

Annual Report 2022-23



MESSAGE FROM THE CHAIRMAN

I am pleased to know that BCSIR Rajshahi Laboratories is preparing to publish the annual report for the period 2022-2023. At this auspicious moment, I pay my deep homage to the Greatest Bangalee of all times, the Father of the Nation, Bangabandhu Sheikh Mujibur Rahman. I also recall three million martyrs of our liberation war and two hundred thousand mothers and sisters who sacrificed their modesty for the cause of independence.

BCSIR Rajshahi Laboratories is a well-known research organization that focuses on various disciplines. They are exploring novel ways of utilizing locally available raw materials in the northern part of Bangladesh and play a vital role in researching ways to maximize the efficient utilization of natural resources. This multidisciplinary institute's main duties are to support industrial development, address issues related to the establishment and growth of high-tech industries, produce knowledge in the field of natural science, and get ready to tackle the challenge of 4IR.

This Laboratories is moving forward to be one of the prime and largest contributory national research and development organizations in the field of medicinal plants, development of herbal products, drugs, and toxicology, fruit products and supplements, fish and poultry feeds, industrial microbiology, edible oils, etc. Moreover, it is a bunch of highly skilled, passionate, and dedicated scientists who play a pivotal role in mentoring M.Sc. and Ph.D. students from various universities across the nation. Their unwavering commitment and determination are poised to make a significant impact in steering the country toward the achievement of the Sustainable Development Goals (SDGs) by 2030.

I like to express my sincere gratitude to the Honorable Prime Minister of the Government of the People's Republic of Bangladesh, Sheikh Hasina, for her dynamic leadership in the era of Smart Bangladesh. I am also thankful to Architect Yeafesh Osman, Minister of the Ministry of Science and Technology, for his continuous support to run the BCSIR smoothly. My special thanks to the Secretary of the Ministry of Science and Technology, Mr. Md. Ali Hossain, for his support in all regards.

I would like to congratulate all scientists, officers, and staff for their relentless effort to uphold the BCSIR. Their synergistic efforts and conscious inventiveness are revealed through the institute's achievements. Finally, I would like to thank the Director of this organization for his management capacity, and Convener, Members of the editorial committee for their vigorous teamwork effort in preparing this report.

Joy Bangla, Joy Bangabandhu
May Bangladesh Live Long

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



MESSAGE FROM THE DIRECTOR

It is with great pleasure and a sense of profound accomplishment that we are going to publish the annual report of BCSIR Rajshahi Laboratories for the fiscal year 2022-2023. At the very beginning, I would like to show honor to the Father of the Nation, Bangabandhu Sheikh Mujibur Rahman, whose indomitable spirit paved the way for our nation's freedom.

Since its inauguration in 1967, BCSIR Rajshahi Laboratories has stood as a beacon of scientific excellence, serving our beloved country through relentless Research and Development (R&D) activities. Over the years, our laboratory has evolved and expanded, manifesting its commitment to progress and innovation. Today, we proudly operate under seven distinct research divisions, each dedicated to advancing knowledge in their respective domains.

This annual report encompasses a comprehensive overview of our laboratory's history, organizational structure, and achievements related to R&D activities. We invite you to explore our journey through a myriad of activities and milestones, including the publication of research papers, the approval of novel processes, the filing of patents, participation in national and international conferences, the facilitation of seminars and workshops, industrial visits, in-house training programs, supervision of thesis students, and the provision of analytical services to government and private organizations. We believe that this report not only encapsulates our endeavors but also serves as a valuable resource for aspiring researchers, scientists, and entrepreneurs.

In our pursuit of excellence, we are elated to announce our imminent journey towards ISO accreditation for BCSIR Rajshahi Laboratories. This milestone will not only enhance our laboratory's recognition but also elevate our testing procedures to global standards. As we move forward, we do so with a renewed sense of purpose and an unwavering commitment to advancing science and technology for the betterment of our nation. Together, we shall continue to explore new horizons and break new ground in the pursuit of knowledge and innovation.

I extend my heartfelt gratitude to the honorable Chairman of BCSIR, Professor Dr. Md. Aftab Ali Shaikh, for his unwavering encouragement, invaluable guidance, and steadfast support of our research and development activities. His leadership continues to be a source of inspiration.

I would also like to commend the dedicated members of the editorial committee for their tireless efforts in bringing this annual report to fruition.

Lastly, I extend my gratitude to every member of the BCSIR Rajshahi Laboratories family. Your unwavering cooperation and contributions have been instrumental in our journey of progress and innovation.

Dr. Md. Salim Khan, CSO
Director (In-Charge)
BCSIR, Rajshahi Laboratories,
Rajshahi-6206.



MESSAGE FROM THE CONVENER

I am delighted to announce that the BCSIR, Rajshahi Laboratories is going to publish the annual report for the years 2022-2023. It is a testament to the collective commitment and excellence that defines the BCSIR, Rajshahi Laboratories. This comprehensive report encapsulates a multitude of narratives showcasing the laboratory's diverse activities, notably its commitment to research and development (R&D) activities, research papers, processes, patents, rendering services to industries, and entrepreneurs, and highlights the institute's wide-ranging innovations. This report also displays information about training, conferences, seminars, and workshops for stakeholders. I believe that this report will provide an invaluable resource, crucial insights, and guidance to researchers, entrepreneurs, and all those associated with our multifarious research field.

I would like to express my heartfelt appreciation to Professor Dr. Aftab Ali Shaikh, chairman of BCSIR, and Dr. Md. Salim Khan, Director–In-charge, BCSIR, Rajshahi laboratories for their unwavering support and continuous inspiration in fostering the research and development activities of this institute. My special thanks and admiration are also reserved for the dedicated members of the editorial committee, whose tremendous and collaborative efforts have been instrumental in shaping and editing this report.

Lastly, I express my deep gratitude to all the scientists, technicians, officers, and personnel whose unwavering dedication and hard work have played a pivotal role in fulfilling Sustainable Development Goals by 2030.

Dr. Md. Nurul Huda Bhuiyan

Convener

Publication Committee 2022-23

BCSIR Rajshahi Laboratories,

Rajshahi-6206



MESSAGE FROM THE MEMBER SECRETARY

I feel so privileged to pen down something as a member secretary of the annual report publication committee of the BCSIR, Rajshahi Laboratories for the year 2022-2023. The report highlights the overall research and developmental achievements of BCSIR, Rajshahi Laboratories including technical support provided to the entrepreneurs, PhD, MPhil, and Masters students of different universities throughout the past twelve months.

I acknowledge my heartfelt gratitude to Dr. Md. Selim Khan, Director (Additional charge), BCSIR Rajshahi Laboratories for his guidance and immense support to assemble this report successfully. My unfeigned gratefulness goes to the convener and members of the committee for their dedication, and collaborative spirit to compile and edit the script. Thanks to all scientists, technicians, officers, and staffs for their efforts to create this magnificent copy of the annual report that reflects the master stroke of the organization.

Finally, this report showcases the overall activities of BCSIR, Rajshahi Laboratories that have contributed to attaining the Sustainable Development Goals (SDGs) and migrating from the least developed to developing country.

A handwritten signature in brown ink, which appears to read 'Farhana'.

Farhana Boby
Member Secretary
Publication Committee 2022-23
BCSIR, Rajshahi Laboratories

Annual Report Committee

Dr. Md. Nurul Huda Bhuiyan
Principal Scientific Officer
Convener



Dr. Mst. Sarmina Yeasmin
Principal Scientific Officer
Member

Md. Waliullah
Scientific Officer
Member



Md. Al-Amin
Scientific Officer
Member



Abu Kowser
Scientific Officer
Member



Farhana Boby
Scientific Officer
Member Secretary



Contents

INTRODUCTION

The history of BCSIR Rajshahi laboratories dates back to 1967 when land was acquired by government order. Primarily, laboratory started to work in a small office of Silk and Lac Research-Cum-Training institute in 1968. After construction of residential building in 1969, laboratory was shifted there. The complete structure of present laboratory was accomplished in 1973, subsequent to Great War of independence.

Until 1975, there were three Research Divisions (Lac Research Division; Oils, Fats & Waxes Research Division and Fiber Research Division) in this laboratory. Four more Divisions named Fruit Processing and Preservation, Applied Botany, Applied Zoology, and Drugs and Toxins were opened in 1976. At present, Rajshahi Laboratories has seven Research Divisions namely-



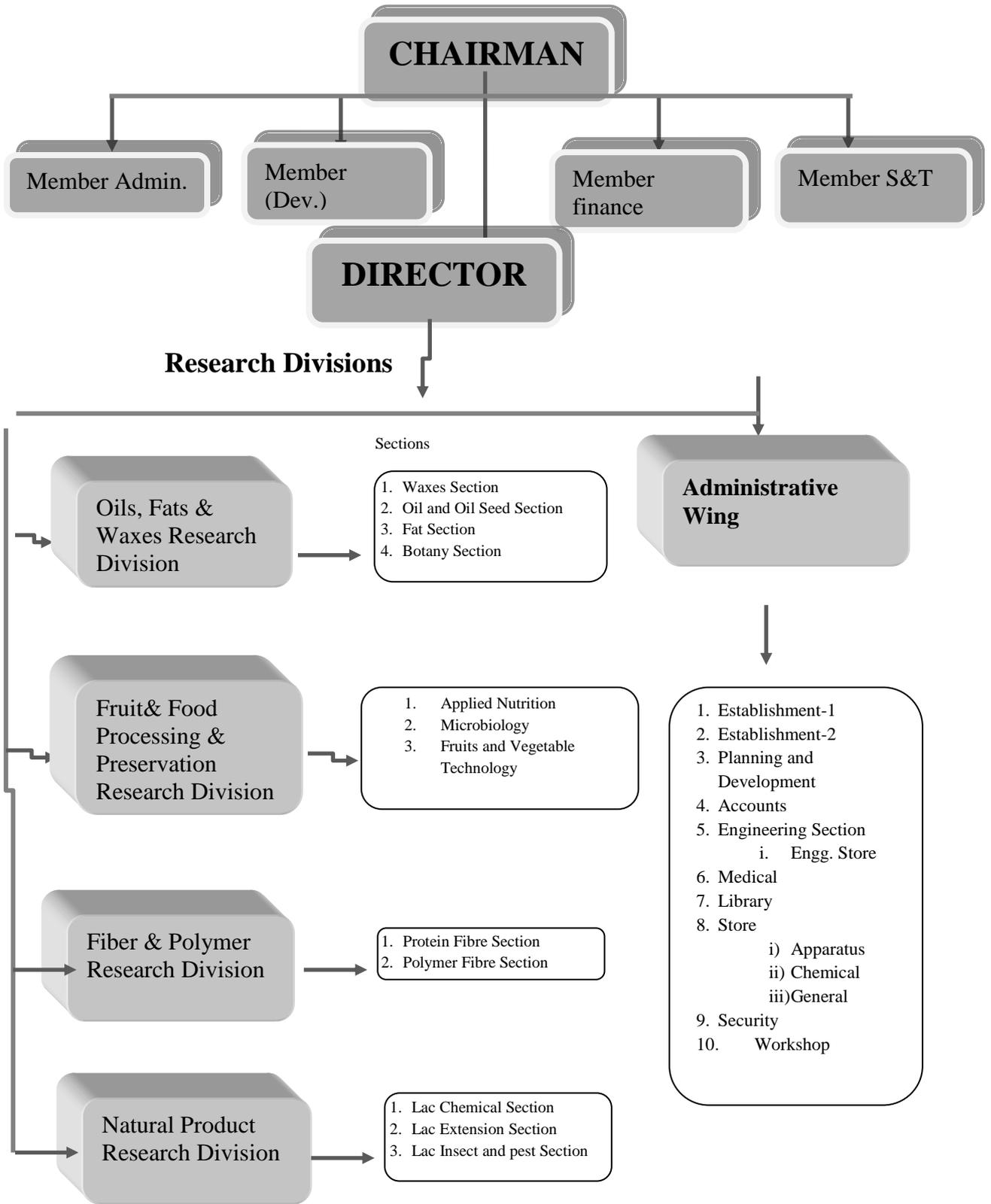
- a. Natural Products Research Division.
- b. Oils, Fats and Waxes Research Division
- c. Fruits & Food Processing and Preservation Research Division
- d. Applied Botany Research Division
- e. Fiber and Polymer Research Division
- f. Applied Zoology Research Division
- g. Drugs and Toxins Research Division

BCSIR Rajshahi Laboratories is playing a vital role on R&D sector. At present scientists of seven divisions from different fields are pursuing R&D activities. It has ultra-modern machine-like RT-PCR, LC-MS, Ion-trap MS, GC-MS, Preparative HPLC, IC, Microbial Identification Station (Biolog), Chemiluminescence, Bioreactor, UV-Vis-NIR Spectroscopy which are used for research related and ad-hoc service-oriented analysis.

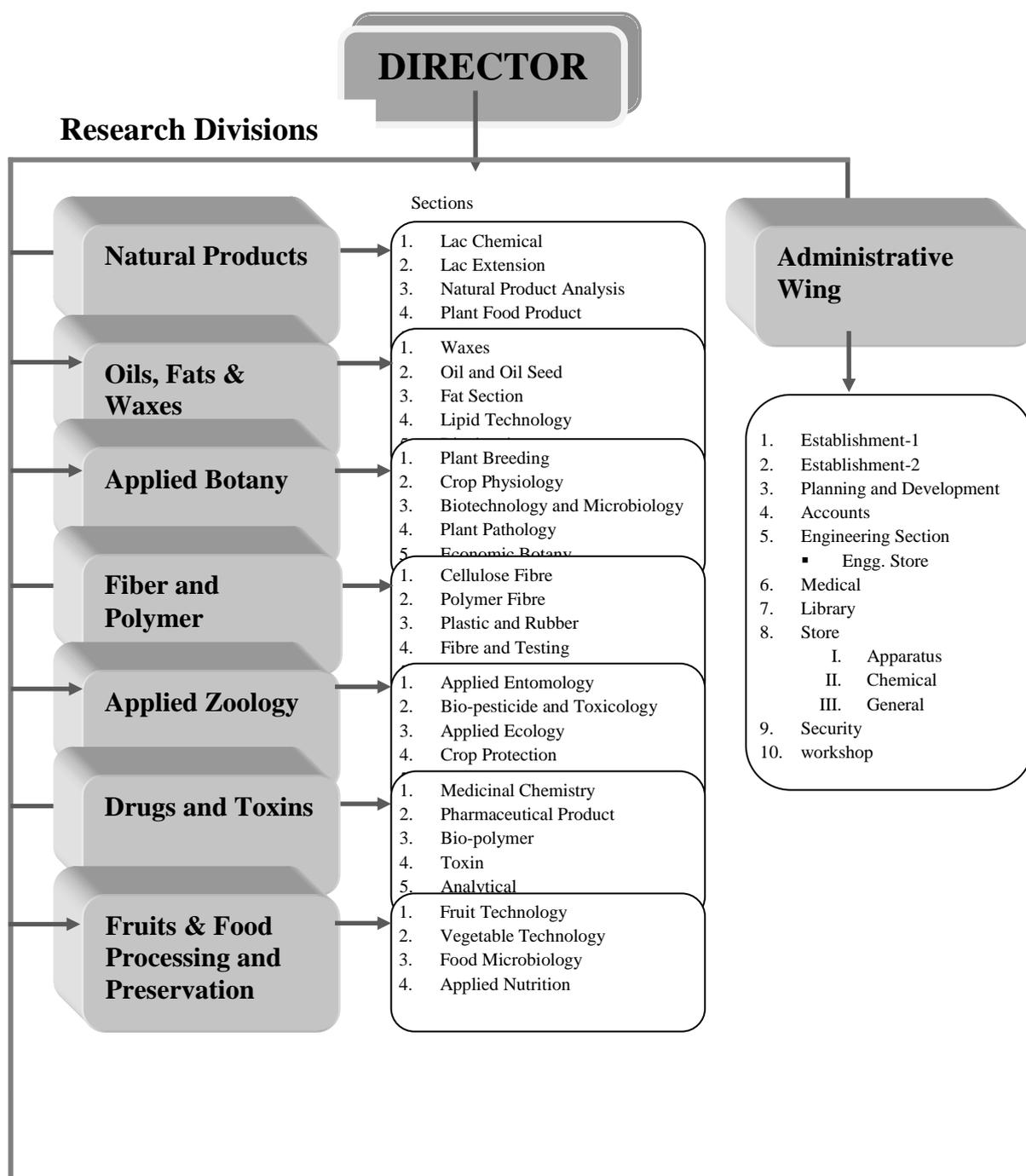
As a researcher of BCSIR Rajshahi Laboratories our mission is to develop a world-class research workforce to contribute in industrial and socio-economic development of the country by invention of technologies for effective utilizations of natural resources in Agriculture, Poultry sector and Crop protection, especially by using the agro base raw materials that are abundant in northern part of the country. Altering on this ideal spirit scientists are actively engaged in scientific and industrial research on various disciplines.

It is our credit to mention that during the period under report we have got published 33 research papers in the journals based in home and abroad, and 2 process has been accepted.

Approved Organogram of BCSIR Rajshahi Laboratories



Proposed Organogram of BCSIR Rajshahi Laboratories



**RESEARCH DIVISIONS WITH SECTIONS IN
BCSIR RAJSHAHI LABORATORIES**

OIC & Research Divisions	Working Researchers	Research Sections
Dr. Md. Badrul Islam PSO Natural Products Research Division	Dr. Md. Badrul Islam, PSO Dr. Faridul Islam, SSO Mahci Al Bashera, SO Md. Sabbir Hasan, SO Farhana Jahan, SO Md. Waliullah, SO Md. Ismail Hossen, SO Md. Ariful Islam, SO (Attachment)	1. Lac Chemical 2. Lac Extension 3. Natural Products Analysis 4. Plant Food Products 5. Natural Dye
Dr. Mst. Sarmina Yeasmin, PSO Oils, Fats & Waxes Research Division	Dr. Mst. Sarmina Yeasmin, PSO Md. Mahmudur Rahman, SO Ratan Kumar Biswas, SO Jaytirmoy Barmon, SO Ali Ahsan Muzahid, SO G.M. Masud Rana, RC Tahmina Akter Chowdhury, RC Md. Jasim Uddin, SO (Attachment)	1. Waxes 2. Oil & Oil Seed 3. Fat 4. Lipid Technology 5. Bio-chemistry
Dr. Md. Salim Khan, CSO Applied Botany Research Division	Dr. Arfatun Nahar Chowdhury, PSO Amit Kumar Dey, SO Nayeema Talukder Ema, SO Md. Moniruzzaman, RC Sabbir Ahmed, RC Abu Kawser, RC Md. Harun Ar Rashid, SO Dapa Rani Roy, RB	1. Plant Breeding 2. Crop Physiology 3. Bio-Technology & Microbiology 4. Plant Pathology 5. Economic Botany
Rasheda Akter, PSO Fiber & Polymer	Md. Ahasanur Rabbi, SSO Most. Halima Khatun, SSO Firoz Ahmed, SO Hurey Jahan Kadri, SO Md. Al-amin, SO (Attachment) Bijoy Maitra, RC Md. Zia Uddin Rasel, RC	1. Cellulose Fiber 2. Polymer Fiber 3. Plastics and Rubber 4. Fiber Testing
Dr. Mohajira Begum, PSO Applied Zoology Research Division	Dr. Mohajira Begum, PSO Lailatul Ferdusi, SSO Supriya Ghosh, SO Ayan Goshwami, SO	1. Applied Entomology 2. Bio-pesticide and Toxicology 3. Applied Ecology 4. Crop Protection 5. Fish Technology
Nazim Uddin Ahmed, PSO Drugs & Toxins Research Division	Nazim Uddin Ahmed, PSO Md. Shakhawat Hossen, SO Safaet Alam, SO Shabiba Pervin Shondhi, SO Kutub Uddin Ahamed, RC Md. Al-Amin Miah, RC Bakul Akter, RP	1. Medicinal Chemistry 2. Pharmaceutical Products 3. Bio-polymers 4. Toxin 5. Analytical
Dr. Md. Nurul Huda Bhuiyan, PSO Fruits & Food Processing & Preservation Research Division	Dr. Md. Nurul Huda Bhuiyan, PSO Md. Jahidul Islam, SSO Farhana Boby, SO Md. Zakaria Al Noman, SO Md Mashud Parvez, SO Partha Paul, SO Md. Akib Hasan, SO	1. Fruit Technology 2. Vegetable Technology 3. Food Microbiology 4. Applied Nutrition

R&D Projects 2022-23

Name of the Division: Applied Botany Research division

1. R & D projects:

1.1 Title: “Improve of soil fertility and yield of rice, wheat, and maize using pressmud compost and eco-friendly fungus”

Name of Scientists:

1. Amit Kumar Dey, SO (Project Leader)
2. Dr. Arfatun Nahar chowdhury, PSO (Project Associate)
3. Dr. Md. Nurul Huda Bhuiyan, PSO (Project Associate)
4. Dr. Mohammad Moniruzzaman, PSO (Project Associate), BCSIR Laboratories, Dhaka
5. Bijoy Maitra, SO (Project Associate)
6. Md. Moniruzzaman, RC (Project Associate)
7. Sabbir Ahmed, RC (Project Associate)

Introduction:

Sugarcane is an important industrial and cash crop in Bangladesh. The contribution of sugarcane to national GDP is about 0.78%. About 5 million peoples are depending on sugarcane cultivation in Bangladesh. Sugarcane industries produce large number of by-products as waste. Press mud is generated as a by-product of sugarcane industries and characterized as a soft, spongy, amorphous, and dark brown (Ghulam *et al.* 2012). In general, when 100 t of sugarcane is crushed, about 3 t of press mud are produced as a by-product (Gupta *et al.* 2011). Handling and management of these byproducts are huge task, because those require lot of space for storage. However, it provides opportunity to utilize these by-products in agricultural crop production as organic nutrient source. Sugarcane by-products such as press mud improve the soil chemical, physical and biological properties and enhanced the crop quality and yield. Press mud is increasing beneficial fungi and bacteria in soil that influence on soil aggregate stability to achieve sustainable agriculture through increase yield and quality of crops.

Objectives:

The present work is undertaken with the following objectives:

- To improve Crop (Rice, Wheat, and Maize) yield.
- To improve the soil chemical, physical and biological properties.
- To enrich compost from sugarcane press mud mixed with organic fertilizer.

Progress Achieved:

- a. Isolation, Purification and identification of *Trichoderma* Fungus from soil.
- b. Preparation of pressmud Organic fertilizer by *Trichoderma* beneficial fungus was done.
- c. Field preparation, Cultivation and harvesting of wheat and maize plants was done.
- d. Proximate analysis of wheat and maize flour is going on.

Name of the Division: Drugs and Toxins Research Division**R & D projects:**

1.2 Title: “Chemical and Biological Investigations of *Colocasia affinis* Schott: *in vitro*, *in vivo* and *in silico* studies.”

Name of Scientists:

1. Safaet Alam, SO (Project Leader)
2. Nazim Uddin Ahmed, PSO (Project Associate)
3. Kutub Uddin Ahamed, RC (Project Associate)
4. Dr. Md. Humayun Kabir (Project Associate)

Introduction:

Colocasia is a flowering plant genus under the Araceae family native to southeastern Asia and the Indian subcontinent which are widely cultivated and naturalized in other tropical and subtropical regions. The genus of *Colocasia* leaves has demonstrated the potentiality of demonstrating antidiabetic, antihypertensive, immune-protective, neuroprotective, and anticarcinogenic activities. Though another species of *Colocasia* genus *i.e.* *Colocasia esculenta* and *Colocasia gigantea* has been hugely investigated, this species is still under-investigated. To our best knowledge, till today no chemical investigation of crude extract and/or fractionates of the crude extract has been carried out as well as no *in silico* study has been also reported to validate the wet lab findings as well as predict the responsible bioactive chemicals to exert pharmacological actions. We hypothesize from the previous study that, compounds isolated from the aerial part of *Colocasia affinis* exhibits different pharmacological activities against health disorder. From this research, we want to identify and characterize several bioactive chemical compounds and evaluate various pharmacological activities that may consider this plant as potential therapeutics in human health.

Objectives:

The present work is undertaken with the following objectives:

- a. This research will help to design and develop new drugs from natural origin.
- b. It will help to determine the therapeutic potentiality of this plant in the treatment of different disease states.
- c. It will reduce the side effects during therapeutic application.
- d. It will also help to reduce the treatment cost of some diseases.

Progress Achieved:

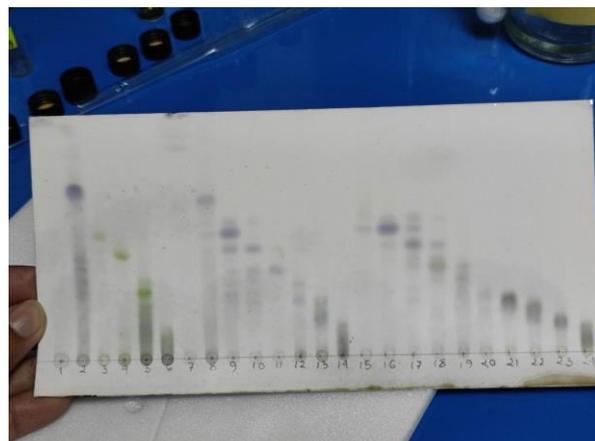
The plant has been collected. The plant extract and kupchan fractions have been prepared following the protocols. GC-MS analyses have been performed. TLC analytical technique is ongoing. Antioxidant and thrombolytic activities are evaluated.



1(a)



1(b)



1(c)

Picture 1: (a) Grinding of plant material after shade-drying, (b) Plant extract preparation, (c) Chemical investigation of different fractions of plant extract.

1.3. Title: “Synthesis of novel oxime derivatives and assessment of their in vitro biological activities.”

Name of Scientists:

1. **Md. Al- Amin Miah, RC (Project Leader)**
2. Mohajira Begum, PSO (Project Associate)
3. Dr. Mst. Sarmina Yeasmin, PSO (Project Associate)
4. Lailatul Ferdousi, SSO (Project Associate)
5. Jasim Uddin, SO (Project Associate)
6. Supriya Ghosh, SO (Project Associate)

Introduction:

The conversion of carbonyl functionalities into oximes is an important reaction in organic chemistry. Oximes are highly crystalline compounds that find applications not only for protection but also for purification and characterization of carbonyl compounds. Classically, oximes are prepared by refluxing an alcoholic solution of carbonyl compounds with hydroxylamine hydrochloride and pyridine. The method has multiple drawbacks such as low yields, long reaction times, and effluent pollution caused by the use of organic solvents. Alumina, CaO, and $\text{TiO}_2/\text{SO}_4^{2-}$ are used as catalysts for the synthesis of oximes, but these methods have been claimed to be less efficient. At present each sector either smaller or larger in production capabilities keeps a sharp eye on the amount of the product (yield), time, cost, reusability of the catalysts, dumping of catalyst, and minimum spoilage of the organic solvents. In view to minimize the expenditure in synthesis, we attempt to devise an extremely simple, suitable, fast, efficient, and novel method for the preparation of oximes. Recently, the biological activity of oxime compounds has attracted more and more attention. The applications of oxime compounds in recent years to agriculture were reviewed according to different chemical structures. Oxime compounds frequently exhibit a reasonable extent of insecticidal, fungicidal or herbicidal activity. Hence, after synthesizing oxime and their derivatives using suitable catalysts and grindstone chemistry, we will screen in vitro biological properties of those synthetic products.

Objectives:

The present work is undertaken with the following objectives:

- a. The main objective of our research is to synthesize Oxime and its derivatives by environmentally benign as well as economic pathways.
- b. To prepare some oxime derivatives with hydroxylamine hydrochloride and carbonyl compounds in the presence of a cheap catalyst.
- c. To synthesize biologically active heterocyclic compounds of oxime derivatives.
- d. To study the biological activity and efficacy of synthesized compounds via in-vitro methods.

Progress-

A trial to synthesize oxime is going on.



1.4.: Title: “Biological evaluation of phytochemicals from germinated crop seeds.”

Name of Scientists:

1. **Nazim Uddin Ahmed, PSO (Project Leader)**
2. Shabiba Parvin Shandhi, SO (Project Associate)
3. Safaet Alam, SO (Project Associate)
4. Md. Al Amin Miah, RC (Project Associate)

Introduction:

In the plant life cycle, the time span of seeds is very small. But by this short period of time, different organs form from a single fertilized cell. Cellular differentiation rate of proliferation and diversity of gene expression is very high at this stage. There are some small molecules that initiate, differentiate, and cause apoptosis at the time of growth and germination. So, the smaller bioactive molecules of seeds can be a good source of lead molecules for the treatment of diseases like diabetes, and different types of cancers that are related to metabolic orders.

Objectives:

The present work is undertaken with the following objectives:

- a. Isolation of phytochemicals from the growing and germinated seeds
- b. Characterization of compounds
- c. Screening biological activity of crude extracts and isolated compounds

Name of the Division: *Fruits and Food Processing and Preservation Research*

Division

R & D projects:

1.5. Title: “Health risk assessment and environmental impacts of heavy metals and organic compounds exposure through informal e-waste recycling in Bangladesh.”

Name of Scientists:

- 1) **Dr. Md. Nurul Huda Bhuiyan, PSO, BCSIR Rajshahi Laboratories (Project Leader)**
- 2) Md. Ahedul Akbor, SSO, INARS, BCSIR, Dhaka (Project associate)
- 3) Farhana Jahan, SO, BCSIR Rajshahi Laboratories (Project associate)
- 4) Md. Abu Bakar Siddique, SO, INARS, BCSIR, Dhaka (Project associate)
- 5) Md. Ripaj Uddin, SO, INARS, BCSIR, Dhaka (Project associate)
- 6) Bijoy Maitra, SO, BCSIR Rajshahi Laboratories (Project associate)
- 7) Zakaria Al Noman, SO, BCSIR Rajshahi Laboratories (Project associate)
- 8) Dr. Barun Kanti Saha, CSO & Director Addl. Charge, BCSIR Rajshahi Laboratories (Project associate)

Introduction:

There is no formal recycling in Bangladesh. All the recycling practices are mostly conducted by informal process which is responsible for serious health risks and environmental destructive effects (Javed and Chakranbarty, 2018). Toxic heavy metals as well as other organic compounds (BFRs, PCDDs, PCDFs, PHAs and PCBs) are sprayed to the environment during recycling process of e-wastes (NEDEW, 2021). The health hazard chemicals are leached into the soil from dumping sites and cause serious health risk and environmental pollution (Ankit et al., 2021; Dutta et al., 2022; ICDDR'B, 2021). The contaminated soils influence nearby water, plants and organisms. After soil contamination, toxic chemicals from informal e-waste recycling leached through the surface area even further to ground water. There is lack of information available on the informal e-waste recycling and the harmful effects on human health and the environment caused by toxic heavy metals and organic compounds released during recycling in Bangladesh. There is a huge knowledge gap among the shop owners and e-waste workers on the health risks and environmental impacts of the toxic compounds that are released during informal recycling in shops. Previous studies focused on the survey and interview to determine the e-waste generation in Dhaka and Chattogram city (Iqbal et al., 2020; Riyad et al., 2014; Islam et al., 2014; Javed and Chakrabarty, 2018). A few researchers conducted research only describing the informal e-waste recycling areas in Chattogram city. However, there was no research published on the measurement of heavy metals and health hazard organic compounds in the environmental media and e-waste worker's biomarkers samples. It is, therefore, prudent to initiate a study to assess the environmental impacts and health risks of heavy metals in e-waste recycling areas of Bangladesh, specially Dhaka and Chattagram. This study will employ a mixed method focusing on the impacts of heavy metals on soil, indoor dust, drinking water in the dumping area and biomarkers (blood and urine) samples of workers in the informal e-waste recycling shops. The purpose of this study is to evaluate the health risk and environmental impacts of heavy metals and organic compounds of the informal e-waste recycling shops. The obtained results of this study will help to strengthen the regulation for a safe and healthy working place for the workers as well as ensuring environment friendly e-waste management system.

Objectives:

The present work is undertaken with the following objectives:

- a) To determine the occupational exposure of heavy metals and organic compounds to the workers through e-waste recycling shops.
- b) To determine the environmental impacts through e-waste recycling shops and dumping.
- c) To characterize the hazard index or risk factors of heavy metals and organic compounds.

Progress Achieved:

Overall, 50% work has been done. The procurement, method development, sample collection of both environmental and biological has been completed. Environmental sample analysis is going on. Dust and biological sample will be done in the second year. Procurement of necessary chemicals and accessories along with sample collection has been completed for the first.

1.6. Title: “Improved xylanase production by a newly isolated xylolytic bacteria using mutation and gene cloning”

Name of Scientists:

- 1) **Farhana Boby, SO (Project Leader)**
- 2) Dr. Barun Kanti Saha, CSO (Project Associate)
- 3) Dr. Md. Nurul Huda Bhuiyan, PSO (Project associate)
- 4) Md. Jahidul Islam, SSO (Project associate)
- 5) Subarna Sandhani Dey, SO (Project associate)
- 6) Farhana Jahan, SO (Project associate)

Introduction:

Xylan is the second most abundant naturally occurring polysaccharide, accounting for one-third of all renewable organic carbon on the earth. Owing to its heterogeneity and complexity, complete hydrolysis of xylan requires variety of cooperatively acting enzymes collectively known as xylanase. Xylanase has wide range of industrial and biotechnological applications in food, feed, paper and pulp industries. Recently, it is also being used to increase the sugar recovery from agricultural residues for biofuel production. Every year Bangladesh imports tons of xylanase from overseas to fulfil its industrial demand in exchange of huge amount of currency. So, it is an utmost necessary to develop a low-cost high production technique so that we can manufacture xylanase by our own. Considering this issue, the current study has aimed at production of xylanase by heterogenous expression of *Bacillus pumilus* xylanase gene in *E. coli* in a low-cost medium with minimal downstream processing.

Objectives:

The present work is undertaken with the following objectives:

- a) To identify and isolate a xylanase producing *Bacillus sp.* from soil sample.
- b) To assess the xylanase production capability of isolated *Bacillus sp.*
- c) To develop low cost media for production of xylanase by isolated bacterial strain
- d) To find out a potential mutant with high productivity of xylanase enzyme to fulfil the need of xylanase at industrial level.

Progress Achieved:

The most potent producer of xylanase, *Bacillus pumilus*, has been screened out from 64 isolates obtained from 4 different types of soil. The bacterium was identified by microscopic observation, Microbial Identification System and molecular analysis. Media optimization using low cost carbon sources has done using Box-Bahnken statistical method. Gene cloning, heterogenous expression and purification of enzymes are under way.



Figure: Xylanase from *Bacillus pumilus* produced on different carbon media

1.7. Title: Production of different Fermented fruit Vinegars and exploring their potential health benefits

Name of Scientists:

1. Md. Jahidul Islam, SSO (Project Leader)
2. Dr. Md Nurul Huda Bhuiyan, PSO (Associate)
3. Subarna Sandhani Dey, SO (Associate)
4. Farhana Boby, SO (Associate)
5. Anik Kumar Saha, SO (Associate)
6. Dr. Barun Kanti Saha, CSO (Associate)

Introduction:

Vinegar has been part of the human diet since ancient times and has been widely used as a preservative, condiment, aromatize, and even as a healthy drink. Moreover, it has also been traditionally used in ancient medicine because of its medicinal properties. Vinegar can be made from any carbohydrate source, amylaceous, or sugary substrate through two successive fermentations: alcoholic fermentation, which is carried out by means of yeasts, and acetic fermentation, with acetic bacteria as the protagonist. In recent years, Fruit Vinegars have been singled out as healthy drinks with potential health remedies which can simply be prepared by fermenting the fruits. Fruit vinegar is also strong detoxifying and purifying agent. Apple Cider Vinegar and Coconut vinegar are two of the most popular and available fruit vinegars in the

market place. Present study is designed to develop different fruit vinegars, comparing their nutrient contents and exploring their potential health benefits.

Objectives:

1. Developing different types of quality fruit vinegars at low cost than the available imported products at the market place
2. Nutrient contents of the developed different fruit products will also be analyzed and compared
3. Finally, the well documented claim of drinking fruit vinegars with health benefits such as reducing glycemic index, weight loss, antimicrobial effect will be explored

Progress Achieved:

1. Different Fermented Fruit Vinegar production is done
2. Acceptation of abstract at BCSIR Congress- 2023 & ICEPSD-2022 Conference.
3. Required data have been stored not only for paper but also for process

Name of the Division: *Applied Zoology Research Division*

R & D projects:

1.8. Title: “Production of cost-effective fish and poultry feed from silkworm, black soldier fly and fish waste”

Name of Scientists: 1. Lailatul Ferdousi, SSO, (Project Leader)

2. Dr. Mst. Sarmina Yeasmin, PSO, (Associate)
3. Md. Abu Bakar Siddique, SSO, (Associate) INARS, BCSIR, Dhaka
4. Dr. Mohajira Begum, PSO, (Associate)
5. Jasim Uddin, SO, (Associate) IFRD, BCSIR, Dhaka
6. Md. Al-Amin Miah, RC, (Associate)

Introduction:

The fish and poultry sub-sectors are considered as important avenue in fostering agricultural growth and reduce malnutrition for the people in Bangladesh. These sub-sectors have proved as an attractive economic activity, thereby, indicating its’ importance for the entire economy. Silkworm pupae, black soldier fly and fish waste are highly enriched with protein, fat and minerals. These protein sources have combindly not used as animal feed. We want to produce high nutritive fish and poultry feed using silkworm pupae, black soldier fly and fish waste available in the northern region of Bangladesh. We will focus on production of linoleic and alpha-linolenic acid enriched feed through black soldier fly and fish waste. Thus, the goal of the proposed research is to help aquaculture and poultry feed industry development in future. Successful completion of the

research especially on nutritive fish feed production which helps to reduce importation of fish meal through this sector.

Objectives:

The present work is undertaken with the following objectives:

- To develop cost-effective high-quality protein as well as fatty acid enriched feed for fish and poultry.
- To evaluate the effect of feed on growth performance of fishes and poultry.
- To help in waste management.

Progress Achieved:

Raw materials for fish feed production from Silkworm pupae, black soldier fly and fish waste were collected, washed, dried, weighed. Then, analyses of nutritional composition of raw materials were done by sophisticated instruments. After this, fish feed was produced from raw materials and other ingredients. Apart from this, it is observed the impact of feed on fish by feed trial and evaluation of growth performance and nutrient profile of treated fishes.



Figure: Fish feed production and fish culture.

1.9. Title: “Evaluation of effectiveness of essential oil as alternative to antibiotics in commercial broiler chicken”

Name of Scientists: 1) **Supriya Ahmed, SO (Project Leader)**

2) Dr. Mohajira Begum, PSO (Project Associate)

3) Dr. Mst. Sarmina Yeasmin, PSO (Project Associate)

4) Lailatul Ferdousi, SSO (Project Associate)

5) Farhana Bobby, SO (Project Associate)

6) Md. Al -Amin Miah, RC (Project Associate)

Introduction:

In Bangladesh, about 37% animal protein meat consumption comes from poultry whose 78% is supplied by broiler chicken. In small-scale commercial broiler farms in Bangladesh, antibiotics are used without veterinary supervision. Antibiotics are also used in sub-therapeutic doses by adding them to feed and water for prophylaxis, growth promotion and as a risk-management strategy. This practice contributes to the development of drug-resistant bacteria in poultry, and human through the food chain. So, we have to look for alternatives to antibiotics because of public concerns. An essential oil is a mixture of fragrant, volatile compounds of plant materials. Essential Oils (EOs) are found to have antibacterial property, also exhibiting antioxidant and other activities. Considering the versatility of EOs, it can be used as growth promoters in poultry production. Therefore, our present research work is designed to observe the effects of essential oils on health and growth performances of commercial broiler chicken.

Objectives:

The present work is undertaken with the following objectives:

- To study chemical analysis and evaluate the biological activities of extracted essential oil.
- To study the biological efficacy of essential oil in broiler.

Progress Achieved:

Raw materials for extraction of essential oils from bay leaves and eucalyptus leaves were collected, washed, dried, weighed. Then, solvent free microwave assisted extraction of essential oils was done by microwave gravity station. After this, chemical analysis and biological activities of extracted essential oils were performed. Apart from this, it is important to observe the effects of extracted essential oil in broiler chicken.

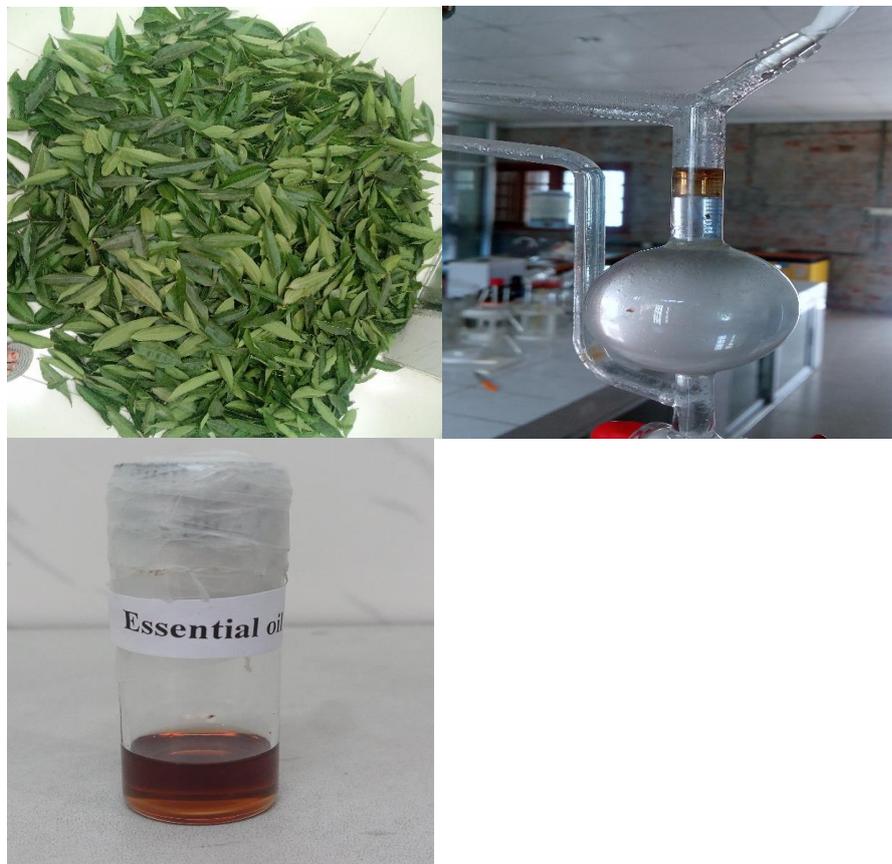


Figure: Solvent free microwave assisted extraction of essential oil from bay leaves

Name of the Division: *Natural Products Research Division*

1. R & D projects:

1.10. Title: “Development of Cost-Effective Recovering Technology of Useful Chemicals from Waste PET Bottle”

Name of Scientists:

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

- i) Dr. Md. Badrul Islam, PSO (Project Leader)
- ii) Mahci Al Basher, SO (Project Associate)
- iii) Md. Sabbir Hasan, SO (Project Associate)
- iv) Shyama Prosad Moulick, SO (Project Associate)
- v) Dr. Md. Nurul Huda Bhuiyan, PSO (Project Associate)

Introduction:

PET, which stands for polyethylene terephthalate, is a form of polyester (just like the clothing fabric). It is extruded or molded into plastic bottles and containers for packaging foods and beverages, personal care products, and many other consumer products. Plastics are replacing the conventional materials like metal, wood and glass because of their lower cost, higher flexibility, manufacturing ease, and better performance [1,2]. Poly Ethylene Terephthalate (PET) is a widely

used form of plastics to make bottles for mineral water, soft drink, ketchup, pickle, etc. The global production of PET is expected to increase from 42 million tonnes (2014) to 72 million tonnes by 2020. During 2015-16, 900 kilo-tonnes of PET was used in India [3]. The use of large amount of plastic has created environment threats and thus it needs to be recycled. The recycling of plastic waste requires energy but the energy production with conventional sources depletes the natural resources and creates environmental degradation. Therefore, this study aims to develop cost effective and environmentally friendly technology for the recovery of industrially applicable chemicals from the PET plastic bottle waste to achieve environmental sustainability to some extent as well in Bangladesh.

Objectives:

The present work is undertaken with the following objectives:

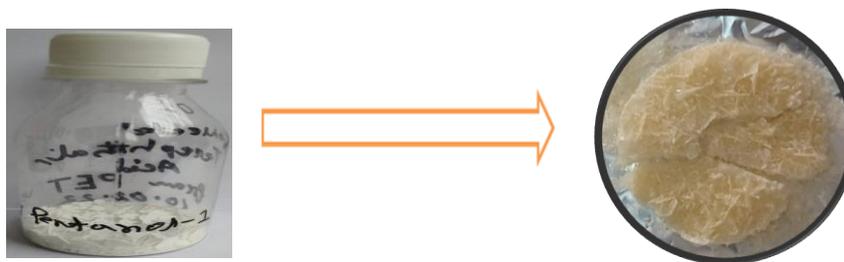
- To develop cost effective and environmentally friendly recovering technology of useful chemicals from waste PET bottle
- To recover terephthalic acid from waste PET bottle through chemical recycling technique.
- To prepare some new derivatives of terephthalic acid recovered from waste PET bottle.

Progress achieved:

Based on the aims and objectives of the R&D project several experiment (alkaline hydrolysis and aminolysis) for the cost effective recovery of useful chemicals from waste PET bottle has been carried out using NaOH, $\text{Ca}(\text{OH})_2$ (as low cost alkali) and ash as alkali and tris-(hydroxymethyl)amino methane as amino compound whereas, water, 1-pentanol, 70% glycerin (as green solvent), mineral oil and 80% ethanol as solvent. All the reaction converted PET to terephthalic acid with low to medium yields (40 to 70%). Besides, two new derivatives of isolated terephthalic acid have been synthesized and their ^1H NMR, ^{13}C NMR, XRD, LCMS, FTIR and UV-Vis study is in progress to characterize the compound.



Picture 01: Recovery of terephthalic acid from waste PET flakes by alkaline hydrolysis.



Picture 02: Terephthalic acid derivatives from waste PET bottle.

1.11. Title: “Hydro-geochemical and risk assessment of pollutants in water systems of coastal regions of Bangladesh”

Name of Scientists:

- i) Dr. Faridul Islam, SSO & PL
- ii) Md. Alamgir Kabir, PSO, IFST
- iii) Sharmin Akter Lisa, SSO, IFST
- iv) Mohammad Moniruzzaman, PSO, BCSIR Lab. Dhaka
- v) Md. Abu Bakar Siddique, SSO, INARS
- vi) A. H. M. Shofiul Islam Molla Jamal, SSO, INARS
- vii) Mehedi Hasan, SO, INARS

Introduction:

Water is necessary for all life, and it also contributes to the creation of an environment. In addition, water quality is also highly appreciated due to its many applications in industry, domestic activities, drinking, and irrigation, among other things. However, groundwater quality is quickly deteriorating on a global scale due to population growth that is out of control, as well as community development, household discharge, and industrial waste contamination. Researchers are concentrating on various removal techniques such as sophisticated oxidation processes, membranes, electrocoagulation, synthetic and natural adsorbents, adsorption employing nanomaterials, magnetic field implementation, etc. The majority of the procedures have extremely high costs, very low levels of efficiency, and produce enormous amounts of secondary waste. In this research, waste Aluminum and biochar will use as adsorbent raw materials to remove the pollutants from water, which is a cost-effective, environmentally friendly, and sustainable approach.

Objectives:

The present work is undertaken with the following objectives:

- To investigate the relationship between local and regional geology and the chemical properties and quality of water.
- To develop nanocomposite-based materials using scrap Aluminum and biomaterials.

- To treat industrial wastewater, use the synthesized nanocomposite.

Progress Achieved:

- ❖ A total of 80 water samples, 20 fish samples, and 15 soil samples were obtained from the Bagerhat and Khulna regions.
- ❖ The physicochemical and heavy metal characteristics of the water sample were analyzed, as well as the microplastic of the fish sample.
- ❖ Hydroxyapatite (HAp) is derived from fish bone debris.
- ❖ The degradation of dyes through photocatalysis has been successfully accomplished by employing Hydroxyapatite (HAp).



Figure: Methyl violet (MV) and Congo red (CR) dye degradation using HAp

1.12. Title: “Isolation of Bioactive Compounds from *Oldenlandia corymbosa* L. to find out the preventive activity of arterial dysfunction.”

Name of Scientists:

- i) **Mahci Al Bashera, SO (Project Leader)**
- ii) Md. Badrul Islam, PSO (Project associate)
- iii) Farhana Jahan,SO(Project associate)
- iv) Md. Mahmudur Rahman,SO (Project associate)
- v) Trissa Saha,SO(Project associate)
- vi) Subarna Sandhani Dey, SO (Project associate)

Introduction:

Sugar can be considered a silent poison to cell in high concentration. Recent study has revealed that pentose sugar e.g. pentoside reacts with body protein and form a glycation end product named as Advanced Glycation End (AGE) product. This complex affects the myoglobin of RBC, endothelial cell and fibroblast and collagen content of skin resulting in iron deficiency, atherosclerosis and skin aging respectively. *Oldenlandia corymbosa* L. is locally named as

Khetpapra is a weedy plant that can be a source of natural antioxidant. Some scientific investigations have revealed the plant extract possessing anti-cancer, hepatoprotective, analgesic and anti-inflammatory effect. Now we want to isolate bioactive compounds that can inhibit arterial dysfunction so that in future along with some modification it can be used in case of diabetes along with cardiovascular complications.

Objectives:

The objectives of this study-

- To isolate bioactive compounds.
- To evaluate the compounds to prevent arterial dysfunction.

Progress Achieved:

- ❖ 3 compounds have been isolated
- ❖ Thrombolytic activity of the compounds has been studied

1.13. Title: “Mineral and heavy metal contents in groundwater and the prevalence of chronic kidney disease in the northern area of Bangladesh”

Name of Scientists:

- i) **Farhana Jahan, SO, BCSIR Rajshahi Laboratories, (Project Leader)**
- ii) Dr. Md. Nurul Huda Bhuiyan, PSO, BCSIR Rajshahi Laboratories, (Project Associates)
- iii) Md. Sabbir Hasan, SO, BCSIR Rajshahi Laboratories, (Project Associates)
- iv) Bijoy Maitra, SO, BCSIR Rajshahi Laboratories, (Project Associates)
- v) Anik Kumar Saha, SO, BCSIR Rajshahi Laboratories, (Project Associates)
- vi) Dr. Mohammad Moniruzzaman, PSO, BCSIR Laboratories Dhaka, (Project Associates)
- vii) Dr. Barun Kanti Saha, CSO, BCSIR Laboratories Dhaka, PA

Introduction:

Groundwater is the main source of drinking water in most of Bangladesh in which millions of people's life directly depends on this. The largest anthropogenic sources of contaminants in groundwater are the use of fertilizers in agricultural processes, septic tanks, and mining, ultimate discharge of treated and untreated waste effluents from different industries. Several studies have reported the presence of heavy metals or excess mineral content in ground water of the region in Rajshahi. Prolonged exposure to heavy metals such as Cd, Cu, Ni, and Zn as well as minerals can cause deleterious effects in humans' organs such as bone and kidney. The claim of minerals or heavy metals in drinking water on health issues like chronic kidney disease is not documented yet. Apart from this, the geochemistry of groundwater is an important factor in determining its use for various purposes as well as to ensure sustainable clean water and safe food, hence a healthy population.

Objectives:

The present work is undertaken with the following objectives:

- To determine the concentration of minerals such as Na, K, Ca, Mg, Fe, and heavy metals such as Zn, Cu, Pb, As, Cd in groundwater in Rajshahi region of Bangladesh.
- To characterize the hazard index or risk factors of these minerals and heavy metals.
- To identify the source and association between the minerals or heavy metal exposure and the prevalence of chronic kidney disease.

Progress Achieved:

- ❖ A total of 70 water samples where 45 tube wells water samples, and 25 river water samples were obtained from Rajshahi region
- ❖ The physicochemical, major anions, and major cations characteristics of the water samples were analyzed.

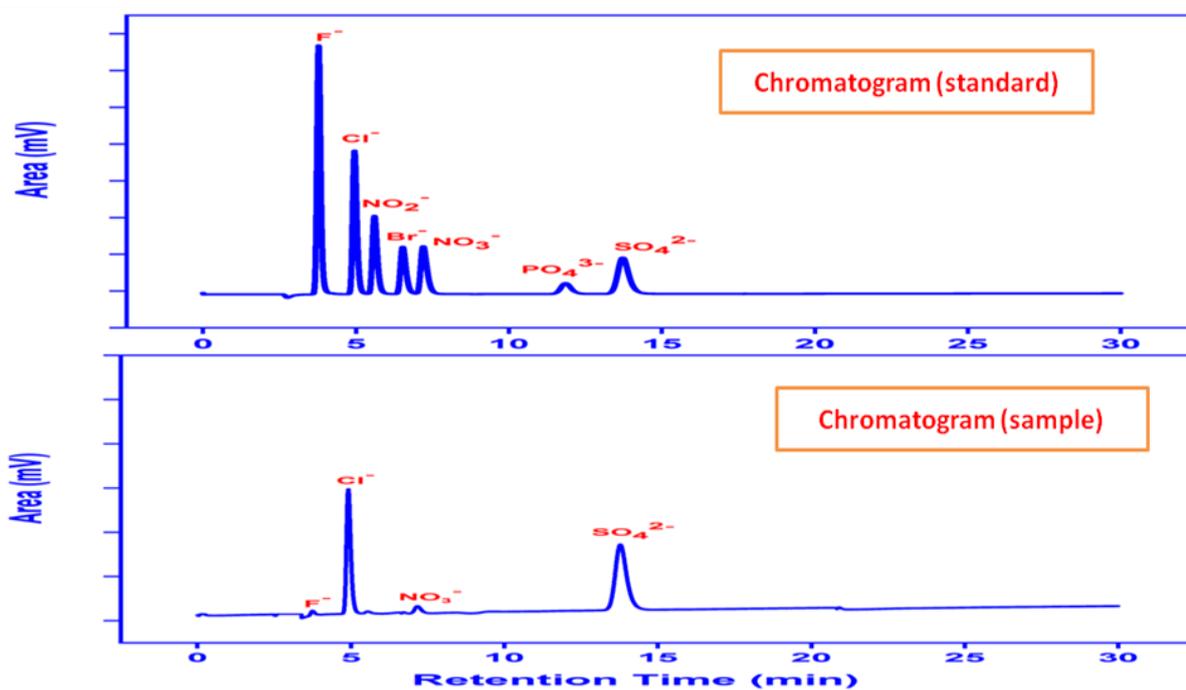


Figure: Determination of anions in river water samples using IC.

1.14. Title: “Development of Metallo Organic Composites for Electrochemical Energy Storage Devices”

Name of Scientists:

- Md. Waliullah, SO (Project Leader)**
- Dr. Md. Badrul Islam, PSO (Project Associate)
- Dr. Md Monirul Islam, Professor, Department of Chemistry, RU (Project Associate)
- Mahci Al Basher, SO (Project Associate)
- Md. Sabbir Hasan, SO (Project Associate)
- Farhana Jahan, SO (Project Associate)

Introduction:

Today's lifestyle, electricity is the fundamental need. With varying time, the amount of power generated and consumed varies, hence storage systems have to bridge the gap. Among the various types of energy storage devices, especially secondary batteries, are often used in energy storage applications. Besides, other energy storage technologies are commercially available, e.g., capacitors and supercapacitors. Capacitors store rather small amounts of energy and are widely used in electronic devices. A supercapacitor is a special type of capacitor that has a larger energy density than conventional capacitors. Furthermore, supercapacitors obtain capacitances that are a few orders of magnitude higher compared to regular capacitors. Supercapacitors are expected to find many future applications in hybrid electric vehicles, devices, and other power devices and systems.

In this study, targets to deposition of polymer and composite of polymer on glassy carbon electrode (GCE) to modify the bare GCE with enhanced electrochemical performance in terms of specific capacitance that leads to high energy and power densities.

Objectives:

The present work is undertaken with the following objectives:

- Synthesis of Schiff base-metal complex for the formulation of PANI composite scaffold.
- To electrodeposition of polymer and composite of polymer-metal complex on bare GCE to modify the GCE.
- Characterization of the deposited materials in terms of UV, FESEM, Physical and electrochemical (CV, GCD, EIS) properties.
- To investigate the electrochemical performance of polymer and composite of polymer-metal complex

Progress Achieved:

- ❖ Synthesis of Schiff-base metal complex has been completed.
- ❖ Characterization of the synthesized compound is running.

1.15. Title: "An Alternative Synthesis Technique of Tris-Amino compound & its Schiff-Bases for Industrial Application"

Name of Scientists:

- i) **Md. Ariful Islam, SO (Project Leader)**
- ii) Dr. Md. Badrul Islam, PSO (Project Associate)
- iii) Mahci Al Basherah, SO (Project Associate)
- iv) Md. Sabbir Hasan, SO (Project Associate)
- v) Farhana Jahan, SO (Project Associate)
- vi) Md. Waliullah, SO (Project Associate)

Introduction:

Tris, or tris (hydroxymethyl) aminomethane is widely used in biochemistry and molecular biology as a component of buffer solutions, such as TAE and TBE buffers, particularly for nucleic acid solutions. It includes a primary amine and hence undergoes the standard amine reactions, such as condensations with aldehydes. In solution, tris also forms compounds with metal ions. Schiff bases have several applications in the food, dye, analytical chemistry, catalysis, fungicidal, agrochemical, and biological industries. Because of their preparative ease and structural variation, Schiff-base complexes are regarded as one of the most important stereochemical models in main group and transition metal coordination chemistry. They not only played a pivotal part in the development of contemporary coordination chemistry, but they may also be found at critical places in the development of inorganic biology, catalysis, and optical materials.

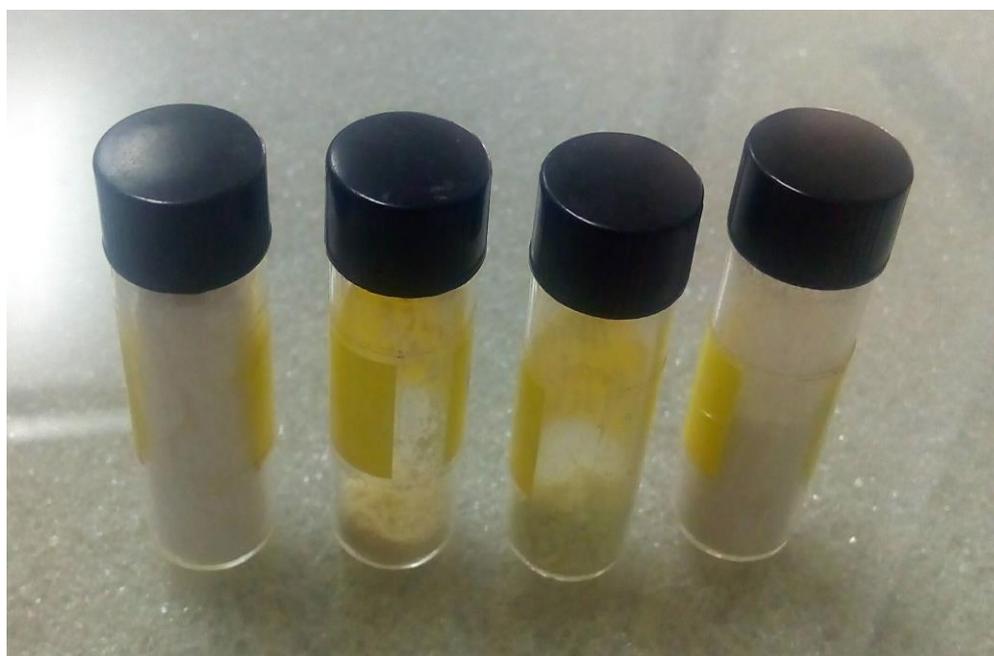
Objectives:

The present work is undertaken with the following objectives:

- a. To Synthesize Tris-Amino compound by Alternative Technique
- b. To Synthesize Tris-Amino derived Schiff-Base compounds.
- c. To Characterize the Synthesized Schiff-Base Compound
- d. To Study the Biological Efficacy of Synthesized Compound by In-Silico & In-Vitro technique.

Progress Achieved:

- ❖ Synthesis of TRIS-Amino Schiff bases Compound has been completed.
- ❖ Characterization of the synthetic products & Determination of biological activities is running.



Picture 01: Tris-Amino derived Schiff-Base compounds

Name of the Division: *Oils, Fats and Waxes Research Division*

1.16. Title: “Bio-composites from cellulose and shrimp chitosan for waste water treatment”

Name of Scientists:

- i. **Md. Mahmudur Rahman, SO, BCSIR Rajshahi Laboratories, (Project leader).**
- ii. Mst. Sarmina Yeasmin, SSO, (Associate).
- iii. Mahci Al Bashera, SO (Associate)
- iv. Tahmina Akter Chowdhury, R.C (Associate)
- v. G.M Masud Rana, R.C (Associate)
- vi. Dr. Barun Kanti Saha, CSO (Associate)
- vii. Aftab Ali Shaikh, Chairman, BCSIR (Project Advisor)

Introduction:

As an agricultural country in Bangladesh every year a huge amount of banana rachis additionally shrimp shells are expelled out from the production and processing zone as an agro-waste material which causes serious pollution in our environment. Though these agro-waste materials should be a good source of cellulose and chitin which can be easily converted into much more valuable CNC and chitosan for their multifunctional uses in industrial wastewater treatment approaches but unfortunately there has been no work done so far in our country as well as over the world. Thus, we have chosen this waste biomass as a potential source material for this innovative work since they are cheap, edible, non-toxic, eco-friendly. By this study, it has been tried to innovate how to use properly the agricultural wastage in the real-time industrial wastewater treatment technology by very economical and easy way for sustainable environmental protection that complies the 4IR.

Objectives:

The present work is undertaken with the following objectives:

- To produce CNC from Banana Rachis Fiber (agro-waste).
- To extract chitosan from shrimp shells waste.
- To fabricate bio-degradable nanocomposites/nano-adsorbents.
- To establish a down flow fixed bed filter column
- To purify of industrial wastewater for reuse/recycle

Progress Achieved:

- Chitosan and CNC has been prepared from Shrimp Shell and banana rachis fiber (agro-waste).

- The required materials such as sand, white clay and charcoal have collected and modified by various chemical process to prepare a bio-nanofilter.
- The nanocomposites have already been fabricated.
- The setup of bio-nanofilter has been successfully done and the purification of the collected waste water sample already have filtered and characterized.
- **One paper already has published in a renowned international journal namely Environmental Nanotechnology Monitoring & Management (IF 7.3, Cite Score 9.3, Q1, Scopus Indexed).**



Figure 1: Production and activation of chitosan from shrimp/prawn shell waste during laboratory experimental session (photographic representation along with flow diagram).

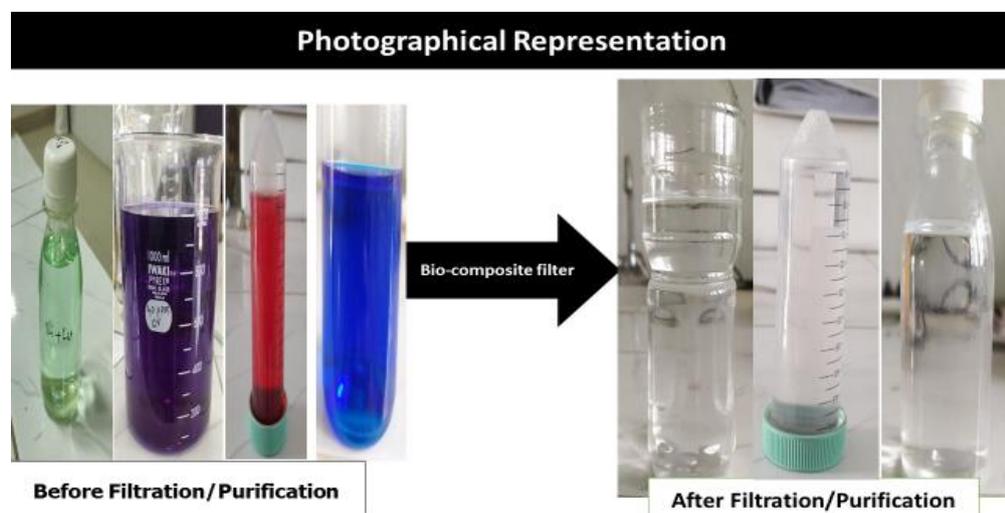


Figure 2: Photographical representation of before purification and after purification of wastewater

1.17. Title: “Profiling and risk characterization of stimulants, preservatives and coloring agents in confectioneries and beverages.”

Name of Scientists:

1. **Ali Ahsan Muzahid, SO (Project Leader)**
2. Dr. Mst. Sarmina Yeasmin, PSO (Project Associate)
3. Dr. Md. Nurul Huda Bhuiyan, PSO (Project Associate)
4. Bijoy Maitra, SO (Project Associate)
5. Md. Jasim Uddin, SO (Project Associate)
6. G.M Masud Rana, RC (Project Associate)
7. Tahmina Akter Chowdhury, RC (Project Associate)

Introduction:

The tendency of eating first food and drinking soft drinks is increasing with the improvement of socio-economic status of Bangladesh. A cocktail of chemicals like stimulating, preserving and coloring agents are used in the preparation of food for making it attractive, delicious, and for longer self-life. Some of these chemicals are permitted for food production but some of them are not food grade. Problem arises when the permitted chemicals are used in the food above their permissible limits and this is now a common phenomenon in Bangladesh, reported in both scientific findings and newspapers. Confectioneries and beverages are widely popular all over the world including Bangladesh. The global popularity of confectioneries and beverages is increasing with the development of the commercial industry. Food coloring agents which are mainly synthetic are used most extensively as food additives, to improve the appearance, color and texture of foods and this helps the commercial producer to make more profit. Most synthetic dyes are amino benzene-based compound. When added in excess, however, these synthetic azo-group food coloring agents can be harmful to human beings and cause a number of allergic reactions including itching, rhinitis, and skin blotching, nettle rash and water retention. In 2011, FDA found a possible association between consumption of certified color additives and possible hyperactivity and other problematic behaviors in children. Several studies showed that a large number of foodstuffs whether manufactured or processed, are unsafe for consumption or adulterated in varying degrees in Bangladesh. This problem persists at every level of the food chain from preparation to consumption. At present food safety is one of the major problems in Bangladesh. Food adulteration and use of hazardous chemicals in food stuffs is published in our media now and then. Synthetic coloring agents are permitted under governmental regulations in every country, and the types and numbers of permitted stimulants, preservatives, and colorants are different for each country. Although the number of permitted food stimulants, preservatives, and coloring agents was reduced for food safety reasons, in recent years many kinds of synthetic food stimulating, preserving, and coloring agents are still widely used above the permissible

level and some cases some of them are not even permitted for use in food. These unauthorized chemicals are used because of their low price, effectiveness and stability.

Objectives:

1. To identify and quantify the stimulants, preservatives, and coloring agents in confectionaries and beverages.
2. To profile the concentration level of stimulants, preservatives, and coloring agents in confectionaries and beverages.
3. To characterize the hazardous index (HI) of these chemicals.

Progress Achieved:

Caffeine as stimulant and Sunset Yellow as colorant have been determined from different brands of confectioneries and beverages. Analysis of another nine types of stimulants, preservatives and colorings agents are going on.

1.18. Title: “Application of polyphenols as potential natural preservatives in edible oils and food products”

Name of Scientists:

1. **Tahmina Akter Chowdhury, RC, BCSIR, Rajshahi Laboratories (Project Leader)**
2. Dr. Mst. Sarmina Yeasmin, PSO, BCSIR, Rajshahi Laboratories (Project Associate)
3. G. M. Masud Rana, RC, BCSIR, Rajshahi Laboratories (Project Associate)
4. Md. Jasim Uddin, SO, BCSIR, Rajshahi Laboratories (Project Associate)
5. Ali Ahsan Muzahid, SO, BCSIR, Rajshahi Laboratories (Project Associate)
6. Raton Kumar Bishwas, SO, IGCRT, BCSIR, Dhaka (Project Associate)
7. Mohajira Begum, PSO, BCSIR, Rajshahi Laboratories (Project Associate)
8. Md. Mahmudur Rahman, SO, BCSIR, Rajshahi Laboratories (Project Associate)

Introduction:

The oxidative reaction is responsible for rancid odors and flavors within fats and oils which reduces nutritional quality of foods and make health hazard. Oxidation reactions consist of auto-oxidation, photo-oxidation, enzymatic oxidation and ketonic oxidation, while auto-oxidation is the most common deterioration during storage of edible oils. There are many factors that affect the auto-oxidation reaction such as unsaturation (the most important factor), temperature, presence of oxygen, light, moisture, heavy metals etc. Polyphenols prevent free radical induced cell and biological targets damage by preventing the formation of radicals, scavenging them, or by promoting their decomposition. Generally, they can be considered as two main groups: natural and synthetic additive. Among the synthetic types, the most frequently used are butylated hydroxyl anisole (BHA), butylated hydroxyl toluene (BHT), propyl gallate (PG) and tert-butyl

hydroquinone (TBHQ). In most countries, the usage level of such type synthetic preservatives is regulated and the safety of the compounds involved has been tested based on long-term toxicity studies. The main goal of these researches was to reduce the application of synthetic compounds because of their potential negative health effects and food safety concern. At present all edible oil companies of Bangladesh use synthetic additives (TBHQ, BHA, BHT etc.). The main target of the project is to extract of polyphenols from indigenous species (citrus fruits, spices and herbs, tea waste.) etc. and fruits peel and apply them in edible oil as well as in food items. After successful completion of this project, it will be possible to replace synthetic additives thus profound impact in reducing export of synthetic stabilizers.

Objectives:

The present work is undertaken with the following objectives:

- To extract natural polyphenols from locally available raw materials.
- To use of natural polyphenols in lieu of synthetic additives in edible oils.
- To develop food products enriched with natural polyphenols.

Progress Achieved:

- i. Characterization of extracts by means of GC-MS, Antioxidant activity, Phenolic content, Flavonoid content and Antimicrobial activity has been done.
- ii. Application of extracts on edible oil and shelf life studies is on progress.
- iii. A manuscript is preparing for publication.

Name of the Division: Fiber and Polymer Research Division

R & D projects:

1.19: Title: Eco-friendly dyeing of Silk and Cotton fabrics using *Terminalia catappa* extract

Name of Scientists:

1. **Most. Halima Khatun, SSO & PL**
2. Firoz Ahmed, SO (Project Associate)
3. Bijoy Maitra, SO (Project Associate)
4. Hurey Jahan Kadri, SO (Project Associate)
5. Shabiba Parvin Shandhi, SO (Project Associate)
6. Md. Al-Amin, SO (Project Associate)

Introduction:

Dyeing is a creative and lucrative art that has been developed and used since ancient times. Fabrics were colored using natural dyes until the middle of the nineteenth century since these were the only colorants available at the time. W. H. Perkin accidentally synthesized mauveine in

1856, and it was soon commercialized to replace natural dye. Synthetic dyes are inexpensive and more readily available apart from imparting more reproducible shades with good fastness properties. Synthetic dyes, which are based on coal tar or petroleum, are harmful, and prolonged contact with human skin can be dangerous. Recently, the global consciousness of environmental sustainability has increased interest in natural dye application to fabrics since they are eco-friendly, non-toxic, and handled safely by workers. Due to the huge demand for natural dye, the proposed study is designed to extract and purify the natural dye from waste leaves of the *Terminalia catappa* plant, characterize, and finally apply it to silk and cotton fabrics.

Objectives:

The present work is undertaken with the following objectives:

1. Extraction, purification, and characterization of the dye from *Terminalia catappa*.
2. Application of dye on silk and cotton fabrics and evaluation of the color fastness properties.
3. Investigation of pH, BOD, COD, TSS, and TDS of the dyeing bath to evaluate the environmental sustainability.

Progress

- The dye was extracted from the waste leaves of *Terminalia catappa* in powder form and characterized with a UV-visible spectrophotometer and FTIR-ATR.
- The dyed silk and cotton fabrics were analyzed with FTIR-ATR, Scanning Electron Microscope, and Konika Minolta spectrophotometer.
- Color fastness properties of dyed silk and cotton were done.
- Investigation of BOD, COD, TSS, and TDS of the dyeing bath to evaluate the environmental sustainability is going on.

1.20. Title: Extractions of Methyl Eugenol from Indigenous Sources and Its Application in Insecticide

Name of Scientists:

1. **Firoz Ahmed, SO (Project Leader)**
2. Md. Ahasanur Rabbi, SSO (Project Associate)
3. Hurey Jahan Kadri, SO (Project Associate)
4. Bijoy Maitra, SO (Project Associate)
5. Md. Zia Uddin Rasel, RC (Project Associate)

Introduction:

Methyl eugenol (ME) (4-allyl-1, 2-dimethoxybenzene-carboxylate), a phytochemical bioactive component is frequently found in wide range of herbal plants possessing well defined biological and functional attributes. Prominent sources of eugenol are clove, cinnamon, tulsi, pepper, and so

on. Various extraction methods have been practiced globally for the extraction of methyl eugenol and other nutraceuticals from plants. The most extensively employed approaches in this regard include solvent extraction, hydro distillation, supercritical carbon dioxide extraction, microwave and ultra sound assisted extraction, etc. ME is used as a flavoring agent in ice cream, cookies, pies, puddings, candy, cola soft drinks, and chewing gum, perfumes, as insect traps in insecticides. Among these, the use of methyl eugenol in insecticide is not exploited exhaustively. As a result, the application of it as a potential insecticide is still proclaimed as the priority of research.

Objective

1. Development of green extraction method of methyleugenol extraction from indigenous sources.
2. Isolation and characterizations of extracted methyleugenol.
3. Potential applications of methyleugenol in insecticides.

Progress achieved

- Experimental work is in progress.

1.21. Title: “Fabrication and characterization of an eco-friendly Superabsorbent Polymer Hydrogel from agro-waste”

Name of Scientists:

1. **Hurey Jahan Kadri, SO & PL**
2. Md. Ahasanur Rabbi, SSO (Associate)
3. Firoz Ahmed, SO (Associate)
4. Bijoy Maitra, SO (Associate)
5. Most. Halima khatun, SSO (Associate)
6. Shabiba Parvin Shandhi, SO (Associate)

Introduction:

Super absorbent polymer (SAP) hydrogels are three dimensional, hydrophilic polymeric matrixes that can absorb and retain large amount of water or aqueous fluid but don't dissolve in water. SAP hydrogels have existed for more than half a century, and today they have many applications in various processes ranging from industrial to biological. Currently, the main raw materials used in preparing synthetic superabsorbent hydrogel are obtained from petrochemical products, including acrylamide, acrylic acid (AA) and acrylonitrile. As the petrochemical products are costly, poorly degradable, non-renewable and environmentally unfriendly, the application of the petroleum-based synthetic super absorbents hydrogel has been severely restricted. Development of novel environmentally friendly cellulosic sources has been practiced globally for the synthesis of cellulose from agro waste residue (sugar cane bagasse, rice straw, rice husk, wheat straw and

bamboo). By utilizing graft copolymerization method an agro-waste based cellulose hydrogel will be synthesized for various potential applications.

Objectives:

- Design and development of Super Absorbent Polymer (SAP) hydrogel.
- Preparation of antimicrobial SAP through incorporation of green synthesized nano particles.

Progress: Experimental work running.

1.22. Title: “Nanoparticles Incorporated Green Coating for Fruits and Vegetables Preservation”

Name of the Scientist:

1. **Bijoy Maitra, SO (Project Leader)**
2. Md. Ahsanur Rabbi, SSO (Project Associate)
3. Dr. Most. Halima Khatun, SSO (Project Associate)
4. Firoz Ahmed, SO (Project Associate)
5. Md. Zia Uddin Rasel, RC (Project Associate)
6. Dr. Nurul Huda Bhuiyan, PSO (Project Associate)

Introduction:

In most of the agriculture-based countries, the principle aim of the farmers is to keep their fruits and vegetables fresh until they reach the consumers. Spoilage of fruits and vegetables also shortens its shelf life due to surface dehydration, moisture loss, browning and proliferation of spoilage-related microbes. There are several techniques used in postharvest processing for regularly used fruits and vegetable; among of them is coating is a vital technique which acts as a barrier between the food and the environment. Development of edible coatings and films are presently in demand as they can be used for a wide variety of foods. The use of biopolymer-based coating from naturally renewable resources like starch, polysaccharides etc., is increasing day by day due to their favorable environment friendly compared to conventional petroleum-based synthetic polymer. Apart from this, metal nanomaterials have recently been employed to improve the properties of coating technology by adding nanoparticles into coating matrices. The efficiency of metal nanoparticles against a variety of microorganisms has been previously established. Having antimicrobial, anti-fungi, anti-yeasts and anti-viral activities of nanoparticles, it can be used with polysaccharides for potential food coating to meet up the growing demand for increased fresh food shelf life. In this project the effects of nanoparticles coating on physicochemical and oxidative properties of fresh fruits and vegetables will be studied.

Objectives:

The present work is undertaken with the following objectives:

1. Development of effective nanoparticle loaded green coating for fresh fruits and vegetables.
2. Development of new preservation technology for highly perishable fruits and vegetables.

Progress:

1. Nano composite starch film containing silver nanoparticles (AgNPs) using green method through one step reaction (One pot synthesis) has been developed.
2. The concentration of starch and Ag has been optimized.
3. The formation of composite film was also characterized by UV-Vis Spectroscopy, FTIR, DLS with Zeta Potential and SEM with EDS. Now the application of nano composite film on fruits is going on.

2. Other research project:

2.1.1. Annual Development Program Project: Not applicable

2.1.2. R&D Project for the Fiscal Year (2022-2023) of Ministry of Science & Technology:

1. “Recovery of Useful Chemicals from Waste Plastic by Chemical Recycling Technique”
2. “Extraction of Aleuritic Acid from Lac”
3. “In-vitro pharmacological activities and isolation of bioactive compounds from pumpkin (*Cucurbita maxima*)”

2.2. Special Allocation Project:

2.2.1. Title: “Determination of mineral heavy metal contents in groundwater of Tista River area and their socio-economic impact”

2.2.2 Title: “Assessment and profiling of health hazard phthalates in packaged food, drinks and beverage contaminated from packaging material in Bangladesh and identify the safe plasticizers for food package”

2.3 Sponsored Research Projects: Not applicable

2.4 Collaborative Research Project: Not applicable

3. Research achievement: Not applicable

3.1. Processes: Accepted:

- i) Production of herbal powder mouthwash, Vide letter no. 39.02.0000.043.37.832.21.1413, date: 07.07.2022
- ii) Formulation of Milk Flavor. Reference No. 39.02.000.043.37.940.22/537 date: 11/06/2023

Name of inventors: 1) Dr. Mohammad Nazrul Islam Bhuiyan, PSO, IFST, BCSIR

- 2) Mohammad Amirul Hoque, SSO, Dhaka Laboratories, BCSIR
- 3) Dr. Abdus Satter Miah, CSO, IFST, BCSIR
- 4) Mst. Samina Akter, SSO, BTRI, Dhaka
- 5) Dr. Faridul Islam, SSO, IFST, BCSIR

Submitted process:

- i) A process for the production of Aloe after shave lotion.
- ii) A process for the production of Aloe glycerin.

3.2 Patents: A patent on “Preparation of nutro cake fortified with defatted sesame seed flour” has been submitted.

3.3 Publications in journal:

A. National:

i. Paper published:

1. Anika Zaman, Hasin Hasnat, **Zakaria Al Noman**, Md Mirazul Islam, Abdullah Al Nakib, Swakshar Mukherjee, Nazim Uddin Emon and Safaet Alam. "Exploring Pharmacological Potentials of p-Coumaric Acid: A Prospective Phytochemical for Drug Discovery." Bangladesh Pharmaceutical Journal 26, no. 2 (2023): 185-194.
2. Hasnat, Hasin, Suriya Akter Shompa, Fahmida Tasnim Richi, Md Mirazul Islam, Mehedi Hasan Suman, **Nazim Uddin Ahmed**, Sania Ashrafi and Safaet Alam. "Bioactive Secondary Metabolites to Combat Diabetic Complications: Evidenced from in Silico Study." Bangladesh Pharmaceutical Journal 26, no. 2 (2023): 167-184.

ii. Paper accepted: Not applicable

iii. Paper submitted: Not applicable

B. International:

i. Paper published:

1. **Sabbir Ahmed**, Dr Arfatun Nahar Chowdhury, Amit Kumar Dey, M. Moniruzzaman, Abu Kowser “Isolation and Identification of Rhizosphere Soil Fungi from Papaya (*Carica papaya* L.) and Eggplant (*Solanum melongena* L.) at BCSIR Campus in Rajshahi, Bangladesh”. DOI:10.29322/IJSRP. 12.04.2022.p12404[http://dx.doi.org/ 10.29322 /IJS R P. 12. 04.2022.p12404](http://dx.doi.org/10.29322/IJSRP.12.04.2022.p12404).
2. Sania Ashrafi, **Safaet Alam**, Arifa Sultana, Asef Raj, Nazim Uddin Emon, Fahmida Tasnim Richi, Tasnuva Sharmin, Myunghan Moon, Moon Nyeo Park, and Bonglee Kim. "Papaverine: A Miraculous Alkaloid from Opium and Its Multimedical Application." Molecules 28, no. 7 (2023): 3149.
3. **Ali Ahsan Muzahid**, Samia Sharmin, Md. Sakhawat Hossain, Kutub Uddin Ahamed, Nasim Ahmed, Most. Sarmina Yeasmin, Nazim Uddin Ahmed, Barun Kanti Saha, G.M. Masud Rana, Bijoy Maitra, Md Nurul Huda Bhuiyan. “Analysis of bioactive compounds present in different crude extracts of *Benincasa hispida* and *Cucurbita moschata* seeds by gas chromatography-mass spectrometry.” Heliyon 9 (2023) e12702
4. Md Shafiullah Shajib, Shanta Islam, **Safaet Alam**, Ridwan Bin Rashid, Mirola Afroze, Mala Khan, Bidyut Kanti Datta, Lutfun Nahar, Satyajit Dey Sarker, and Mohammad A.

- Rashid. "GC–MS analysis and pharmacological evaluations of *Phoenix sylvestris* (Roxb.) seeds provide new insights into the management of oxidative stress and hyperglycemia." *Food Science & Nutrition* 11, no. 3 (2023): 1553-1562.
5. Banna Ghosh, Muhammed Mahfuzur Rahman, Tanoy Saha, Md Jamal Hossain, **Safaet Alam**, D. A. Al-Aman, Md Shahidulla Kayser et al. "Drinking Water Sources along the Banks of Buriganga River of Bangladesh are Polluted and Possess Serious Health Risks: A Comprehensive In Vivo Analysis." *Journal of Environmental and Public Health*, 2023(2023).
 6. Habib, M.R., Aziz, M.A., Khatun, M., **Rabbi, M.A.** (2022). Inhibitory effect of *Ammannia bacifera* leaves against lipase and angiotensin-converting enzyme. *Journal of Pharmacognosy and Phytochemistry*, 11(2), 21-23.
 7. Habib, M.R., Igarashi, Y., **Rabbi, M.A.** (2022). Phytochemical composition of *Blumea lacera* leaf and its inhibitory effects on the activity of enzymes related to metabolic diseases. *Pharmaceutical Sciences Asia*, 49(3), 265-272.
 8. Habib, M.R., Igarashi, Y., **Rabbi, M.A.** (2022). In vitro inhibitory activity of *Annona squamosa* leaves against enzymes associated with metabolic disorders. *Journal of Research in Pharmacy*, 26(5): 1272-1280.
 9. **Khatun, M.H.**, and Mostafa, M.G. 2022. Optimization of Dyeing Process of Natural Dye Extracted from *Polyalthia longifolia* Leaves on Silk and Cotton Fabrics. *Journal of Natural Fibers*. Doi: 10.1080/15440478.2022.2081281.
 10. Marufuzzaman M, **Ahmed F** and Mondal MIH. Nano Chitosan Coated Cotton Fiber (NCCCF) for the Removal of Heavy Metals from Industrial Effluents. *Biomed J Sci & Tech Res* 46(1)-2022. DOI: 10.26717/BJSTR.2022.46.007295
 11. Hasinur Rahman MH, Sofiuzzaman M, Mondal MIH, Rahman A, **Ahmed F**, et al. Recent Advancement of PVA/Chitosan-Based Composite Biofilm for Food Packaging. *Biomed J Sci & Tech Res* 46(1)-2022. DOI: 10.26717/BJSTR.2022.46.007286
 12. **Maitra B**, Khatun MH, Ahmed F, et al. Biosynthesis of *Bixa orellana* seed extract mediated silver nanoparticles with moderate antioxidant, antibacterial and antiproliferative activity. *Arab J Chem*. 2023;16(5):104675. doi:https://doi.org/10.1016/j.arabjc.2023.104675
 13. Mondal MIH, Haque MI, **Ahmed F**. Durable biobased hybrid compounds: Potential modifying agents for the development of functional cotton fabrics. *Arab J Chem*. 2023;16(9):105093. doi:https://doi.org/10.1016/j.arabjc.2023.105093
 14. Saha J, Mondal MIH, **Ahmed F**, Rahman M. Extraction, characterization and functionality assessment of Aloe vera, chitosan and silk sericin. *Arab J Chem*. 2023;16(9):105087. doi:https://doi.org/10.1016/j.arabjc.2023.105087
 15. Islam MM, **Ahmed F**, Mondal MIH. "Development of Methylcellulose/Polyvinylpyrrolidone Nanocomposites Enriched with Biogenic Zinc Oxide Nanoparticles for Wound Healing Applications." *Biomed J Sci Tech Res*. 2023;49(3):40624-40633. doi:10.26717/bjstr.2023.49.007795
 16. **Ahmed F**, Safiuzzaman M, Raihan MA, Islam MM, Kadri HJ, Habib MA, Mondal MIH. Fabrication and Characterization of Carboxymethyl Cellulose-g-(Polyvinyl Pyrrolidone-co-Acrylamide) Hydrogel. *Biomed J Sci Ind Res*. 2019;49(3):1-16. doi:10.26717/BJSTR.2023.49.007793

17. Islam MH, **Ahmed F**, Saha SS, Alam MS, et. al. Development of Eco-Friendly Carboxymethyl Cellulose Hydrogel from Sugarcane Bagasse. Res Med Eng Sci. 10(3). RMES.000738. 2023. DOI: 10.31031/RMES.2023.10.000738
18. Islam MM, **Ahmed F**, Pervez MN and Mondal MIH. Antimicrobial Finishing of Cotton Fabric Using Neem Leaf Extract for Medical and Healthcare Textiles. Res Med Eng Sci. 10(3). RMES.000736. 2023. DOI: 10.31031/RMES.2023.10.0007
19. **Ferdousi, L., Begum, M., Yeasmin, M.S., Uddin, J., Miah, M.A.A., Rana, G.M., Chowdhury, T.A., Bobby, F., Maitra, B., Khan, R. and Emran, T.B.**, 2023. Facile acid fermentation extraction of silkworm pupae oil and evaluation of its physical and chemical properties for utilization as edible oil. Heliyon, 9(1).
20. Al Mamun, M.Z.U., Hossen, M.S., **Begum, M.**, Satter, M.A., Sathee, R.A., **Yeasmin, S., Ferdousi, L., Ahmed, S.**, Reza, M.S. and **Miah, M.A.A.**, 2023. Nutritional comparison of experimentally and commercially sun-dried lean fish and small prawns of Bangladesh. Journal of Agricultural, Food Science; Biotechnology.
21. **Ferdousi, L.**, Kabir, H., Ali, M.H., **Begum, M.**, Salma, M., Sarker, M.M., Ahmed, S., Miah, M.A.A., Katun, H., Mim, F. and Reza, M.S., 2023. Biochemical analysis of commonly consumed fishes and shell fishes from the Tista and the Baral River in Bangladesh. Journal of Agriculture and Food Research, p.100671.
22. Al Mamun, Z.U., Rashid, M., **Begum, M.**, Musarrat, M., Haq, A. and Sathee, R.A., 2022. Appraisal of Vitamin D3 Concentration in Dietary Supplement Marketed in Bangladesh using HPLC. Oriental Journal of Chemistry, 38(6), p.1440.
23. Al Mamun, M.Z.U., Hossain, M.S., Moulick, S.P., **Begum, M.**, Sathee, R.A., Hossen, M.S., Jahan, F., Rashid, M.M., Islam, F., Bhuiyan, R.H. and Alam, M.S., 2023. Nano-crystallite bones of Oreochromis niloticus and Katsuwonus pelamis for the photocatalytic degradation of Congo red dye. Heliyon, 9(7).
24. Haque, M. A., Rahman, M. M., **Islam, F.**, Sulong, A. B., Shyuan, L. K., Rosli, R. E., Haider, J. (2023). Kinetics of Oxygen Reduction Reaction of Polymer-Coated MWCNT-Supported Pt-Based Electrocatalysts for High-Temperature PEM Fuel Cell. *Energies*, 16(3), 1537.
25. Al Mamun, M. Z. U., Moulick, S. P., Begum, M., **Jahan, F.**, Satter, M. A., Uddin, M. N., Rahima Akter Sathee, **Md. Waliullah & Islam, F.** (2023). Nutritional analysis of indigenous sources: An approach to explore its potential application as alternative feedstuffs for Thai Koi (Anabas testudineus). *Journal of Agriculture and Food Research*, 12, 100558.
26. **Farhana Jahan**, Md Nurul Huda Bhuiyan, Md Jahidul Islam, Sabbir Ahmed, Md Sabbir Hasan, Mahci Al Basherah, **Md Waliullah** et al. "Amaranthus tricolor (red amaranth), an indigenous source of nutrients, minerals, amino acids, phytochemicals, and assessment of its antibacterial activity." Journal of Agriculture and Food Research 10 (2022): 100419.
27. **Jahan, F., Islam, M. B.**, Moulick, S. P., **Al Basherah, M., Hasan, M. S.**, Tasnim, N., Trissa Saha, Farhana Bobby, **Md. Waliullah**, Anik Kumar Saha, Amin Hossain, Lailatul Ferdousi, Md. Mahmudur Rahman, Barun Kanti Saha, & Bhuiyan, M. N. H. (2023). Nutritional characterization and antioxidant properties of various edible portions of Cucurbita maxima: A potential source of nutraceuticals. *Heliyon*.
28. Rahman, M.M., Yeasmin, M.S., Uddin, M.J., Hasan, M., Shaikh, M.A.A., Rahman, M.S., Maniruzzaman, M., 2023. Simultaneous abatement of Ni²⁺ and Cu²⁺ effectually from

industrial wastewater by a lowcost natural clay-chitosan nanocomposite filter: Synthesis, characterization and fixed bed column adsorption study. *Environmental Nanotechnology Monitoring & Management*. 20, 100797. <https://doi.org/10.1016/j.enmm.2023.100797>

29. Muzahid, A.A., Sharmin, S., Hossain, M.S., Ahamed, K.U., Ahmed, N., Yeasmin, M.S., Ahmed, N.U., Saha, B.K., Rana, G.M., Maitra, B. and Bhuiyan, M.N.H., 2023. Analysis of bioactive compounds present in different crude extracts of *Benincasa hispida* and *Cucurbita moschata* seeds by gas chromatography-mass spectrometry. *Heliyon*, 9(1).
30. Hossain, M.S., Shahiduzzaman, M., Rahim, M.A., Paul, M., Sarkar, R., Chaity, F.S., Uddin, M.N., Rana, G.M., Yeasmin, M.S., Kibria, A. and Islam, S., 2023. Bioactive properties and organosulfur compounds profiling of newly developed garlic varieties of Bangladesh. *Food Chemistry: X*, 17, p.100577.
31. Uddin, M.F., Bishwas, R.K., Chowdhury, T.A., Hossain, M.A., Das, A.K. and Saha, K., 2022. Phytochemical screening of plant extracts and GC-MS analysis of the n-hexane extracts of stems and roots of *Catharanthus roseus* growing in Bangladesh. *Journal of Pharmacognosy and Phytochemistry*, 11(5), pp.228-234.

ii. Paper accepted: Not applicable

iii. Paper submitted: Paper submitted: In silico exploration of *Serratia* sp. BRL41 genome for detecting prodigiosin biosynthetic gene cluster (BGC) and in vitro antimicrobial activity assessment of secreted prodigiosin. April 2023, PLOS ONE.

C. Other publication: Book chapter

Gazi Md Arifuzzaman Khan, **Md Sabbir Hasan**, Md Hafezur Rahaman, Allahrakha Aydid, Md Moshiur Rahman, Md Hasanuzzaman, Rownok Jahan, and Md Jannat-Al-Foisal. "Cellulose and Its Composites in Textiles and Food Industry." In *Regenerated Cellulose and Composites: Morphology-Property Relationship*, pp. 223-264. Singapore: Springer Nature Singapore, 2023.

4.1 Training:

A. Training obtained:

1. **Nazim Uddin Ahmed, PSO** has participated and completed successfully training entitled "**Operation and maintenance of Preparative HPLC**", for 05 days, BCSIR Rajshahi Laboratories.
2. **Safaet Alam, SO** has participated and completed successfully training entitled "**In-House Training on Preparative HPLC and Ion Chromatography**", for 02 days, BCSIR Rajshahi Laboratories.
3. **Md. Al-Amin Miah, RC** has participated and completed successfully training entitled "**In-House Training on Preparative HPLC and Ion Chromatography**", for 02 days, BCSIR Rajshahi Laboratories.

4. **Md. Al-Amin Miah, RC** has participated and completed successfully training entitled **“In-House Training on Fourier Transform Infrared Spectroscopy and UV-Vis NIR”**, for 02 days, BCSIR Rajshahi Laboratories.
5. **Md. Ahasanur Rabbi, SSO** attended at the following training course on **“Principles and Operation of preparative HPLC with LabSolutions Workstation”** held at Shimadzu Asia Pacific Ltd. Singapore in October, 2022.
6. **Hurey Jahan Kadri, SO** has participated and completed successfully training on **“BET Sorptometer”**, on 14-18 May, 2023 conducted by CARF, BCSIR, Dhaka.
7. **Md. Al-Amin, SO** has participated and completed successfully training on **“FTIR (Fourier Transform infrared) & UV-vis NIR (Ultraviolet, Visible near Infrared) Spectroscopy”** from 16-17 April 2023, conducted by P & D, BCSIR, Rajshahi, Bangladesh.
8. **Md. Al-Amin, SO** has participated and completed successfully training entitled **“In-House Training on Preparative HPLC and Ion Chromatography”**, for 02 days, BCSIR Rajshahi Laboratories.
9. **Zia Uddin Rasel, RC** has participated and completed successfully training on **“Preparative HPLC”**, from 26 Feb-02 March 2023, conducted by P & D, BCSIR, Dhaka, Bangladesh.
10. **Dr. Md. Nurul Huda Bhuiyan, PSO** has participated and completed successfully training entitled **“Training on Total Viable Microbial Count in Food and Feed Sample”**, for 1 day, BCSIR Rajshahi Laboratories.
11. **Md. Jahidul Islam, SO** has participated and completed successfully training entitled **“Detection of Salmonella sp. in Food and Feed sample”** held on 24 May 2023, organized by BCSIR Rajshahi Laboratories
12. **Farhana Boby, SO** has participated and completed successfully training entitled **“Detection of Salmonella sp. in Food and Feed sample”** held on 24 May 2023, organized by BCSIR Rajshahi Laboratories
13. **Farhana Boby, SO** has participated and completed successfully training entitled **“Uncertainty Measurement in the Analytical Method”** held on 5 April 2023, organized by BCSIR Rajshahi Laboratories
14. **Farhana Boby, SO** has participated and completed successfully training entitled **“Method validation theoretical and hands on demonstration for Iso targeted five parameters”** held on 2-3 April 2023, organized by BCSIR Rajshahi Laboratories
15. **Farhana Boby, SO** has participated and completed successfully training entitled **“41st Understanding Training Courses on ISO/IEC 17025: 2017”** held on 26-28 July 2022, organized by Bangladesh Accreditation Board (BAB), Dhaka, Bangladesh

16. **Md. Zakaria Al Noman, SO** has participated and completed successfully training entitled “**Method validation theoretical and hands on demonstration for ISO targeted five parameters**”, for 2 days, BCSIR Rajshahi Laboratories.
17. **Md. Zakaria Al Noman, SO** has participated and completed successfully training entitled “**Uncertainty measurement in the analytical methods**”, for 1 day, BCSIR Rajshahi Laboratories.
18. **Md. Zakaria Al Noman, SO** has participated and completed successfully training entitled “**Training on Total Viable Microbial Count in Food and Feed Sample**”, for 1 day, BCSIR Rajshahi Laboratories.
19. **Md. Zakaria Al Noman, SO** has participated and completed successfully training entitled “**Detection and Estimation of Total Coliform in Water, Food and Feed Sample**”, for 1 day, BCSIR Rajshahi Laboratories.
20. **Md Mashud Parvez, SO** has participated and completed successfully training entitled “**Method validation theoretical and hands on demonstration for ISO targeted five parameters**”, for 2 days, BCSIR Rajshahi Laboratories.
21. **Md Mashud Parvez, SO** has participated and completed successfully training entitled “**Uncertainty measurement in the analytical methods**”, for 1 day, BCSIR Rajshahi Laboratories.
22. **Md Mashud Parvez, SO** has participated and completed successfully training entitled “**Training on Total Viable Microbial Count in Food and Feed Sample**”, for 1 day, BCSIR Rajshahi Laboratories.
23. **Md Mashud Parvez, SO** has participated and completed successfully training entitled “**Detection and Estimation of Total Coliform in Water, Food and Feed Sample**”, for 1 day, BCSIR Rajshahi Laboratories.
24. **Md Mashud Parvez, SO** has participated and completed successfully training entitled “**FTIR and UV-VIS NIR spectroscopy**”, for 1 day, BCSIR Rajshahi Laboratories.
25. **Partha Paul, SO** has participated and completed successfully training entitled “**Training on Total Viable Microbial Count in Food and Feed Sample**”, for 1 day, BCSIR Rajshahi Laboratories.
26. **Partha Paul, SO** has participated and completed successfully training entitled “**Detection and Estimation of Total Coliform in Water, Food and Feed Sample**”, for 1 day, BCSIR Rajshahi Laboratories.
27. **Partha Paul, SO** has participated and completed successfully training entitled “**Detection of Salmonella sp. in Food and Feed sample**” held on 24 May 2023, organized by BCSIR Rajshahi Laboratories

28. **Lailatul Ferdousi, SSO** participated and completed successfully In-House Training on “**Dumas Protein Analyzer & Fat Extractor**” from December, 04-08, 2022 at ITTI, BCSIR, Dhaka, Bangladesh.
29. **Lailatul Ferdousi, SSO and Supriya Ahmed, SO** participated and completed successfully training entitled “**Uncertainty measurement in the analytical methods**”, for 1 day in BCSIR Rajshahi Laboratories.
30. **Lailatul Ferdousi, SSO and Supriya Ahmed, SO** participated and completed successfully training entitled “**Method validation theoretical and hands on demonstration for ISO targeted five parameters**”, for 2 days in BCSIR Rajshahi Laboratories
31. **Supriya Ahmed, SO** has participated and completed successfully training entitled “**Protein estimation in feed (poultry and fish feed)**” for 1 day in BCSIR Rajshahi Laboratories.
32. **Supriya Ahmed, SO** has participated and completed successfully training entitled “**Training on FTIR (Fourier transform infrared) & UV –vis NIR (Ultraviolet, visible, near-infrared) spectroscopy**” for 2 days in BCSIR Rajshahi Laboratories
33. **Dr. Md. Badrul Islam, PSO** received foreign training on Principles and operation of preparative HPLC with LabSolutions workstation at Shimadzu Asia Pacific Pte. Ltd., Singapore, 10 October, 2022.
34. **Dr. Md. Badrul Islam, PSO** received foreign training on Principles and operation of VU-VIS Spectroscopy for UV-3600 series with integrating sphere attachment at Shimadzu Asia Pacific Pte. Ltd., Singapore, 11 October, 2022.
35. **Mahci Al Bashera, SO** has participated and completed successfully training entitled “Operation and Maintenance of Preparative HPLC”, for 5 days, BCSIR, Rajshahi Laboratory.
36. **Md. Sabbir Hasan, SO** has participated in five-day long training program on “Introduction to Inductively coupled plasma mass spectrometry (ICPMS), Organized by Central Analytical Research and Facilities (CARF), BCSIR, Dhaka, held on February 12-16, 2023.
37. **Md. Sabbir Hasan, SO** has participated in two-day long training program on “National Training and Mentoring Program for Young Innovators of Bangladesh (Phase- II), Organized by Department of Patent, Design and Trademarks (DPDT), Bangladesh and World Intellectual Property Organization (WIPO), held on October 10-11, 2022 held at Hotel 71, Bijoy Nagar Road, Dhaka 1000.
38. **Farhana Jahan, SO** has participated training on “Method validation theoretical and hands on demonstration for ISO targeted five parameters” held on 2-3 April, 2023; organized by BCSIR Rajshahi Laboratories, Rajshahi.

39. **Farhana Jahan**, SO has participated training on “Uncertainty Measurement in the analytical methods” held on 5 April, 2023; organized by BCSIR Rajshahi Laboratories, Rajshahi.
40. **Farhana Jahan**, SO has participated training on “Protein Estimation in Feed (Poultry and Fish Feed)” held on 13 April, 2023; organized by BCSIR Rajshahi Laboratories, Rajshahi.
41. **Md. Waliullah**, SO has participated in five-day long training program on “BET Sorptometer”, Organized by Central Analytical Research and Facilities (CARF), BCSIR, Dhaka, held on May 14-18, 2023.
42. **Md. Ariful Islam**, SO has participated and completed successfully training on “Liquid Chromatography with Tandem Mass Spectrometry (LC-MS/MS)”, on 09-13th April, 2023.
43. **Md. Ariful Islam**, SO has participated and completed successfully training on “Fourier transform infrared (FTIR) & UV-vis NIR (Ultraviolet, Visible, near-infrared)”, on 16-17th April, 2023.
44. **Md. Mahmudur Rahman (Scientific Officer)** has successfully completed the five-day long training course on: “**Inductively Coupled Plasma Mass Spectrometry (ICP-MS)**” which held on CARF, BCSIR Dhaka (Date:12/02/2023-16/02/2023)
45. **Ali Ahsan Muzahid (Scientific Officer)** has participated and completed successfully training entitled “**Gas Chromatography (GC)**” for 05 days, conducted by BCSIR Laboratories, Dhaka from 30 October-03 November 2022.
46. **Md. Jasim Uddin (Scientific Officer)** has participated and completed successfully training entitled “**Gas Chromatography Mass Spectrometry (GC-MS)**”, for 05 days, conducted by INARS, BCSIR, Dhaka, Bangladesh from 14-19 January 2023.
47. **Md. Jasim Uddin (Scientific Officer)** has participated and completed successfully training entitled “**Preparative HighPerformance Liquid Chromatography**”, for 05 days, BCSIR, conducted by BCSIR Laboratories, Rajshahi from 26 February-02 March 2023.
48. **Md. Jasim Uddin (Scientific Officer)** has participated and completed successfully training entitled “**Liquid Chromatography Tandem Mass Spectrometry (LC-MS-MS)**”, for 05 days, conducted by CARF, BCSIR, Dhaka, Bangladesh from 09-13 April 2023.
49. **Jaytirmoy Barmon (Scientific Officer)** attended at the In-house training on “**Fat content in poultry and fish Feed**” held in 11 April 2023 at BCSIR Laboratories, Rajshahi.

50. **Jaytirmoy Barmon (Scientific Officer)** attended at the In-house training on “**Uncertainty Measurement in the analytical methods**” held in 5 April 2023 at BCSIR Laboratories, Rajshahi.
51. **Jaytirmoy Barmon (Scientific Officer)** attended at the In-house training on “**Method validation theoretical and hands on demonstration for ISO targeted five parameters**” held in 2-3 April 2023 at BCSIR Laboratories, Rajshahi.
52. **G. M. Masud Rana, RC** has attended at the In-house training on “**Fat content in poultry and fish Feed**” held in 11 April 2023 at BCSIR Laboratories, Rajshahi.
53. **G. M. Masud Rana, RC** has attended at the In-house training on “**Uncertainty Measurement in the analytical methods**” held in 5 April 2023 at BCSIR Laboratories, Rajshahi.
54. **G. M. Masud Rana, RC** has attended at the In-house training on “**Method validation theoretical and hands on demonstration for ISO targeted five parameters**” held in 2-3 April 2023 at BCSIR Laboratories, Rajshahi.
55. **Tahmina Akter Chowdhury, RC** has attended at the In-house training on “**Fat content in poultry and fish Feed**” held in 11 April 2023 at BCSIR Laboratories, Rajshahi.
56. **Tahmina Akter Chowdhury, RC** has attended at the In-house training on “**Uncertainty Measurement in the analytical methods**” held in 5 April 2023 at BCSIR Laboratories, Rajshahi.
57. **Tahmina Akter Chowdhury, RC** has attended at the In-house training on “**Method validation theoretical and hands on demonstration for ISO targeted five parameters**” held in 2-3 April 2023 at BCSIR Laboratories, Rajshahi.

B. Training offered:

1. **Bijoy Maitra, SO** has offered training on “**Preparative HPLC**”, from 26 Feb-02 March 2023, conducted by P & D, BCSIR, Dhaka, Bangladesh.
2. **Dr. Md. Nurul Huda Bhuiyan, PSO** has offered training entitled “**Uncertainty Measurement in the Analytical Method**” held on 5 April 2023, organized by BCSIR Rajshahi Laboratories
3. **Dr. Md. Nurul Huda Bhuiyan, PSO** has offered training entitled “**Method validation theoretical and hands on demonstration for Iso targeted five parameters**” held on 2-3 April 2023, organized by BCSIR Rajshahi Laboratories
4. **Dr. Md. Nurul Huda Bhuiyan, PSO** has offered training entitled “**Detection of Salmonella sp. in Food and Feed sample**” held on 24 May 2023, organized by BCSIR Rajshahi Laboratories

5. **Farhana Bobby, SO** has offered training entitled “**Training on Total Viable Microbial Count in Food and Feed Sample**”, for 1 day, BCSIR Rajshahi Laboratories.
6. **Farhana Bobby, SO** has offered training entitled “**Detection and Estimation of Total Coliform in Water, Food and Feed Sample**”, for 1 day, BCSIR Rajshahi Laboratories.
7. **Lailatul Ferdousi, SSO** has offered training on “**Protein estimation in feed (poultry and fish feed)**”, conducted by Applied Zoology Research Division, BCSIR Rajshahi Laboratories, Bangladesh from 13 April, 2023
8. **Farhana Jahan, SO** offered Training on “Operation and maintenance of Preparative HPLC” held on 26 February- 02 March, 2023; organized by BCSIR Rajshahi Laboratories, Rajshahi.
9. In-house training program conducted by **Dr. Nurul Huda Bhuiyan (PSO), Farhana Jahan (SO) and Bijoy Maitra (SO)** on “Preparative High-Performance Liquid Chromatography” as trainer during 26 Feb-02 March, 2023 at Central Analytical Research and Facilities (CARF) of BCSIR Rajshahi Laboratories. Ten Scientists from different units of BCSIR participated in the program.
10. In-house training program conducted by **Dr. Nurul Huda Bhuiyan (PSO), Farhana Jahan (SO) and Bijoy Maitra (SO)** on “FTIR and UV-Vis NIR” as trainer during 16-17 April, 2023 at Central Analytical Research and Facilities (CARF) of BCSIR Rajshahi Laboratories. Ten Scientists from different sections of Rajshahi Laboratories participated in the program

4.2 a) Participation in Meeting/Seminar/Workshop/Conference/Exhibition:

1. **Nazim Uddin Ahmed, PSO** has offered a daylong Workshop on the “**National Integrity Strategy of Bangladesh**”, conducted by the Administration and Training Branch, BCSIR Rajshahi Laboratories.
2. **Abu kowser RB**, has been participated at “**International conference on environmental protection for sustainable development 2022**” Topic: Afforestation and Biodiversity conservation.
3. **Nazim Uddin Ahmed, PSO** has offered a seminar on “**4IR: Impacts we are experiencing, Challenges we are facing and Opportunities we can harness - Opinion roundup.**” conducted by P&D Branch, BCSIR Rajshahi Laboratories.
4. **Samia Sharmin, RF** has offered a seminar on “**Extraction Isolation and characterization of Bioactive compounds from fruit seeds.**” conducted by the P&D Branch, BCSIR Rajshahi Laboratories
5. **Firoz Ahmed, SO** has been participated at “**BCSIR Congress-2022**” on 01-03 December 2022, Oral Presentation.

6. **Hurey Jahan Kadri, SO** has been participated “**International Conference on Environmental Protection for Sustainable Development (ICEPSD-2022)**” on 02-04 September 2022, Oral presentation -02
7. **Hurey Jahan Kadri, SO** has been participated “**BCSIR Congress-2022**” on 01-03 December 2022, PP
8. **Hurey Jahan Kadri, SO** has been participated at “**International Conference on Recent Progress in Science, Eengineering and Technology (ICRPSET-2022)**” on 26-27 December, 2022, Faculty of Engineering, University of Rajshahi.
9. **Md. Al-Amin, SO** has been participated at “**International Conference on Environmental Protection for Sustainable Development (ICEPSD-2022)**” on 02-04 September 2022, Oral presentation.
10. **Md. Al-Amin, SO** has been participated “**BCSIR Congress-2022**” on 01-03 December 2022, Oral presentation
11. **Dr. Md. Nurul Huda Bhuiyan, PSO** has participated on oral presentation on a conference entitled “**Integrated Approach for Adopting 4IR**” held on 01-03 December 2022, organized by BCSIR, Dhaka, Bangladesh.
12. **Farhana Boby, SO** has participated on oral presentation on a conference entitled “**Integrated Approach for Adopting 4IR**” held on 01-03 December 2022, organized by BCSIR, Dhaka, Bangladesh.
13. **Lailatul Ferdousi, SSO** participated in “**BCSIR Congress-2022**”, for 1 -3 december 2022 in BCSIR., Dr Qudrat-i-Khuda, Dhanmondi, Dhaka-1205, Bangladesh
14. **Supriya Ahmed, SO** participated in “**BCSIR Congress-2022**”, for 1 -3 december 2022 in BCSIR., Dr Qudrat-i-Khuda, Dhanmondi, Dhaka-1205, Bangladesh
15. **Dr. Md. Badrul Islam, PSO** presented a paper in a local seminar entitled “**Development of Cost effective Recovering Technology of Useful Chemicals from Waste PET Bottle**” at BCSIR Rajshahi Laboratories on 17.08.2022.
16. **Md. Waliullah** attained conference at International Conference on Environmental Protection for Sustainable Development (ICEPSD)-2022, 02-04 September 2022
17. **Dr. Faridul Islam** attained conference at BCSIR Congress-2022, Dhaka, 01-03 December 2022
18. **Farhana Jahan** attained conference at BCSIR Congress-2022, Dhaka, 01-03 December 2022 for oral presentation.
19. **Md. Waliullah** attained conference at BCSIR Congress-2022, Dhaka, 01-03 December 2022 for oral presentation.
20. **Md. Ariful Islam** attained conference at BCSIR Congress-2022, Dhaka, 01-03 December 2022 for oral presentation.

21. **Ali Ahsan Muzahid (Scientific Officer)** and **Md. Jasim Uddin (Scientific Officer)** have participated on “International Conference on Environmental Protection for Sustainable Development (ICEPSD-2022)” held on 2-4 September, 2022 at CIRDAP and University of Dhaka, Bangladesh.
22. **Ali Ahsan Muzahid, SO**, have participated on “**BCSIR Congress-2022**” held on 01-03 December, 2022 at BCSIR , Dhaka, Bangladesh.
23. **Tahmina Akter Chowdhury, RC** have participated on “**BCSIR Congress-2022**” held on 01-03 December, 2022 at BCSIR , Dhaka, Bangladesh.
24. **Md. Mahmudur Rahman, SO**, have participated on “**BCSIR Congress-2022**” held on 01-03 December, 2022 at BCSIR , Dhaka, Bangladesh.

b) Participation in different universities/institution as an expert: Not Applicable

4.3 a) Academic achievements (Ph.D/M.Phil/PGD & M.S.):

1. **Md. Mahmudul Hassan Mondol, SSO**, has been awarded PhD from Kyungpook National University, South Korea
2. **Dr. Most. Halima Khatun, SSO** has been awarded Ph.D. degree in Environmental Science from the Institute of Environmental Science (IES), University of Rajshahi. Title of Ph.D. research “Application of natural dyes on textiles and their environmental sustainability”
3. **Hurey Jahan Kadri, SO**, PhD (Continuing) Supervisor’s name: Dr. Md. Ibrahim H. Mondal, Professor, Dept. of Applied Chemistry and Chemical Engineering (ACCE, RU, Bangladesh), Session: 2018-2019, entitled the topic “**Study of the Polysaccharide based Biocompatible Composite Hydrogel and its application**”
4. **Dr. Faridul Islam** achieved Ph.D in Chemical Engineering, The University of Newcastle, Australia

4.4 a) Guidance to student’s Research work (Ph.D/M.Phil & M.S.)-

1. **Shamsad Sarmin** from university of Rajshahi is carrying out research at Fiber and Polymer Research Division, BCSIR Rajshahi Laboratories as *Professor Mofizuddin Ahmed Memorial* research fellow under the supervision of **Md. Ahasanur Rabbi, SSO**, Fiber and Polymer Research Division, BCSIR Rajshahi Laboratories.
2. **Md. Abdus Sabur Ali** from Begum Rokeya University, Rangpur is carrying out M.Sc. research with the title “Biosynthesis of Metal Nanoparticles and Their Potential Applications” under the co-supervision of **Md. Ahasanur Rabbi, SSO**, Fiber and Polymer Research Division, BCSIR Rajshahi Laboratories.

3. **Mst. Bithi Akhter** from Begum Rokeya University, Rangpur is carrying out M.Sc. research with the title “Green Synthesis of Magnetic Nanocomposites and its Application as Adsorbent” under the co-supervision of **Md. Ahasanur Rabbi, SSO**, Fiber and Polymer Research Division, BCSIR Rajshahi Laboratories.
4. **Dr. Most. Halima Khatun, SSO** has continuing supervision as a Co-supervisor of M.Sc. thesis works of Md. Rakibul Islam, Department of Chemistry, University of Rajshahi
5. **Dr. Most. Halima Khatun, SSO** has continuing supervision as a Co-supervisor of Ph.D. thesis works of Asma Siddika, Institute of Environmental Science, University of Rajshahi.
6. **Dr. Md. Nurul Huda Bhuiyan, PSO** has completed supervision as a Co – supervisor of M.Sc. thesis works of Anika Tabassum, Department of Zoology, University of Dhaka.
7. **Dr. Mohajira Begum, PSO** has completed supervision as a Co – supervisor of M.Sc. thesis works of Mst. Halima Khatun, Department of Zoology, University of Rajshahi.
8. **Lailatul Ferdousi, SSO** has completed supervision as a Co – supervisor of M.Sc. thesis works of Md. Humayun Kabir, Md. Hashem Ali, and Md. Eunus Ali Sheikh Department of Zoology, University of Rajshahi.
9. **Dr. Md. Badrul Islam, PSO** has completed supervision as a Co – supervisor of M.Sc. thesis works of
 - i) Sah Alom, Session: 2019-20; Roll/Reg. 1610523136, Department of Chemistry, University of Rajshahi
 - ii) Md. Shahjalal Islam, Session: 2020-21; Roll/Reg. 1711023165, Department of Chemistry, University of Rajshahi.
10. **Dr. Faridul Islam, SSO** has completed supervision as a Co – supervisor of one (01) M.Sc. thesis student.
11. **Farhana Jahan, SO** has completed supervision as a Co – supervisor of one (01) M.Sc. thesis student.
12. **Dr. Mst. Sarmina Yeasmin, PSO** has completed supervision as a Co – supervisor of M.Sc. thesis works of Md. Mokesedul Islam, Department of Chemistry, Begum Rokeya University

4.8 Industrial Visit-

1. **Applied Botany Research Division** visited Rajshahi Sugar Mills, Horian on 15.12.2022
2. **Drugs and Toxins Research Division** visited Rajshahi Sugar Mills, Horian on 15.12.2022
3. **Fiber and Polymer Research Division** visited S.R Non-Woven Bag & Packaging Industries, BSCIC Industrial Area, Sopura, Rajshahi on 12.06.2023.
4. **Fruits and food processing and preservation research division** Visited Pran Agro, Natore on 23.03.2023

5. **Applied zoology research division** Visited ACI Godrej Agrovet Limited, Rajshahi on 18.05.2023
6. **Natural Products Research Division** Visited S.M. Cosmetics, Ltd. Natore on 15.06.2023
7. **Oil, Fat and Waxes Research Division** Visited SQUARE Lifesciences Ltd. (SLL), Patikabari, Hemayetpur, Pabna on 05.06.2023

Laboratory visit

1. A group of officers from food safety authority, Rajshahi visited the the Central Analytical and Research Facilities (CARF), BCSIR, Rajshahi laboratories on 18th January, 2022.

5. Information on Institutional Personnel

5.1 Joining/Promotion/Transfer/ PRL/Resign-

NAME AND DESIGNATION OF PRL OFFICER

Sl.No.	Name	Designation
1.	Dr. Arfatun Nahar Chowdhury	PSO

5.2 Number of working scientists, technical officers and staffs 2022-2023: 114

5.3 Name of the Scientists with designation:

Name	Designation	Field of specialization	E-mail	Mobile No.
Dr. Md. Salim Khan	CSO	Tissue Culture & Geomic research	K2salim@gmail.com	01712201504
Dr. Arfatun Nahar Chowdhury	PSO	Plant Tissue Culture & Biotechnology	a.nahar64@gmail.com	01703946968
Amit Kumar Dey	SO	Pathology, Taxonomy, Microbiology	amitdey016@yahoo.com	01515274026
Md. Moniruzzaman	RC	Limnology & Aquaculture, Plant Taxonomy, Phytochemistry, Microbiology	milon.rubot@gmail.com	01737357800
Sabbir Ahmed	RC	Plant Tissue Culture & Biotechnology, Microbiology	sabbirahmed1@gmail.com	01724052028
Abu Kowser	RB	Limnology, Hydrobiology, Seaweed, Mycology	shadhinkowser@gmail.com	01727607278
Md. Harun Ar Rashid	RB	Molecular cytogenetics, Genetics and Biometry	harunarrashid971993@gmail.com	01515612497
Nayeema Talukder Ema	SO	Microbiology, Molecular Biology, Bioinformatics	nayeema.mgcc@gmail.com	01973761701
Dipa Rani Roy	RB	Microbiology, Plant tissue culture	diparaniroy98@gmail.com	01796722113
Nazim Uddin Ahmed	PSO	Phytochemistry	nazimpharm@yahoo.com	01711446079
Nasim Ahmed	SO	Nano-Chemistry	nasimaccedu143@gmail.com	01787403485
Md. Sakhawat Hossain	SO	Pharmaceutical Chemistry	sakhawat.du11@gmail.com	01737507075
Shabiba Parvin Shandhi	SO	Natural Product	shabiba.shandhi@gmail.com	01755739736
Safaet Alam	SO	Phytochemistry	safaet.du@gmail.com	01533078521

Kutub Uddin Ahmed	RP	Pharmacology	kutubuddinju@gmail.com	01777239300
Md. Al- Amin Miah	RC	Synthesis	alaminbcsir2021@gmail.com	01506591447
Rasheda Akhter	PSO	Applied Zoology	rashedabcsir@yahoo.com	01720061745
Md. Ahasanur Rabbi	SSO	Nanoparticle	rabbi_chem@yahoo.com	01715973466
Dr. Most. Halima khatun	SSO	Natural Dye	halima.apee@gmail.com	01724161804
Firoz Ahmed	SO	Bio-polymer	fahmed0920@yhoo.com	01737731925
Hurey Jahan Kadri	SO	Polymer Hydrogel	hureyjahan@gmail.com	01731299940
Bijoy Maitra	SO	Nanoparticle	maitra.bijoy09@gmail.com	01716033677
Md. Al-Amin	SO	Biopolymer & Electrochemistry	alamin.acce@gmail.com	01745169214
Md. Zia Uddin Rasel	RC	Polymer Chemistry	rasel.nstuacce@gmail.com	01717895454
Dr. Md. Nurul Huda Bhuiyan	PSO	Mycotoxin, Pesticides & Antibiotics	nhbmb@yahoo.com	01711446079
Dr. Mohajira Begum	PSO	Nutrition and Fish Technology	Mohajira10@yahoo.com	01914893794
Jahidul Islam	SSO	Analytical chemistry, organic & inorganic, environmental chemistry	pihanacct@gmail.com	01917822830
Lailatul Ferdousi	SSO	Entomology and Fish Nutrition	Laila.sujata@gmail.com	01714353889
Farhana Boby	SO	Biotechnology, Antimicrobial resistance and Bacterial secondary metabolite	Farhanaboby802@gmail.com	01826641441
Md. Zakaria Al Noman	SO	One health epidemiology, Veterinary pharmacology	Zakarianoman95@gmail.com	01773559882
Md. Mashud Parvez	SO	Analytical chemistry, Biochemical and molecular analysis	parvezdealer@gmail.com	01716222172
Supriya Ahmed	SO	Veterinary Science	Supriya.ahmed063@gmail.com	01631970337
Md. Selim Reza	SO	Biochemistry and Molecular Biology	Selimrezabmb1849@gmail.com	01741069190
Partha Paul	SO	Biochemical and molecular microbiology	Parthapaul0808@gmail.com	01672498447
Dr. Md. Badrul Islam	PSO	Product formulation, Organic synthesis,	badol02@yahoo.com	01716639255
Dr. Faridul Islam	SSO	Materials Science, Electrochemistry, Environmental remediation	faridbcsir@gmail.com	01717511576
Mahci Al Bashera	SO	Natural Product, Environmental Science	aurin.bashera@gmail.com	01751630444
Md. Sabbir Hasan	SO	Polymer nanocomposites, Hydrogels, Environmental Pollution Control	sabbirhasan.ac@gmail.com	01722576166
Farhana Jahan	SO	Biochemistry, Molecular Biology, Natural Products, Food and Nutrition	Farhanajahan308@gmail.com	01778836109
Md. Waliullah	SO	Electrochemistry, Nanochemistry, Solution Chemistry, Environmental remediation	m.waliullah2021@bcsir.gov.bd	01701044604
Md. Ariful Islam	SO	Product formulation, Organic synthesis,	arif.bcsir2022@gmail.com	01515259813
Md. Ismail Hossen	SO	Electrochemistry	Ismail.just14@gmail.com	01962691719
Dr. Mst. Sarmina Yeasmin	PSO	Oils, Fats and Waxes	lisabcsir@yahoo.com	01721913447
Md. Mahmudur Rahman	SO	Environmental Science	shamrat.acce@gmail.com	01714353889
Ali Ahsan Muzahid	SO	Natural Products	aliahsanmuzahid@gmail.com	01719378679
Md. Jasim Uddin	SO	Nanochemistry	mdjasimbcsir2022@gmail.com	01816241951
Jaytirmoy Barmon	SO	Phytopharmacology	jaytirmoybarmon@gmail.com	01753632728

G.M. Masud Rana	RC	Oils and Fats	masud5026@gmail.com	01745255761
Tahmina Akter Chowdhury	RC	Essential Oils	jnutahmina@gmail.com	01840709985

5.4. Name of the Technical Officers & Staff with Designation:

1. Mrs. Monowara Banu, Junior Technician
2. Nur Mohammad, Lab Technician
3. Mr. Md. Mamun-Ur-Rashid, Lab Attendant
4. Shree Bidhan Chandra, Lab Attendent
5. Moyna Begum, Senior Lab Attendant
6. Md. Mahbub Alom, Lab Attendant
7. Mr. Md. Baijul Islam, Lab Technician
8. Md. Mirajul Islam, Lab Attendant
9. Md. Sahin Ali, Lab Attendant
10. Md Mofijul Islam, Lab Attendant
11. Ronzena Khatun, Lab Attendant

5.5. Name of the Officers & Staff with Designation

NAME AND DESIGNATION OF TECHNICAL OFFICERS

Name	Designation
1. Nepal Chandra Dey	Experimental Officer
2. Md. Shahidur Rahman	Experimental Officer

NAME AND DESIGNATION OF OFFICER

Sl.No.	Name	Designation
1.	Md. Ferdous Zaman	Executive Eng.
2.	Mohammad Al Mamun Subrata	Administrative Officer
3.	Md. Rejwan Ahmed	Assistant Engineer
4.	Md. Sarowar Jahan Sarker	Assistant Administrative Officer
5.	Mst. Sahan Ara Khattun	Superintendent
6.	Md. Shaheen Iqbal Chowdhury	Asst. Eng.
7.	Md. Sarowar Jahan Sarker	Superintendent
8.	Binoy Kumar Ghos	Superintendent

NAME AND DESIGNATION OF STAFF

Sl. No	Name	Designation
1.	Mohammad Golam Faruq	Head assistant
2.	Md. Gazioul Hoque	Head assistant

3.	Md. Nurul Islam	Technician
4.	Md. Nazrul Islam	Technician
5.	Md. Hafizur Rahman	S.G
6.	Naru Gopal Mohonta	UDA
7.	Mst. Ayesha Khatun	UDA
8.	Md. Ripon Hossain	LDA
9.	Md. Abdus Salam	LDA
10.	Md. Mashiur Rahman	LDA
11.	J. M. Mehedi Hasan Joy	LDA
12.	Mst. Monowara Banu	Junior Technician
13.	Md. Khybor Rahman	Junior Technician
14.	Md. Saiful Islam	Junior Technician
15.	Sazzadul Islam	Junior Technician
16.	Md. Shahjahan Ali	Senior Library assistant
17.	Md. Bodrul Islam	Security Supervisor
18.	Md. Shohidul Islam	Senior Security Guard
19.	Md. Mokter Hossain (1)	Senior Security Guard
20.	Md. Abdul Malak	Senior Security Guard
21.	Md. Mozzamel Hoque	Senior Security Guard
22.	Md. Aktarujjaman	Senior Security Guard
23.	Md. Idris Ali	Senior Security Guard
24.	Md. Mokter Hossain (2)	Senior Security Guard
25.	Md. Monzu Mia	Senior Security Guard
26.	Kazi Mamun ur Rashid	Senior Security Guard
27.	Md. Hafizur Rahman	Driver
28.	Md. Mukul Ali	Senior Carpenter
29.	Md. Baijul Hossain	Lab: Technician
30.	Nour Mohammad	Lab: Technician
31.	Moyna Begum	Senior Lab: attendant
32.	Md. Nazrul Islam	Record Keeper
33.	Md. Abdur Rahim	Record Keeper
34.	Md. Kamal Hossain	Senior Gardener
35.	Md. Atiqur Rahman	Senior Gardener
36.	Md. Ehia	T. C. Helper
37.	Ronzena Khatun	Lab: attendant
38.	Md. Amaz Uddin	Lab: attendant
39.	Md. Mofijul Islam	Lab: attendant
40.	Sree Bidhan Chondra	Lab: attendant
41.	Md. Mirajul Islam	Lab: attendant
42.	Md. Shahin Ali	Lab: attendant
43.	Md. Mamunur Rashid	Lab: attendant
44.	Md. Mahabub Alam	Lab: attendant
45.	Md. Masud Rana Talukdar	Lab: attendant
46.	Md. Aslam Hossain	Gardener
47.	Sukanti Chandra Pal	Office assistant
48.	Shohidul Islam	Office assistant
49.	Most. Nazma Khatun	Office assistant
50.	Parimal Chandra	Office assistant
51.	Md. Sagor Hossain	Office assistant
52.	Md. Milton Hossain	Office assistant
53.	Md. Mohebbul Alam	Office assistant
54.	Imran Ali	Office assistant

55.	Md. Asadul Islam	Electric Helper
56.	S.M. Abdullah	Plumbing Helper
57.	Md. Karimul Islam	Security Guard
58.	Md. Mehedi	Security Guard
59.	Md. Raihan Ali	Security Guard
60.	Md. Selim Zowardar	Security Guard
61.	Md. Masud Rana	Security Guard
62.	Md. Hedayetulla	Cleaner
63.	Sreemoti Parboti Rani	Cleaner

**NAME AND DESIGNATION OF HIGHER DEGREE OBTAINED OFFICER
OFFICER**

Sl.No.	Name	Designation	Obtained degree
1.	Dr. Mohajira Begum	PSO	PhD
2.	Dr. Most. Halima Khatun	SSO	PhD

NAME AND DESIGNATION OF PRL OFFICER

Sl.No.	Name	Designation
1.	Dr. Arfatun Nahar Chowdhury	PSO

5.6. Different Committees of BCSIR Rajshahi

COMMITTEES

The following committees have been formed in connection with various functions relating to research and administrative work.

ANALYTICAL SERVICE CELL MANAGEMENT COMMITTEE

1. Nazim Uddin Ahmed, PSO (Convener)
2. Mahci Al Basher, SO (Member)
3. Farhana Bobby, SO (Member)
4. Ali Ahsan Muzahid, SO (Member)
5. Bijoy Maitra, SO (Member)
6. Safaet Alam, SO (Member)
7. Sabbir Ahmed, SO (Member)
8. Lailatul Ferdousi, SSO (Member Secretary)

TENDER EVALUATION COMMITTEE (RFQ)

1. Dr. Badrul Islam, PSO (Convener)
2. Md. Jhorul Islam, SEO, INMAS, Rajshahi (Member)
3. Md. Ferdous Zaman (Member-Secretary)

4IR PLANING AND EXCUTION COMMITTEE

1. Nazim Uddin Ahmed, PSO (Convener)
2. Md. Jahidul Islam, SSO (Member)
3. Md. Waliullah, SO (Member)
4. Md. Al-Amin Miah, RC (Member)
5. Sabbir Ahmed, RC (Member)
6. Md. Mahmudur Rahman, SO (Member-Secretary)

OFFICIAL COST ESTIMATE COMMITTEE

1. Md. Ferdous Zaman, Executive Engineer (Convener)
2. Md. Zakaria Al Noman (Member)
3. Md. Rejone Ahmed, Assistant Engineer (Member-Secretary)

COST ESTIMATION AND AUCTION COMMITTEE

1. Nazim Uddin Ahmed, PSO (Convener)
2. Ali Ahsan Muzahid, SO (Member)
3. Md. Rejone Ahmed, Assistant Engineer (Member)
4. Nepal Chandra Dey, (Member)
5. Mohammad Al Mamun Subrata (Member-Secretary)

ANNUAL REPORT PUBLICATION COMMITTEE

1. Dr. Md. Nurul Huda Bhuiyan, PSO (Convener)
2. Dr. Mst. Sarmina Yeasmin, PSO (Member)
3. Md. Waliullah, SO (Member)
4. Md. Al-Amin, SO (Member)
5. Abu Kowser, RC (Member)
6. Farhana Boby, (Member-Secretary)

SOCIAL WELFARE COMMITTEE

1. Dr. Mohajira Begum, PSO (Convener)
2. Administrative Officer (Member)
3. Accounts Officer, (Member-Secretary)

TECHNICAL, ADMINISTRATIVE AND FINANCIAL COMMITTEE FOR RESEARCH AND DEVELOPMENT PROJECT

1. Director, BCSIR Raj Laboratories (Convener)
2. All Divisional Head, BCSIR Raj Laboratories (Member)
3. Administrative Officer, BCSIR Raj Laboratories (Member)
4. Accounts Officer, BCSIR Raj Laboratories (Member)
5. Acting Officer, P&D BCSIR Raj Laboratories (Member-Secretary)

WEBSITE / ICT COMMITTEE

1. Md. Ahasanur Rabbi, SSO (Convener)
2. Dr. Md. Nurul Huda Bhuiyan, PSO (Member)
3. Dr. Mst. Sarmina Yeasmin, PSO (Member)
4. Md. Waliullah, SO (Member)
5. Md. Zakaria Al Noman, SO (Member)
6. Md. Sabbir Hasan, SO (Member-Secretary)

MASJID COMMITTEE

1. Md. Jahidul Islam, SSO, (President)
2. G.M. Masud Rana, (Member)
3. Md. Nazrul Islam Tech. (Member)
4. Md. Saiful Islam J.Tech. (Cashier)
5. Md. Mahmudur Rahman, SO (Member-Secretary)

INNOVATION COMMITTEE

1. Nazim Uddin Ahmed, PSO, (Convener)
2. Amit Kumar Dey, SO (Member)
3. Ali Ahsan Muzahid, SO (Member)
4. Firoz Ahmed, SO (Member-Secretary)

SPECIFICATION COMMITTEE

1. Dr. Md. Nurul Huda Bhuiyan, PSO (Convener)
2. Dr. Md. Khalakuzzaman, Genetic Engineering Dept. RU. (Member)
3. Firoz Ahmed, SO (Member Secretary)

VERIFICATION COMMITTEE

1. Dr. Md. Badrul Islam, PSO (Convener)
2. Professor Dr. Md. Aminul Haque, Agronomy and Extension Dept, RU (Member)
3. Nepal Chandra Dey, SO (Member)
4. Lailatul Ferdousi, SSO (Member)
5. Amit Kumar Dey, (Member- Secretary)

CONDEMNATION COMMITTEE

1. Dr. Md. Badrul Islam, PSO (Convener)
2. Md. Moniruzzaman, RC (Member)
3. Md. Mahmudur Rahman, SO (Member)
4. Md. Ferdous Zaman, Executive Engineer (Member)
5. Nepal Chandra Dey, Accounts Officer (Member)
6. Farhana Boby, SO (Member)
7. Lailatul Ferdousi, SSO (Member- Secretary)

APA COMMITTEE

1. Nazim Uddin Ahmed, PSO (Convener)
2. Dr. Mst. Sarmina Yeasmin, PSO (Member)
3. Mr. Nepal Chandra Dey (Member)
4. Amit Kumar Dey, SO (Member)
5. Md. Jahidul Islam, SSO (Member Secretary)

ISO 17025 ACREDITATION COMMITTEE

1. Director, BCSIR Rajshahi Laboratories (Laboratory Manager)
2. Dr. Md. Nurul Huda Bhuiyan, PSO (Quality Manager)
3. Lailatul Ferdoushi, SSO (Assistant Quality Manager, Technical Manager & Analyst)
4. Tahmina Akhtar Chowdhuri, RC (Technical Manager & Analyst)
5. Farhana Jahan, SO (Assistant Technical Manager & Analyst)
6. Farhana Boby, SO (Assistant Technical Manager & Analyst)

7. Md. Zakaria Al Noman, SO (Analyst)
8. Supriya Ahmed, SO (Analyst)
9. Md Mashud Parvez, SO (Analyst)
10. Jaytirmoy Barmon, SO (Analyst)
11. Partha Paul, SO (Analyst)
12. G.M. Masud Rana, RC (Assistant Technical Manager & Analyst)
13. Md. Baizul Hossain, Lab Technician (Laboratory Assistant)
14. Moina Begum, Sr. Lab Attendant (Laboratory Assistant)
15. Md. Mirajul Islam, Lab Attendant (Laboratory Assistant)
16. Md. Mofijul Islam, Lab Attendant (Laboratory Assistant)
17. Mst. Ronzena Khatun, Lab Attendant (Laboratory Assistant)
18. Md. Mahub Alom, Lab Attendant (Laboratory Assistant)

5.7 Budgetary allocation:

5.7.1 Allocation for Rajshahi Laboratories:

Head	2022-2023 (Allocation)	2022-2023 (Total expenditure)
Pay & Allowance	515,04,126.00	500,79,729.00
Research	93,10,000.00	93,02,836.00
Repair	24,95,000.00	24,92,379.00
Others	257,47,000.00	254,23,101.00
Total Allocation and expenditure	890,56,126.00	872,98,045.00

5.7.2 Total income of Rajshahi Laboratories: Analysis and service rendered: 30,07,950.00

Photo gallery



1st August Tree plantation program



15 August National Mourning Day



Victory day celebration and discussion on 16 December



A group BCSIR Rajshahi Scientists visiting ACI GODREJ Agro. Vet. Pvt. Ltd.



Chairman of BCSIR Professor Dr. Aftab Ali sheikh at BCSIR Rajshahi Laboratories and inauguration of shahid Minar



Training on IC & HPLC at the Central laboratory of BCSIR Rajshahi Laboratories



Training on UV-Vis- NIR and FTIR at the Central laboratory of BCSIR Rajshahi Laboratories



Industrial visit at PRAN Agro Limited, Natore



Industrial visit at Square Pharmaceuticals, Pabna



Students from different departments of Rajshahi University (Biochemistry, Microbiology, and Genetic Engineering) visited BCSIR Rajshahi Laboratories



Family Day of BCSIR Rajshahi Laboratories



Charge handover and receiving of Directorship



Weekly Seminar



Stakeholder program of BCSIR Rajshahi Laboratories



Science Fair 2023