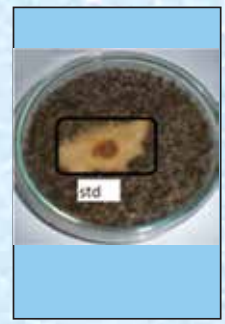
254nm



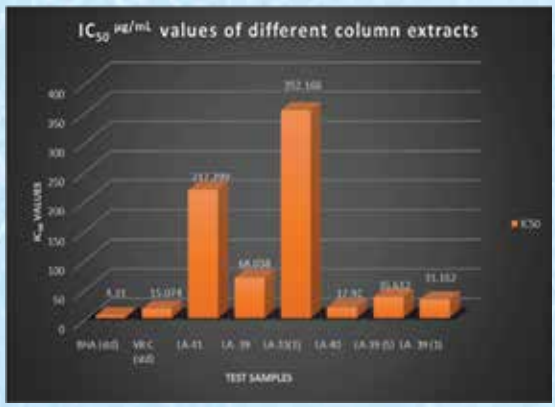
Antibacterial activity against *S. typhi*

Antifungal activity against *E. coli*

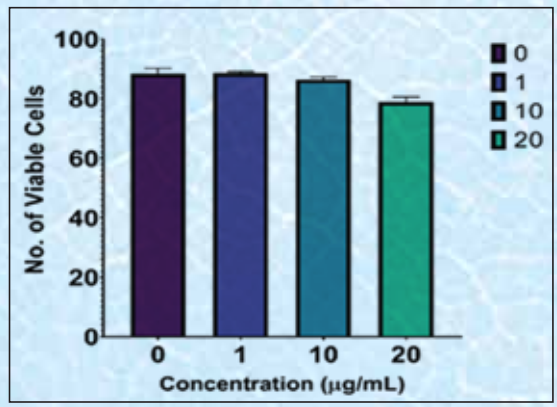
Antifungal activity against *A. niger*



Std. Ketoconazole



Antioxidant Activity by DPPH Free Radical Scavenging Method



Cytotoxicity effect through Cell line

7. Development of dissolution, analytical and bioanalytical methods for estimation of Trimetazidine

Suriya Sharmin (PL), Fatema Moni, Satyajit Roy Rony, Dr. Farhana Afroz, Dr. Md. Hossain Sohrab

Introduction:

Analytical and bioanalytical method developemt goes hand in hand with the new and generic drug development process. Analytical methods should be developed for drug or drug combinations when not officially included in pharmacopoeias as drug or specific formulation, or when any change in the Analytical method. Bioanalytical method involves processing and analysis of biological matrix for a chemical compound or compounds that can be used in pharmacokinetic, drug interaction or bioequivalence studies. A discriminatory dissolution method characterizes tablets in presence of critical formulation factor to suggest bioavailability. Validation of these developed analytical methods will confirm that the procedure employed for a specific test is suitable for its intended use with satisfactorily reliable result.

Objectives:

- To develop and validate analytical methods for estimation of Trimetazidine hydrochloride.
- To develop and validate dissolution method of Trimetazidine hydrochloride MR tablets.
- To develop and validate bioanalytical method for estimation of Trimetazidine hydrochloride in blood sample for estimation of drug-drug interaction.

Work Progress:

- Degradation pattern of Trimetazidine in bulk and MR tablet dosage form has been observed (Fig. 1).
- Dissolution method from Trimetazidine MR tablet has been developed and validated.
- Simultaneous analytical method has been developed for Trimetazidine and atenolol in human serum using hydrochlorothiazide as internal standard (Fig. 2).

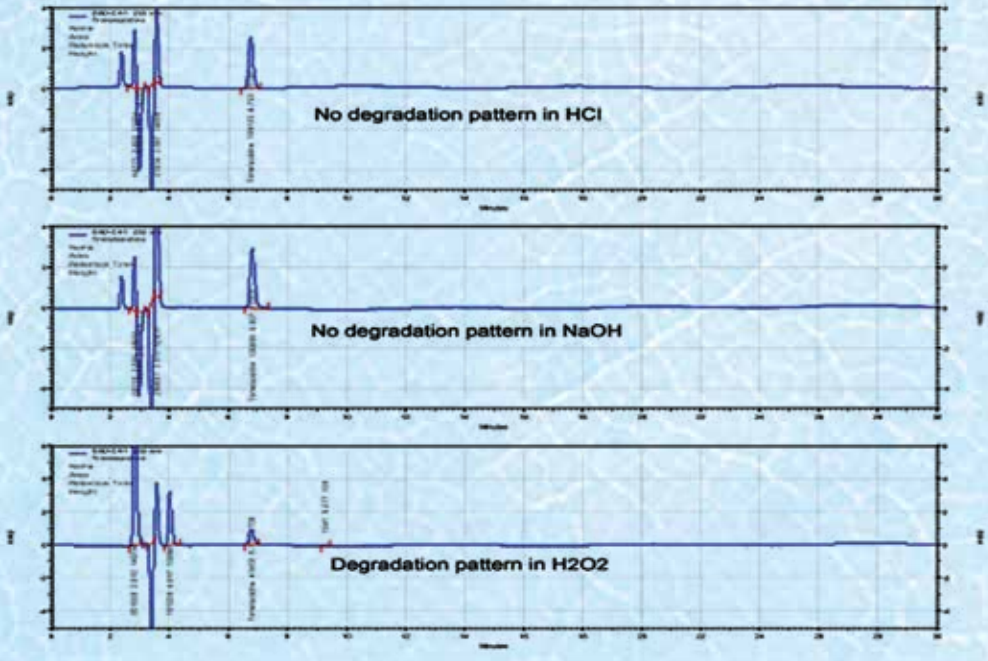


Fig 1: Stability indicating method of Trimetazidine analysis

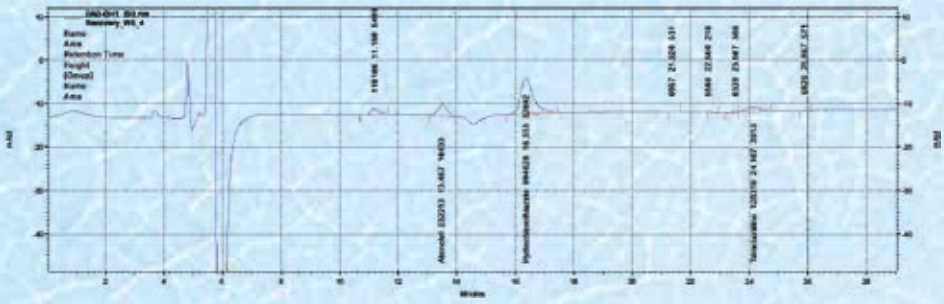


Fig 2: Simultaneous assay of Trimetazidine and Atenolol

8. Identification of pharmacophore of isolated bioactive compounds and their structure activity relationship (SAR) study

Dr. Md. Hossain Sohrab (PL), Dr. Farhana Afroz, Fatema Moni, Saima Mollick, Md. Ariful Haq

Introduction:

Drug discovery by synthetic chemistry is inspired by small molecules isolated from various natural sources including plants, bacteria and marine sponges to name a few. The bioactivity of these compounds is the most crucial part when it comes to devising a retrosynthesis (working backwards from natural product to simple starting materials). Efficient synthetic routes enable biological investigations that delve further into trying to uncover the rich biology that can be learned through the synthesis and detailed structure-activity relationship (SAR) of natural products and derivatives including simplified versions with comparable or unique biological activity. The analysis of SAR enables the determination of the chemical groups responsible for evoking a target biological effect in the organism.

Objectives:

- Isolation of bioactive compounds from medicinal plants and their associated endophytic fungi.
- Identification of pharmacophore of bioactive compounds.
- Logical modification and Structure Activity Relationship (SAR) study for improved activity.

Work Progress:

- 07 (seven) compound having different pharmacologicallogical property has been identified and chosen as lead for further drug development proceedings.
- Active site of the compound has been predicted by in-silico study of the compound.
- In-silico study of toxicity profiles of some isolated compounds have been done.
- 2 papers are published and another 1 paper is submitted.

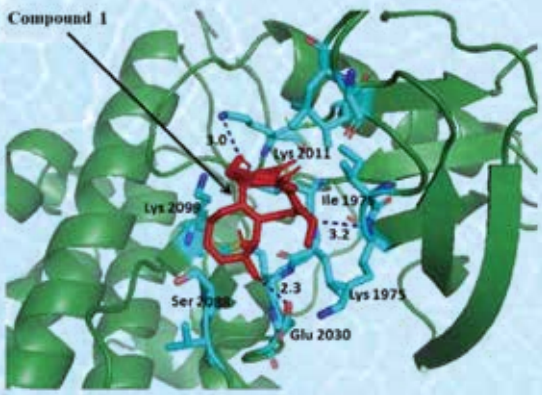


Fig. Visualisation of active site and ligand - receptor interaction of selected compound

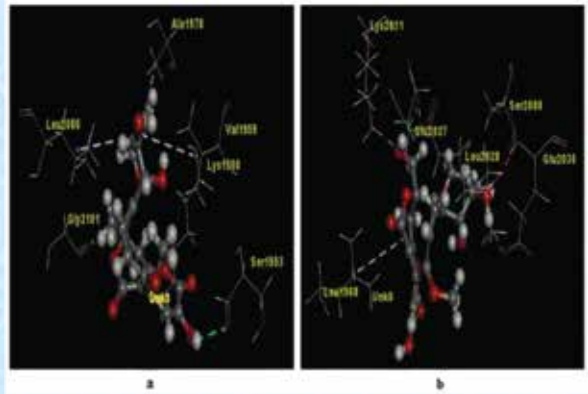


Fig: Non-bond interactions of selected compound with conforming presumed structures of ROS kinase

9. Bioassay screening of extracts, fractions and isolated metabolites obtained from natural sources

Dr. Farhana Afroz (PL), Dr. Md. Hossain Sohrab, Satyajit Roy Rony, Suriya Sharmin, Mst. Nadira Begum

Introduction:

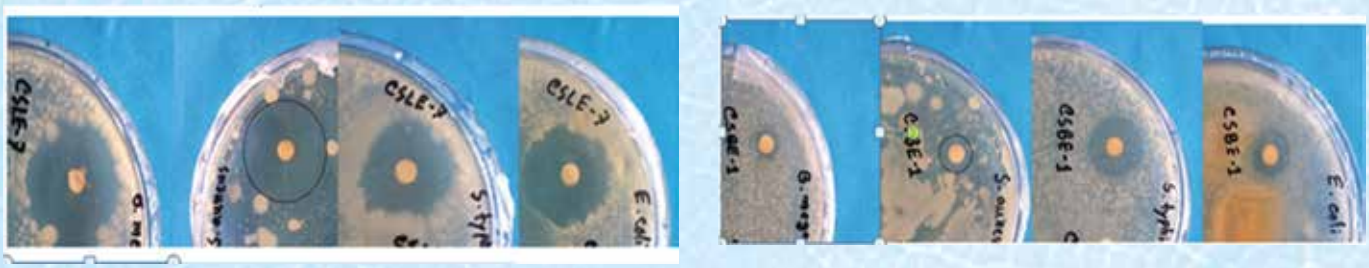
This project is an effort through a combination of basic and applied research to search anticancer/anti-inflammatory/ other bioactive compounds by performing different preliminary bioassays.

Objectives:

- Screening of anticancer/anti-inflammatory/other bioactivities of extracts, fractions and metabolites.
- To build knowledge and develop manpower capable to work in bioassay laboratory.

Work Progress:

- Anticancer activity of several isolated compounds and extracts of plant endophytic fungi have been screened on Vero and human Lung cancer cell line.
- Antimicrobial activities of different crude extracts, their column fractions and pure compounds were screened.
- 4 papers are published and another 3 papers are submitted.
- Fourteen (14) MS students from different universities have successfully completed their MS research under this project.



CSLE-7 CSBE-1

Fig. Significant antimicrobial activity against different microbes.

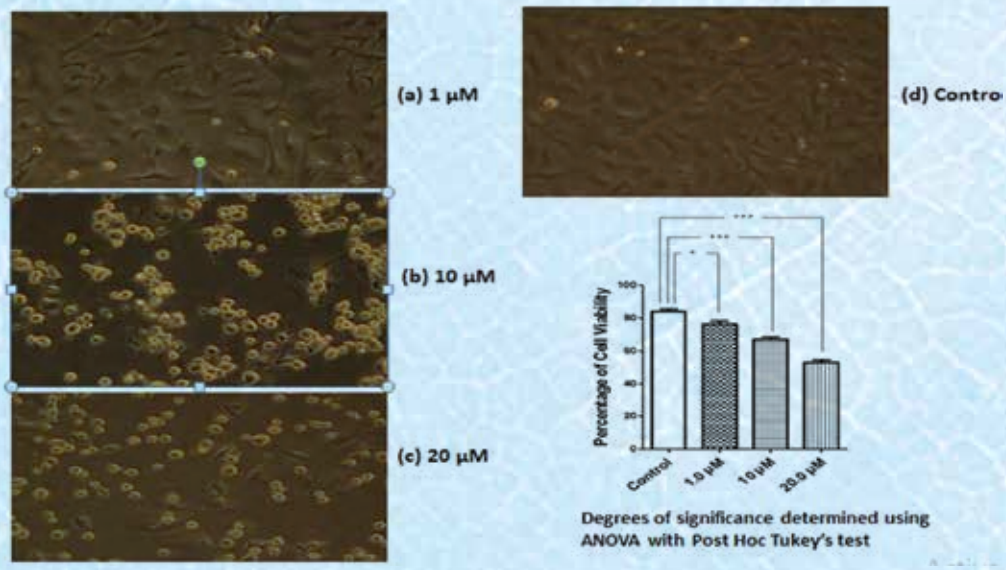


Fig: Microscopic images (20X) of Cytotoxic activity of the pure compound LE-7 (46) was determined on African Green Monkey Kidney cell (Vero cell) line at different concentration.

ADP (Annual Development Project):

Establishment of Institute of Bioequivalence Studies and Pharmaceutical Sciences

Dr. Md. Hossain Sohrab (PD), Satyajit Roy Rony (APD)

Introduction:

To avail the vast opportunity of pharmaceutical sector in the global market, BCSIR is implementing the ADP project "Establishment of Institute of Bioequivalence Studies and Pharmaceutical Sciences" since 2017. It will be a world class research institute creating facilities of clinical research and bioequivalence studies, synthesis of active pharmaceutical ingredients (APIs) and excipients, drug discovery and bioassay, new drug development, new and effective dosage form design, quality assurance and improvement of medicines etc. as well as related analytical services. These will open doors of export to regulated market, reduce import dependency, develop export quality generic drugs and thus save foreign currency. People will be able to get safe, effective and quality medicine with affordable price in local market.

Objectives:

- Establishment of a world class 'Pharmaceutical Sciences Research Institute for Bioequivalence Studies and Drug Development'.
- To create clinical research facilities for developing export quality Generic Drugs.
- To create facilities of Bioequivalence Studies which will be necessary to open doors of export to regulated market by local Pharma Industries.
- To create research facilities for Drug Discovery and Bioassay, Synthesis of Active Pharmaceutical Ingredients (APIs) and Excipients, Quality Assurance of Medicines, Dosage Form design (Formulation) as well as to provide necessary analytical services to Pharma companies.

Work Progress:

- Procurement of scientific equipment and office appliances has been completed.
- Manpower development for project has been completed.
- Construction of laboratory building under the project is completed along with interior designing and utility works.
- According to the guidance of regulatory bodies, procurement of consultant under the project has been completed.
- Overall progress of the ADP project up to the month of June, 2022 is 76.94%.

Achievements:

Research Papers:

1. Kamrun Nahar, Md Nurush Shams, Choudhury Mahmood Hasan, Sanjida Jahan, Shamim Ahmed, Md Hossain Sohrab, "Isolation and Characterisation of (17*E*)-Cycloart-17, 26-Dien-3 *β*-Ol and Cycloart-3*β*, 25-Diol from the Peel of *Artocarpus Heterophyllus* L.", *Malaysian Journal of Pharmaceutical Sciences*, **2021**, 19, 113-122.
2. Mahmuda Nasrin, Farhana Afroz, Mst. Nadira Begum, Satyajit Roy Rony, Suriya Sharmin, Fatema Moni, Md. Sohel Rana, Md. Hossain Sohrab, "Isolation and Bioactivity Screening of Endophytic Fungi from *Commelina diffusa"*, *Indian Journal of Pharmaceutical Education and Research*, **2021**, 55(3), 829-836.

3. Mita Munshi, Md. Hossain Sohrab, Mst. Nadira Begum, Sattyajit Roy Rony, Md. Adnan Karim, Farhana Afroz & Md. Nazmul Hasan, "Evaluation of bioactivity and phytochemical screening of endophytic fungi isolated from *Ceriops decandra* (Griff.) W. Theob, a mangrove plant in Bangladesh", *Clinical Phytoscience*, **2021**, 7(1), 81 (Springer).

4. Nazia Hoque, Farhana Afroz, Farjana Khatun, Satyajit Roy Rony, Choudhury Mahmood Hasan, Md Sohel Rana, Md Hossain Sohrab, "Physicochemical, Pharmacokinetic and Cytotoxicity of the Compounds Isolated from an Endophyte Fusarium oxysporum: In Vitro and In Silico Approaches", *Toxins*, **2022**, 14(3), 159.

5. Nishan Chakrabarty, Hea-Jong Chung, Rashedul Alam, Nazim Uddin Emon, Safaet Alam, Mohammed Fazlul Kabir, Md Islam, Seong-Tshool Hong, Tapas Sarkar, Md Sarker, Moklesur Rahman, and Mohammad Manjur Rahman, "Chemico-Pharmacological Screening of the Methanol Extract of Gynura nepalensis D.C. Deciphered Promising Antioxidant and Hepatoprotective Potentials: Evidenced from in vitro, in vivo, and Computer-Aided Studies", *Molecules*, **2022**, 27(11), 3474.

6. Shabnur Mahmud, Safaet Alam, Nazim Uddin Emon, Umme Habiba Boby, Kamruzzaman, Firoj Ahmed, A.S.M. Monjur-Al-Hossain, Afroza Tahamina, Sajib Rudra, and Marzina Ajrin, "Opportunities and challenges in stem cells therapy in cardiovascular diseases: position standing in 2022", *Saudi Pharmaceutical Journal*, **2022**.

7. Farhana Afroz, Suriya Sharmin, Satyajit Roy Rony, Fatema Moni, Md. Hossain Sohrab, "Quality and Pharmaceutical equivalence Determinations of commercially available Amlodipine Besylate Immediate Release Tablets", *Pharmacology & pharmacy,* **2022**, 13(5), 129-139.

8. Subrata Paul, Md. Ashraful Alam, Tarun Kumar Pal, Md. Najem Uddin, Md. Monirul Islam, Md. Chanmiya Sheikh, "Quantum computational, spectroscopic investigation, molecular docking, and in vitro pharmacological studies of sulfonamide Schiff base", *Journal of Molecular Structure*, Elsevier, **2022**, 1262, 133084.

9. Md. Monirul Islam, Tarun Kumar Pal, Subrata Paul, Md. Najem Uddin, Md. Chanmiya Sheikh, Md. Ashraful Alam, Jewel Hossen, "Computational, Hirshfeld surface, and molecular docking analysis of 2-(((4-methoxyphenyl) imino) methyl)-4-nitrophenol: In-vitro anticancer, antimicrobial, anti-inflammatory, and antioxidant studies", *Results in Chemistry*, Elsevier, **2022**, 4, 100331.

10. Fatema-Tuz-Zohora, Rumana Mahtarin, Md Ackas Ali, Mohammad Johirul Islam, Md. Hossain Sohrab, Choudhury Mahmood Hasan, Monira Ahsan, "Cytotoxicity, Antioxidant Activity, Molecular Docking, and Dynamics Simulation Analysis Against SARS-CoV-2 M and N Protein Models of Phytoconstituents of Micromelum Minutum", *Biointerface Research in Applied Chemistry*, **2022**.

11. Gazi Monjur Murshid, Sukalyan Kumar Kundu, Md Hossain Sohrab, Md Abdul Mazid, "Pharmacological Overview of Tinospora cordifolia, an Ethnologically Important Plant of Bangladesh", *Pharmacology and Pharmacy*, **2022**, 13(3), 93-106.

12. Fatema-Tuz-Zohora, Sinthyia Ahmed, Khondaker Miraz Rahman, Mohammad A Halim, Md Rafi Anwar, Md Hossain Sohrab, Fatema Tabassum, Choudhury Mahmood Hasan, Monira Ahsan, "Isolation and In silico prediction of potential druglike compounds with a new dimeric prenylated quinolone alkaloid from Zanthoxylum rhetsa (Roxb.) root extracts targeted against SARS-CoV-2 (Mpro), *Research Square,* **2022**.

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 in BCSIR
1	Study of bioactive metabolites isolated from fusarium genus of endophytic fungi from *Sarcolobus globosus* mangrove plant.	MS	Fahamida Binta Anower	Department of Pharmacy, Jagannath University	Dr. ADA Shahinuzzaman, SSO
2	Isolation, Characterization and Secondary metabolite extraction from *Boerhavia diffusa*	MS	Noshin Nawal	Department of Pharmacy, Jagannath University	Suriya Sharmin, SSO
3	Isolation of halotolerant endophytic fungus associated with the halophyte (*Porteresia coarctata*) and their effect on rice plant under salt stress.	MS	Arifa Akhter Airin	Department of Biochemistry and Molecular Biology, University of Dhaka,	Dr. ADA Shahinuzzaman, SSO
4	Search of growing organisms of *Curcuma longa.*	MS	Iffat Jahan	Department of Pharmacy, University of Dhaka, Dhaka.	Dr. Md. Hossain Sohrab, CSO
5	Investigation of anticancer and antibacterial metabolites from Seaweeds of the Bay of Bengal and their associated endophytic fungi.	PhD	Sadia Noor	Department of Pharmaceutical Chemistry, Faculty of Pharmacy, University of Dhaka.	Dr. Md. Hossain Sohrab, CSO
6	Studies on antibacterial and cytotoxic metabolites from endophytic fungi	PhD	Gazi Md. Monjur Murshid	Department of Pharmaceutical Chemistry, Faculty of Pharmacy, University of Dhaka	Dr. Md. Hossain Sohrab, CSO
7	Isolation, identification and bioscreening of endophytic fungi isolated from two mangrove plants *Ceriops decandra* and *Heritiera littoralis*	PhD	Mita Munshi	Department of Biotechnology and Genetic Engineering, Jessore University of Science and Technology.	Dr. Farhana Afroz, SSO
8	Bioanalytical method development and validation of Fexofenadine Hydrochloride and Losartan Potassium in human plasma	BCSIR Fellow	Farhana Afroz	Prof. Mofizuddin Ahmed Smrity Fellowship (BCSIR)	Dr. Md. Hossain Sohrab, CSO
9	Bioactive metabolites from three medicinal plants and their associated endophytic fungi	BCSIR Fellow	Rabita Zinnurain	Prof. Mofizuddin Ahmed Smrity Fellowship (BCSIR)	Dr. Md. Hossain Sohrab, CSO
10	Isolation of bioactive compounds from *Commelina diffusa* and *Commelina benghalensis* and their associated endophytic fungi	BCSIR Fellow	Mahmuda Nasrin	*Dr. Qudrat-I-Khuda Doctoral Fellowship (BCSIR)*	Dr. Md. Hossain Sohrab, CSO

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

Training:

1. **Suriya Sharmin (SSO)** participated in a training program on "Method Validation for ISO 17025/2017" held on 31 August, 2021 at BCSIR Dhaka Laboratories.
2. **Dr. ADA Shahinuzzaman (SSO)** participated as a trainer in a training program on "Nuclear Magnetic Resonance Spectrometer" held on 05-09 September, 2021 at CARF, BCSIR, Dhaka.
3. **Suriya Sharmin (SSO)** participated in a training program on "NIS for transparent data generating of particle size analyzer" held on 16 September, 2021 at BCSIR Laboratories Dhaka.
4. **Dr. ADA Shahinuzzaman (SSO)** participated as a trainer in a training program on "Liquid Chromatography-Tandem Mass Spectrometry (LC-MS/MS)" held on 10-14 October, 2021 at CARF, BCSIR, Dhaka.
5. **Suriya Sharmin (SSO)** participated in a training program on "Liquid Chromatography-Tandem Mass Spectrometry (LC-MS/MS)" held on 10-14 October, 2021 at CARF, BCSIR, Dhaka.
6. **Dr. ADA Shahinuzzaman (SSO)** participated in an online training program on "Introduction to Programming and Data Analysis in R for Biologist" held on 06 November –04 December, 2021 organised by *cBLAST,* Department of Biochemistry and Molecular Biology, University of Dhaka, Dhaka-1000, Bangladesh.
7. **Md. Ariful Haq (SO)** participated in an online training program on "Introduction to Programming and Data Analysis in R for Biologist" held on 06 November –04 December, 2021 organised by cBLAST, Department of Biochemistry and Molecular Biology, University of Dhaka, Dhaka-1000, Bangladesh.
8. **Saima Mollick (SO)** participated in a training program on "Basic Principle, Application, Operation and Maintenance of HPLC" held on 25 January, 2022 at BCSIR Dhaka Laboratories.
9. **Md. Ariful Haq (SO)** participated in a training program on "Basic Principle, Application, Operation and Maintenance of HPLC" held on 25 January, 2022 at BCSIR Dhaka Laboratories.
10. **Fatema Moni (SSO)** participated in a training program on "Gas Chromatography-Mass Spectrometry (GC-MS)" held on 13-17 February, 2022 at INNARS, Dhaka.
11. **Saima Mollick (SO)** participated in a training program on "Gas Chromatography-Mass Spectrometry (GC-MS)" held on 13-17 February, 2022 at INNARS, Dhaka.
12. **Fatema Moni (SSO)** participated in a training program on "Learning Session on Computational Drug Discovery" held on 07 March, 2022 at BCSIR Dhaka Laboratories.
13. **Md. Ariful Haq (SO)** participated in a training program on "Dilute Solution Viscomitry Using Automated Micro-Viscometer" held on 08 March, 2022 at BCSIR Dhaka Laboratories.
14. **Satyajit Roy Rony (SSO)** participated in a training program on "Rheometer, Microviscometer, Refractometer with Density Module" held on 03-07 April, 2022 at Fiber and Polymer Research Division, BCSIR, Dhaka.
15. **Md. Ariful Haq (SO)** participated in a training program on "Fourier-Transform Infrared Spectrophotometer (FTIR) & Universal Testing Machine (UTM)" held on 08-12 May, 2022 at Lather Research Institute (LRI), Savar.
16. **Md. Najem Uddin (SO)** participated in a training program on "Fourier-Transform Infrared Spectrophotometer (FTIR) & Universal Testing Machine (UTM)" held on 08-12 May, 2022 at Lather Research Institute (LRI), Savar.

17. **Dr. ADA Shahinuzzaman (SSO)** participated in a training program on "Ion Chromatography & Preparative High Performance Liquid Chromatography (Preparative HPLC)" held on 05-09 June, 2022 at BCSIR Laboratories, Rajshahi.
18. **Md. Sakhawat Hossain (SO)** participated in a training program on "ISO/IEC 17025:2017" held on 16-17 June, 2022 at BCSIR Laboratories, Rajshahi.
19. **Mr. Safaet Alam (SO)** participated in a training program on "ISO/IEC 17025:2017" held on 16-17 June, 2022 at BCSIR Laboratories, Rajshahi.

Conference:

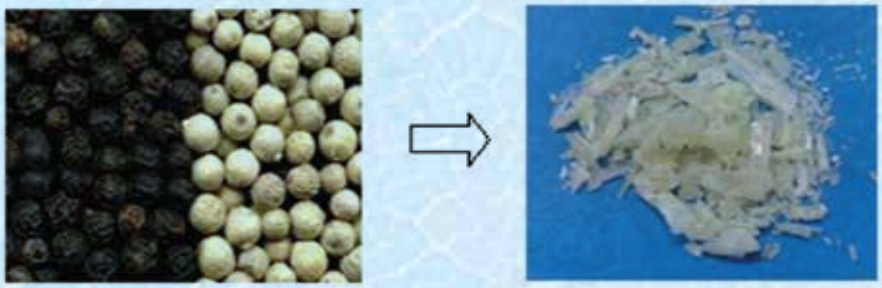
1. **Kazi Jannatul Ferdous**, Md. Rakibul Islam, Farhana Afroz, Md. Hossain Sohrab and Md. Abdul Mazid, "Comperative phytochemical screening of two Zingiberaceae plants of Bangladesh by using GC-MS.", in ICGNB -2022, held at North South University, Bashundhara, Dhaka-1229, Bangladesh, 26-28 June, 2022. Abstract no. NDP-026, Page no. 53.
2. **Rabita Zinnurine**, Dr. Md. Sohel Rana and Dr. Md. Hossain Sohrab, "Bioactivity and Isolation of Bioactive Metabolites from the plant *Carica Papaya* L.", in ICGNB -2022, held at North South University, Bashundhara, Dhaka-1229, Bangladesh, 26-28 June, 2022. Abstract no. NDP-027, Page no. 54.
3. **Mahmuda Nasrin**, Mst. Nadira Begum, Abdullah Al Munsur, Choudhury Mahmood Hasan, Md. Hossain Sohrab and Dr. Md. Sohel Rana, "Cytotoxicity of the pure compound and isolated from Endophytic Fungus *Alternaria longipes*.", in ICGNB -2022, held at North South University, Bashundhara, Dhaka-1229, Bangladesh, 26-28 June, 2022. Abstract no. NDP-028, Page no. 54.
4. **Farhana Afroz**, Suriya Sharmin, Fatema Moni, Shah Md. Masum and Dr. Md. Hossain Sohrab, "RP-HPLC Method Development and Validation for Quantification of Fexofenadine in Human Serum", in ICGNB -2022, held at North South University, Bashundhara, Dhaka-1229, Bangladesh, 26-28 June, 2022. Abstract no. NDP-030, Page no. 55.

Number of Analytical (Ad-Hoc) Problem Solved:

Name of division	Routine type	Research type	Total
Pharmaceutical Sciences Research Division	19	-	19

Product Picture:

Figure: Fruit flavored salt for gastric comfort



Black & White pepper **Piperine crystal**

Figure: Pure Piperine as Active Pharmaceutical Ingredient (API) from Black Pepper and White Pepper

Equipment Picture:

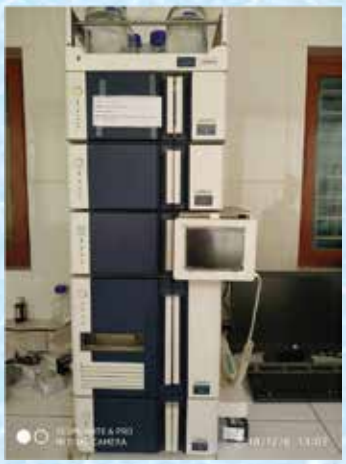


Fig.:HPLC

Fig.: Inverted Microscope

Fig.: Digital Polarimeter

Fig.: PCR machine

Fig.: Centrifuge machine

Fig.: Automated cell counter

Short biography of PSRD Scientists

Dr. Md. Hossain Sohrab (February, 1997- present)

Office	Pharmaceutical Sciences Research Division	Blood group	**O+**
Position	Chief Scientific Officer	Degree obtained	Ph.D (2005)
Contact	mhsohrab@yahoo.com	Mobile	+88-01720121525

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 Dhaka Laboratories. He is 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 102 publications and get 903 citation (h-index: 17). He has one accepted patent and one accepted process.

Dr. Farhana Afroz (July, 2006- April, 2022)

Office	Pharmaceutical Sciences Research Division	Blood group	**O+**
Position	Senior Scientific Officer	PhD (2010)	Ph.D (2010)
Contact	farhana@bcsir.gov.bd	Mobile	+8801711506403

Dr. Farhana Afroz has worked as Senior Scientific Officer at Pharmaceutical Sciences Research Division, BCSIR Dhaka Laboratories. She has been awarded International Postgraduate Research Scholarship (IPRS) in 2011 and completed her PhD degree in Medical Biochemistry from Flinders University, Australia. Her thesis title was "Regulation of antioxidant enzyme and bile acid transporter gene expression by rapamycin and oltipraz in liver". Her research focus is mainly on New Drug Development from natural sources, Regulation of Gene Expression and Cell Signaling, Bioanalytical Method Development, Proteomics and Metabolomics. She is author or coauthor of more than 40 publications. She is member of Australian Society for Medical Research (ASMR), Association of Plant Tissue Culture and Biotechnology, Bangladesh.

Satyajit Roy Rony (June, 2011- present)

Office	Pharmaceutical Sciences Research Division	Blood group	**B+**
Position	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 Dhaka Laboratories. 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 is also working 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 29 publications in different renowned national and international journals. He has 02 accepted process. 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+**
Position	Senior Scientific Officer	Degree obtained	Ph.D (2019)
Contact	shahinbcsir@gmail.com	Mobile	+880-1308637064

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 signaling in activated macrophages and Post-translational modifications (PTMs) identification using mass spectrometry. Here, as a project leader, I am working towards characterizing the natural neutralizing antibodies produced against SARS-CoV-2 infection using proteo-genomics approaches. Additionally, as a team, we are exploring the endogenous endophytic fungi for their natural products' characterization. Our team is also establishing Bangladesh's first independent bio-equivalence study centre to support clinical trials of generic medicines and new drug leads.

Suriya Sharmin (February, 2013- present)

Office	Pharmaceutical Sciences Research Division	Blood group	**O+**
Position	Senior Scientific Officer	Degree obtained	M Pharm (2010)
Contact	sharmin041@yahoo.com	Mobile	01717035571

Suriya Sharmin received M. Pharm and B. Pharm degree in Pharmacy from the University of Dhaka. Her research interest is mainly focused on developing new drug candidates using chemical biology, medicinal chemistry and analytical tools. She authored or coauthored more than 22 publications. She also has two accepted processes. Ms. Suriya has presented her research on several international conferences.

Fatema Moni (July, 2015- present)

Office	Pharmaceutical Sciences Research Division	Blood group	**B+**
Position	Senior Scientific Officer	Degree obtained	M Pharm (2010)
Contact	moni.fatema@yahoo.com	Mobile	01816619127

Fatema Moni is working as a Senior Scientific Officer at Pharmaceutical Sciences Research Division, BCSIR Dhaka Laboratories. She has completed both B. Pharm. and M. Pharm. in Pharmacy from the University of Dhaka. Her research focus is mainly on the development of analytical and bioanalytical method of pharmaceutical product. She is also involved in the research area of isolation, characterization and bioactivity assessment of compounds isolated from natural sources. He has authored or coauthored 12 publications and get 77 citation (h-index: 3). She has one accepted process. She is a member of Bangladesh Pharmaceutical Society.

Shammi Akhter (March, 2016- present)

Office	Pharmaceutical Sciences Research Division	Blood group	**B+**
Position	Scientific Officer	Degree obtained	MS in Pharmaceutical Technology
Contact	shammiakhter74@gmail.com	Mobile	01676454575

Shammi Akhter is working as a Senior Scientific Officer in Institute of Food Science and Technology, BCSIR, Dhaka. She was in Pharmaceutical Sciences Research Division, which is a division in BCSIR Dhaka Laboratories from March 2016- November 2021 as Scientific Officer. 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 a Scientific Officer (Additional Charge) in the Annual Development Programme (ADP) of Government of Bangladesh named 'Instititute of bioequivalance studies and pharmaceutical sciences'. She has authored or co-authored 07 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+**
Position	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 Dhaka Laboratories. 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+**
Position	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 Dhaka Laboratories. He has completed both B. Pharm. and M. Pharm. degree from the University of Rajshahi. His research focus is mainly on Phyto-Pharmacology, Microbiology, 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+**
Position	Scientific Officer	Degree obtained	M. Pharm. (2015)
Contact	md.arifulhaq13@gmail.com	Mobile	01768344233

Md. Ariful Haq earned his both B.Pharm and M.Pharm degree from Khulna University. He is currently working as a Scientific Officer at Pharmaceutical Sciences Research Division, BCSIR Dhaka Laboratories. 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+**
Position	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 Dhaka Laboratories. He has completed B. Pharm in Pharmacy and M. Pharm in Pharmaceutical Chemistry from Faculty of Pharmacy, University of Dhaka, Bangladesh. His research area is mainly focused on isolation and characterization of bioactive compounds from natural sources and also investigation of pharmacological activities. He has 05 publications in different renowned national and international journals. He is a member of Bangladesh Pharmaceutical Society.

Mst. Maya Khatun (May, 2022 - present)

Office	Pharmaceutical Sciences Research Division	Blood group	**B+**
Position	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 Dhaka Laboratories. She has completed B. Pharm. and M. Pharm. in Pharmacy from department of Pharmacy, University of Rajshahi.

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.

PHYSICAL INSTRUMENTATION DIVISION (PID)

Scientists of PID

Physical Instrumentation Division

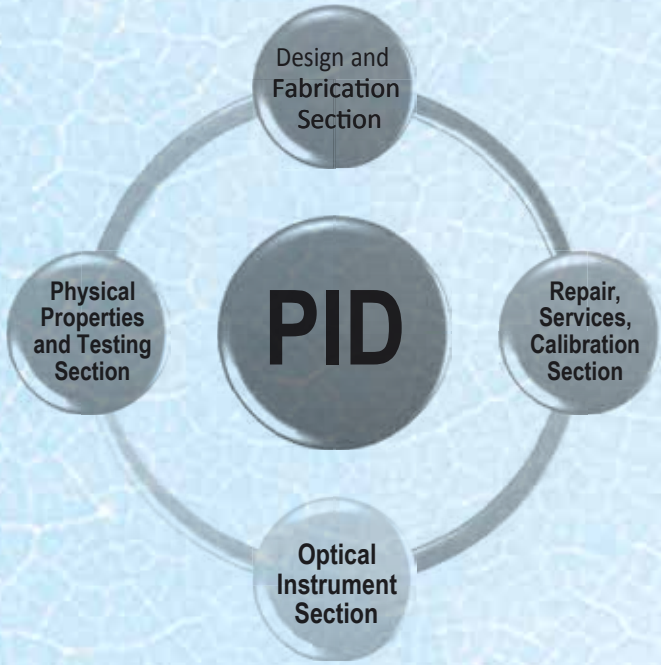
The main works of PID are:

a. Conducting research activities for the development of scientific/laboratory instruments using locally available raw materials.

b. Maintenance, repairing, servicing and installation of scientific equipment and electronic instruments.

c. Conducting software development and other innovative activities in the field of information technology.

d. Provide computer training (software and hardware).



At present, three (03) Scientists/Engineers are working in this Division.

Field of Research: Electrical and Electronics Engineering, Embedded System Design, Information and Communication Technology, Internet of Things (IoT).

R&D Project:

1. Development of a multi agent based control system for fire disaster management

Khaledun Nahar Babi (PL), Md. Sadequl Islam, Md. Saidul Islam, Abu Kowsar, Md. Forhad Hossain, Mst. Kamrun Nahar, Dr. Samina Ahmed

Introduction: Multi agent based control system combined with automatic fire detection, an emergency response and evacuation plan can significantly reduce property damage, personal injuries and loss of life from fire.

Objective:

- To design and develop an effective multi-agent based conceptual prototype model for disaster management caused by fire spread.
- To develop a system for automatic control of firefighting equipment.
- To develop an agent based user interface for fire management.

Work Progress:

- Prototype model development is completed.
- Fire Detector development is completed.
- Android app development is completed.
- A manuscript is ready for submission.

Other Activities: Repairing, Servicing, Maintenance, Calibration and Installation of scientific/ laboratory equipment : During the period from 1st July, 2021 to 30th June, 2022 services were provided to 84 Laboratory/Scientific Instruments (such as: Computer CPU, Printer, UPS (Online & Offline), Conductivity Meter, Electric Oven etc.)

Achievements and Activities:

Published Paper:

1. Abu Kowsar, Md Saidul Islam, Sumon Chandra Debnath, Md Masum Billah, Khaledun Nahar Babi, Ali Newaz Bahar, and Syed Farid Uddin Farhad, "Simulation and performance optimization of high efficiency triple-junction solar cells using an advanced MSCS-1D simulator", *International Journal of Renewable Energy Research,* **2021**, 4: 1713-1721

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

1. Khaledun Nahar Babi, SSO, Physical Instrumentation Division, BCSIR Dhaka Laboratories pursuing PhD course in Department of Computer Science and Engineering, Jahangirnagar University, Bangladesh, under supervision of Professor Dr. Israt Jahan and Professor Dr. Md. Zahidur Rahman (Co-supervisor) and working on “Multi-Agent Based Modeling and Simulation for Natural Disaster Management: Bangladesh perspective.”, session 2018-2019.

Industrial Tours / Dissemination:

Name and Designation	Name of the Institute	Date
Dr. Engr. Md. Abul Kashem, CSO	Mostafa Paper Mill Chottagram	15-06-2022 to 17-06-2022
Dr. Engr. Md. Abul Kashem, CSO	Nitol Paper mill Satok, Sunamgonj, Sylhet	18-06-2022 to 20-06-2022

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

Sl. No	Title of research	Research Category	Name of the Student	Name of the Institution	Name of Supervisors
01	Implementation of an insole using electrical impedance tomography.	BCSIR Fellow (Professor Nurul Afsar Post graduate Fellowship)	Ashaduzzaman	University of Dhaka	Dr. Engr. Md. Abul Kashem, CSO

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

Training:

1. Khaledun Nahar Babi (SSO) participated in the training program on "Dilute Solution Viscometry Using Automated Micro-Viscometer" held on 08 March, **2022** at BCSIR Dhaka Laboratories, Bangladesh Council of Scientific and Industrial Research.
2. Khaledun Nahar Babi (SSO) participated in the training program on "Learning session on Computational drug discovery" held on 07 March, **2022** at BCSIR Dhaka Laboratories, Bangladesh Council of Scientific and Industrial Research.

Conference:

1. Dr. Engr. Md. Abul Kashem (CSO) participated in the international conference on Physics for 4rth Industrial revolution and beyond, **2022**, organized by Bangladesh Physical Society, 19-21 May, 2022.

Short biography of PID Scientists

Dr. Engr. Md. Abul Kashem (August, 1992- present)

Office	Physical Instrumentation Division	Blood group	**B+**
Position	Chief Scientific Officer	Degree obtained	Ph.D (2004)
Contact	kashem222@yahoo.com	Mobile	01716501220

Dr. Engr. Md Abul Kashem earned his BSc (Hon) degree in Electrical & Electronics Engineering (EEE) from the Chittagong University of Engineering and Technology (CUET). He obtained both MS and Ph.D in Electronic Engineering from Nagoya University, Japan under the supervision of Professor Sinzu Morita in the field of Thin Film Materials. He has authored or coauthored 19 research articles in international Journal and 34 conference proceedings. He got best paper award from journal of Photopolymer Science and Technology in 2004. He is a life fellow of Institute of Engineers' Bangladesh (IEB) and life member of BAS, BAAS, NITUB, BPS and JUAB.

Khaledun Nahar Babi (June, 2006- present)

Office	Physical Instrumentation Division	Blood group	**O+**
Position	Senior Scientific Officer	Degree obtained	MS (2012)
Contact	khaledunnahar@yahoo.com	Mobile	01816218248

Khaledun Nahar Babi is pursuing PhD course in Department of Computer Science and Engineering, Jahangirnagar University in the field of Natural Disaster Management based on Agent Based Modeling and Simulation. She has authored or coauthored 5 research articles in international Journal and 4 conference proceedings. She is a life member of NITUB, BPS and associate member of Bangladesh Computer Society (BCS).

Research interest: Cyber Security, Software Engineering, Speech Recognition, Artificial Intelligence, Embedded System Design. Agent Based Modeling and Simulation etc

Skills and expertise: Programming in C, Java Programming, Microcontroller Programming, Microsoft Project, Visio 2013, MS Office, Computer Database, HTML, CSS, Android Application Development, Proteus 7.10 & 8.3, Agent based Modeling and Simulation, Software Architecture etc.

Md. Sadequl Islam (July,2002- present)

Office	Physical Instrumentation Division	Blood group	**A+**
Position	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

Engineers are repairing Instruments

Digital Multimeter/ Switch System

Digital Control Winding Machine

PULP & PAPER RESEARCH DIVISION (PPRD)

Scientists of PPRD

Scientists of Pulp and Paper Research Division

Mini paper machine

Major Instruments of Pulp and Paper Research Division

HPLC

Fiber Quality Analyzer (FQA)

Rapid Kothen Sheet Former

Bursting Strength Tester

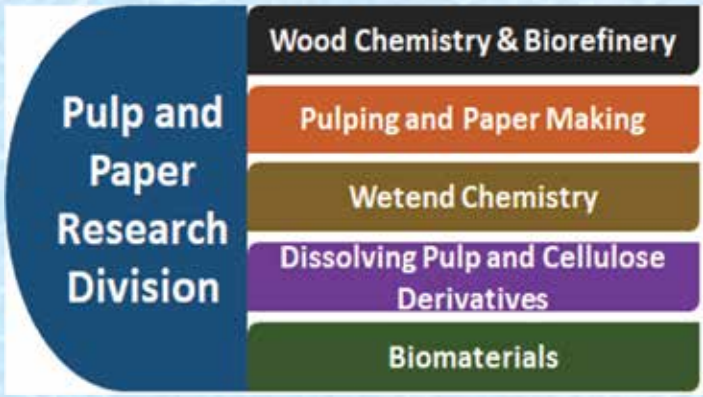
Digester

Universal Tensile Machine

Pulp & Paper Research Division (PPRD)

Pulp and Paper Research Division (PPRD) is concerning with the conversion of wood biomass into pulp, paper, and biobased goods. PPRD, one of BCSIR Dhaka Laboratories's earliest research division, is crucial to the research and development of lignocellulosic materials. Over the past few decades, numerous efforts have been made to identify high-yield biomass for pulp production and an appropriate alternative pulping procedure for nonwoods. This research division uses bioresources that are readily available locally to produce pulp, paper, and biochemicals. Additionally, this division's researchers are focused on lignocellulosic products. Lignin can be found in substantial quantities as an isolated product of the pulp and paper industry and due to its extreme complexity of structure, a great deal of research remains to reveal. Scientists are working nonstop to reduce greenhouse gas emissions through the development of biobased goods and a green pulping technique for agricultural leftovers other than wood as Bangladesh pledges to reduce carbon emissions by 22% by 2030. In addition, PPRD offers highly regarded analytical and intellectual services to the regional paper and paper products businesses.

Fields of Research



R&D Projects:

1. Evaluation of *Erythrina fusca* as pulping potential raw material

Dr. M. Mostafizur Rahman, S.S.O (PL), Dr. M Sarwar Jahan, Director, Jannatun Nayeem, S. S. O, IGCRT, Razia Sultana Popy, S. O, Md. Nur Alam Likhon, S.O

Introduction:

Erythrina fusca that is locally called Madar tree, grow randomly in the southeastern area as well as other part of Bangladesh. Its growth is fast and has no industrial use in our country. Some documents have been found on this tree for medicinal value purposes. No information has been reported on pulpwood quality and pulping of this species. Since the growth of *E. fusca* is fast and has not been studied for pulping, an initiative is taken to studies the potentiality of E. *Fusca* as pulping raw material.

Objectives:

To utilize *Erythrina fusca* (Madar tree) as a new source for pulping in Bangladesh.

Work Progress:

- The morphological and chemical properties of the samplewere performed.
- Anatomical properties was done.

- The chemical properties: extractive content, pentosan content, α-cellulose were determined in the *Erythrina fusca* (Madar tree) according to TAPPI methods.
- Kraft Pulping of the sample was carried out at different conditions.
- Evaluation of kraft pulp was done.
- Bleaching of the produced pulp was done with chlorine dioxide according to D_0EpD_1 sequences.

2. Valorization of lignin from nonwoods

Dr. M. Mostafizur Rahman, S.S.O (PL), Dr. M Sarwar Jahan, Director, Dr. Md. Nashir Uddin, PSO, Jannatun Nayeem, S. S. O, IGCRT, Razia Sultana Popy, S. O, Md. Nur Alam Likhon, S. O

Introduction:

Lignin is the second most abundant natural biomass after cellulose on Earth. It is a byproduct of pulping industry. Depending on the pulping processes, it can be classified into four categories: Kraft, lignosulfonate, alkali, Potassium hydroxide and organosolv lignin. Researchers are working on the diversified application of lignin in addition to conventional energy production in the boiler. Although most of the research have been carrying out on alkali lignin and lignosulfonate from wood because of its abundant production, the study on nonwoodlignin is far behind. That is why, an attempt has been taken to characterize and conversion to a product of the nonwood lignin from available agriculture residue.

Objectives:

- To utilize nonwood lignin for bio-products

Work Progress:

- Separation of lignin by KOH and Organosolv process was done.
- Purification and characterization of lignin was completed.
- Lignin acrylic acid copolymer was synthesized.

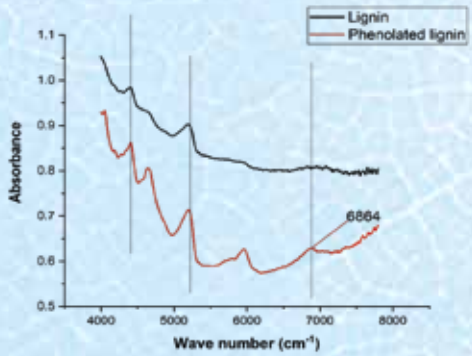


Fig. 2: MIRNIR spectrum of KOH lignin and phenolated KOH lignin.

3. Development of rayon grade pulp from mixture of jute stick and jute fiber

Dr. M. Mostafizur Rahman, SSO (PL), Dr. M Sawar Jahan, Director, Dr. Md. Nashir Uddin, PSO, Jannatun Nayeem, SSO, Kazi Md. Yasin Arafat, SO, Razia Sultana Popy, SO

Introduction:

The high α-cellulose and low lignin contents in jute fiber make its good source of dissolving pulp production. It was observed that dissolving pulp produced from jute fiber had low reactivity and filterability. To improve the

reactivity and filterability, jute stick which has short fiber length was mixed. Moreover, high temperature (160-180° C) pretreatment remove about 60-80% hemicellulose form the jute stick. The hemicelluloses are mostly xylose which would be a good source of furfural. The dissolved hemicellulose in the prehydrolysis liquor was converted to furfural by varying acid concentration, temperature and time.

Objectives:

The objective of the present work is to prepare rayon grade pulp by pre-hydrolysis soda AQ process from a mixture of jute stick and jute.

Work Progress:

- Analysis of the prehydorlysis liquor obtained from the pretreatment of jute fiber and jute stick mixture.
- Optimization of the furfural production conditions from the phrehydrolysis liquor by acid hydrolysis.
- Analysis of the furfural yield and sugar conversion.
- Characterization of the pulp bleached with chlorine dioxide.
- Testing the reactivity of the dissolving pulp.

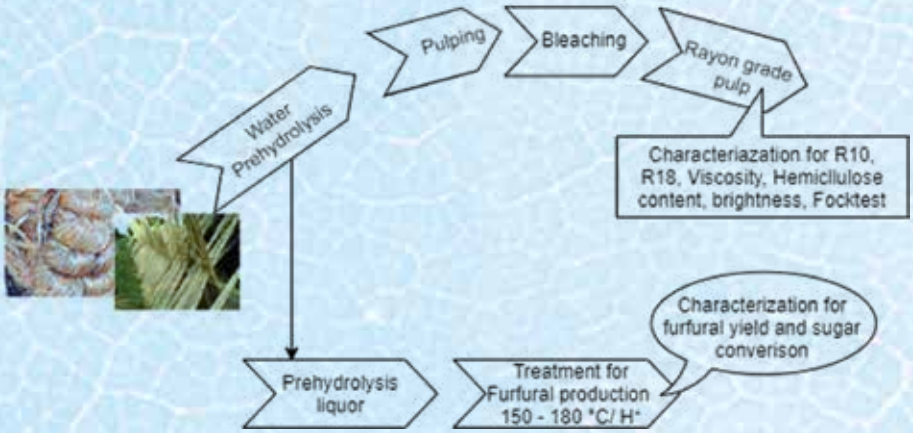


Figure: Flow diagram of rayon grade pulp production and furfural preparation form PHL.

3. Non Conventional Production of Paper Grade Pulp from crop wastes

Dr. M. Mostafizur Rahman, SSO (PL), Dr. M Sawar Jahan, Director, Dr. Md. Nashir Uddin, PSO, Jannatun Nayeem, SSO, Kazi Md. Yasin Arafat, SO, Razia Sultana Popy, SO, Dr. Mohammad Moniruzaman, PSO, Md. Shamim Ahmed, PSO, INARS

Introduction:

Rice straw is bulky nature and low density compare to wood and not a suitable raw material for conventional pulp mill.Again a conventional pulp mill cannot be economically and environmentally feasible without a chemical recovery system. In that case, the nitric acid pulping process could be a suitable alternative for crops wastes pulping. Advantages of the nitric acid pulping are: low cooking temperature, need low concentration of acid, comparatively shorter cooking time, reuse of cooking liquor without chemical recovery process.A huge amount of non-fibrous cells considered as pith can be removed in the nitric acid process easily. In the proposed project concept, all fractions of biomass will be separated and utilized without generating wastes. Finally, the effluent liquor produced in the proposed nitric acid process will be used as liquid fertilizer.

Objectives:

The objective of the present work is to prepare rayon grade pulp by pre-hydrolysis Kraft process from a mixture of jute stick and jute.

Work Progress:

- Pretreatment was done with 1 to 3% nitric acid
- Rice straw pulping was carried out at the below boiling temperature and low acid concentration
- The nitric acid pulp was treated with potassium hydroxide to remove more lignin
- The waste cooking liquor was analyzed for nitrogen, potassium, phosphorous, total organics to use as soil nutrient

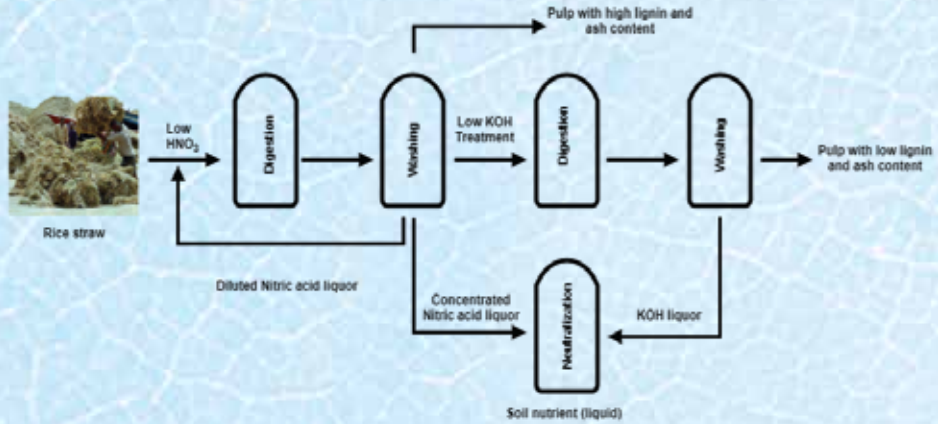


Figure: Flow Diagram of the nitric acid and potassium hydroxide experiment.

Achievements & Activities

1. M. Mostafizur Rahman, Esrat Jahan, Jannatun Nayeem, Kazi Md. Yasin Arafat, A.K.M Golam Sawar, M. Nashir Uddin, and M. Sarwar Jahan, "Evaluation of *Erythrina fusca* Lour. as a pulping raw material" *International Wood Products Journal,* **2022**, 13 (2): 107-114.
2. Akash Mamun Sarkar, M Sawar Jahan, Jannatun Nayeem, Arafat, Kazi Md. Yasin Arafat, M. Mostafizur Rahman, Razia Sultana Popy, AHM Shofiul Islam Molla Jamal and M. Abdul, "Chemical and morphological characterization and pulping of Casuarina equisetifolia". *Nordic Pulp & Paper Research Journal,* **2021**, 36 (4), 559-569.
3. Maisha Farzana, M. Mostafizur Rahman, Taslima Ferdous, and M Sawar Jahan, "Review on Trema orientalis as a potential bioresource in tropical countries" *Trees,* **2021**, 1-9.
4. M. Mostafizur Rahman and František Potůček, "Displacement washing of softwood pulp cooked to various levels of residual lignin content" *TAPPI JOURNAL,* **2021**, 20(9), 553-563.

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

1. **Mamon Sarkar,** RC, Pulp and Paper Research Division, Pursuing PhD, degree from University of Wyoming, USA.

Industrial Tours/Disseminations

Name and Designation	Name of the institution	Date
1. Dr. Md. Mostafizur Rahman, Senior Scientific Officer 2. Razia Sultana Popy, Scientific Officer	Karnafuli Paper Mill, Chandraghona, Rangamati	28.03.2022
3. Dr. Md. Mostafizur Rahman, Senior Scientific Officer	Mostofa Paper Mills, Chattogram	16.06.2022

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

Sl. No	Title of Research	Research Category	Name of the Student	Name of the Institution	Name of Supervisors
1	Tissue grade paper pulp from corn stalk in integrated biorefinery concept	MS Thesis (Student)	Amiyo Roy	Applied Chemistry & Chemical Engineering, University of Dhaka	Dr. Md. Mostafizur Rahman
2	Pulping og *Trewia Nudiflora*- a fast growing wood species		Md. Zahurul Islam		
3	Functionalized nanocellulose based composite for antibacterial paper		Md. Nokib Hossen		

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

1. Dr. Md. Mostafizur Rahman (SSO), participated in training on NIS for transparent dada generating of particle size analyser held on 16 September, 2021 at BCSIR Dhaka Laboratories.
2. Dr. Md. Mostafizur Rahman (SSO), participated in training on e-Filing held on 12 October, 2021 at BCSIR Dhaka Laboratories.
3. Dr. Md. Mostafizur Rahman (SSO), participated in training on Integrity strategy and good governance held on 01 December, 2021 at BCSIR Dhaka Laboratories.
4. Dr. Md. Mostafizur Rahman (SSO), participated in training on Basic principle application, operation and maintenance of HPLC held on 25 January 2022 at BCSIR Dhaka Laboratories.
5. Dr. Md. Mostafizur Rahman (SSO), participated in training on Learining session of computational drug discovery held on 07 March, 2022 at BCSIR Dhaka Laboratories.
6. Dr. Md. Mostafizur Rahman (SSO), participated in training on Dilute solution viscomitry using automated micro-viscometer held on 08 March, 2022 at BCSIR Dhaka Laboratories.
7. Razia Sultana Popy (SO), participated in training on Learining session of computational drug discovery held on 07 March, 2022 at BCSIR Dhaka Laboratories.
8. Razia Sultana Popy (SO), participated in training on Dilute solution viscomitry using automated micro-viscometer held on 08 March, 2022 at BCSIR Dhaka Laboratories.
9. Razia Sultana Popy (SO), participated in training on Right to Information held on 10 March, 2022 at BCSIR Dhaka Laboratories.
10. Razia Sultana Popy (SO), participated in training on Rheometer, Microviscometer, Refractometer with Density Module held on 03-07 April, 2022 at BCSIR Dhaka Laboratories
11. Razia Sultana Popy (SO), participated in training on e-Governance held on 20 June, 2022 at IFST, BCSIR, Dhaka.

Number of Analytical (Ad-hoc) problem solved:

Name of division	Routine type	Research type	Total
Pulp and Paper Research Division	501	7	508

Celebration of 'Mujib Borsho' at a glance

Dr. Md. Sarwar Jahan (1992- present)

Office	BCSIR Dhaka Laboratories	Blood group	**B+**
Position	Director	Degree obtained	Ph.D (2000)
Contact	sarwar2065@hotmail.com	Mobile	01715078023

Dr. Md. Sarwar Jahan achieved his BSc and MSc degree in Applied Chemistry from Rajshahi University, and later he acquired PhD degree on 'jute pulping' from the same university. He has built up a versatile research career on pulping, wood and fiber chemistry, biorefinery and biomaterials. He has published more than 200 articles in the high ranked peer reviewed journals and gets 3400 citations with 30 h-index. He received many awards including David Wetherhorn Award, TAPPI, USA 2009, Bangladesh Academy of Science gold medal 2013, Successful Innovation in Science and Technology in Developing Countries, 2015, and he is an Elected Fellow, International Academy of Wood Science, 2015. He is active members of Australia and New Zealand Pulp and Paper Industries Technical Association (APPITA), Pulp and Paper Technical Association of Canada, TAPPI USA, Society of Wood Science and Technology (SWST), International Union of Forest Research Organization (IUFRO), Bangladesh Chemical Society. He is a steering committee member of INGSA, Asia. Dr. Jahan organized different international conferences and workshops in home and abroad.

Dr.Mohammad Nashir Uddin (October 2001- present)

Office	Pulp & Paper Research Division	Blood group	**O+**
Position	Principal Scientific Officer	Degree obtained	Ph.D (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 36 publications and has supervised more than 20 students for accomplishing their MSc thesis. He has been performing the duty of Director of Planning and Development Division (P&D), BCSIR since September 2019 as additional charge.

Dr. Md. Mostafizur Rahman (2006 - present)

Office	Pulp & Paper Research Division	Blood group	**A+**
Position	Senior Scientific Officer	Degree obtained	Ph.D (2019)
Contact	mmrbcsir@yahoo.com	Mobile	01737683668

Dr. Md. Mostafizur Rahman his completed BSc and MSc (organic) degree in Chemistry from University of Rajshahi. Later he acquired PhD degree in Pulp and Paper focusing on brown stock pulp washing from University of Pardubice, Czech Republic. Dr. Rahman interested in pulping, browstock pulp washing, biorefinery and biomaterials. He has published 43 articles in the peer reviewed journals as first author, corresponding author and coauthor. Besides, he as supervised 9 students for accomplishing their MSc thesis. He is a member of International Society of Wood Science & Technology (SWST), Membership invoice no. 004672, Bangladesh Chemical Society, Bangladesh Association for the Advancement of Science (BAAS), Rajshahi University Chemistry Alumni Association (RUCAA), BCSIR-Scientist Association.

Razia Sultana Popy (December, 2016- present)

Office	Pulp & Paper Research Division	Blood group	**A+**
Position	Scientific Officer	Degree obtained	M.Sc. (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 five (06) publications.

Akash Mamon Sarkar (August, 2016- present)

Office	Pulp & Paper Research Division	Blood group	**B+**
Position	Research Chemist	Degree obtained	MSc (2010)
Contact	akash.mamon@gmail.com	Mobile	6052021957

Sarkar achieved his BSc and MSc degree in Chemistry from the Jagannath University, Dhaka. He is currently in deputation for his PhD degree (Organic Chemistry) from the University of Wyoming, USA (2019 to present) under the supervision of Professor Micheal Thompson Taylor. His research is mainly focused on the Cellulose Chemistry, Synthetic Chemistry and Environmental Chemistry. He has been published 33 articles as first author, corresponding author or coauthor and got 313 citations (h-index: 9). He is a life member of Bangladesh Chemical Society and a member of American Chemical Society from 2018.

Md. Nur Alam Likhon (November, 2021…)

Office	Pulp & Paper Research Division	Blood group	**O+**
Position	Scientific Officer	Degree obtained	MS (2018)
Contact	likhon.bcsir@gmail.com	Mobile	01750650950

Md Nur Alam Likhon achieved both his BS Honours 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 Dhaka Laboratories. He has done his MS thesis on Lignin modification. His research is mainly focused on Lignocellulosic chemistry.

Stakeholder meeting of BCSIR Dhaka Laboratories




Stakeholder meeting of BCSIR Dhaka Laboratories was held on May 31, 2022. Mr. Mohammed Zaker Hossain (Member, Development), Mr. Sultan Alam (Member, Administration) and Mr. Shah Abdul Tarique (Secretary and Member Finance) were present as special guests in the workshop. The Stakeholder meeting was presided over by Dr. Engr. Md. Abul Kashem (CSO) and the keynote article was presented by Dr. Md. Monarul Islam (Senior Scientific Officer), Chemical Research Division. More than one hundred representatives of different industries, University teachers, and scientists were present in the meeting. The Stakeholder meeting was organized by chemical research division (CRD).

BCSIR Dhaka Laboratories
List of accepted process, 2011 - 2022 (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 naturalingredient, 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. Isolation of Bulk amount of Piperine as a active pharmaceutical ingredients (API) from Black pepper and White Pepper, 27.09.20_D/L
48. Production of Herbal Body wash, 17.12.20_D/L
49. Herbal Skin Care Cream **(Sponsored),** 09.03.21_D/L
50. Anti Bacterial Hand Wash **(Sponsored),** 10.03.21_D/L
51. Production of Amyl Acetate, 04.11.21_D/L
52. Production of Hand Sanitizer Gel, 16.11.21_D/L
53. Development of in-situ Arsenic Detection Kit for Aqueous Medium, 24.11.21_D/Lab
54. Production of Iron (III) Chloride (Anhydrous) from Scarp Iron, 24.01.22_D/L
55. Formulation Hair and Scalp Cleanser, 25.04.22_D/L

Contact Address

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