



तेजपुर विश्वविद्यालय / TEZPUR UNIVERSITY

(केंद्रीय विश्वविद्यालय / A Central University)

ऊर्जा विभाग / DEPARTMENT OF ENERGY

तेजपुर-784028 :: असम / TEZPUR-784028 :: ASSAM

कुलाध्यक्ष का सर्वोत्तम विश्वविद्यालय पुरस्कार, 2016, एनआईआरएफ भारत रैंकिंग 05 :2016 और नाक द्वारा ए ग्रेड प्राप्त
Visitor's Best University Award, 2016, NIRF India Rankings 2016: 05 and accredited with NAAC 'A' grade

A REPORT ON

International Research Collaborative activity between India and Brazil under the project entitled "Integrated Biorefinery Approach towards production of sustainable fuel and chemicals" from Algal biobased systems

1. Name of the Collaborative Activity: International Joint Research Collaboration between India and Brazil on the topic 'Integrated Biorefinery Approach towards production of sustainable fuel and chemicals from Algal biobased systems.
2. Nature of Activity: Research Project mode, Exchange visit of students and faculty members from both countries.
3. Name of the Collaborating Agency/ Individual with affiliation, and contact details:

Indian Principal investigator

(i) Prof. D. Deka (Ph.D.)—Lead Principal Investigator
Head, Department of Energy,
Tezpur University,
Tezpur-781014, Assam, India
Phone: 03712 27 5301 (o), +919435380897 (mobile)
Fax : 03712267006/5
E-mail: dhanapati@tezu.ernet.in
ddeka1965@gmail.com

(ii) Prof. M C Kalita (Ph.D.)
Department of Biotechnology, Gauhati University,
Guwahati-781014, Assam, India
Phone: 91-0361-2700231(O); Fax: 91-0361- 2700231
E-mail: mckalitagu@gmail.com.


(iii) Dr Vaibhav V Goud (Ph.D.)
Department of Chemical Engineering
IIT Guwahati
Guwahati- 781039
E-mail: vvgoud@iitg.ac.in Phone: +91 9957573605.

Indian Co-Investigator

(i) Dr. Nayan M Kakoty
Associate Professor
Department of Electronic Communication and Engineering
Biomimetic and Cognitive Robotics Lab
Tezpur University,
Tezpur-784028, Assam, India
E-mail: nkakoty@tezu.ernet.in Phone: +919435783446

(ii) Dr. Manabendra Mandal
Associate Professor
Department of Molecular Biotechnology
Tezpur University
Tezpur-784028, Assam, India,
E-mail: mandal@tezu.ernet.in Phone: +919864181445

(iii) Prof. L Sahoo
Department of Bioscience and Bioengineering
IIT Guwahati
Guwahati- 781039,


Head
Department of Energy
Tezpur University



Brazilian Collaborator:

Prof. Donato Aranda, Ph.D. (PI)
 Chemical Engineering Department
 Federal University of Rio de Janeiro
 Brazil, +55 (21) 2562-7657
 E-mail: donato@eq.ufrj.br
 www.greentec-ufrj.com
 www.procat-ufri.com
 Consultor Tecnico/UBRABIO

4. Summary of collaboration:



Renewable carbon neutral liquid biofuels are gaining importance as a means for replacing petroleum derived fuels which are declining and contribute to global warming. A shift towards a bio-based economy for industry and society is inevitable in order to meet our future daily requirements and demands for sustainability.

Algal biofuels may provide a viable alternative to fossil fuels; however, this technology must overcome a number of hurdles before it can compete in the fuel market and be broadly deployed. These challenges include strain identification and improvement, both in terms of oil productivity and crop protection, nutrient and resource allocation and use, and the production and utilization of co-products to improve the economics of the entire system. Microalgae are emerging as potential biomass sources, because of their much higher photosynthetic efficiency, areal productivity and oil content and do not compete with food cultures, arable land, and portable water which have also the possibility of being harvested on a daily basis.



Keeping the view above, a joint collaborative research on microalgae based biorefinery was carried out in between India and Brazil involving Tezpur University, Gauhati University and Indian Institute of Technology Guwahati from India and Federal University of Rio de Janeiro (UFRJ), from Brazil.

5. List of year-wise activities under the collaboration:

Year	Activity
2016-17	Setting principle of the project by Skype meeting/video conferencing with Brazil Collaborator. Finalization of experimental design, Procurement of consumables, setting up of the necessary facilities and optimization, staff recruitment, Trial experiments and preliminary evaluation of results.
2017-18	Conducted of objectives specific experiments and analysis of the result in Tezpur University and other Indian partner Institutes. Unialgal cultures of the microalgae strains (<i>Scenedesmus obliquus</i> and <i>Haematococcus pluvialis</i>) were isolated and raised under controlled laboratory growth conditions. Selection of a particular media for the growth of both the species has been done by observing the growth in different media like BG11, CHU 13, BBM and RM media. Different inorganic and organic carbon sources were tested and also the influence of salinity, pH, and light were observed for the growth of these species. With an aim to make the process cost effective and increased oil yield a number of experiments have been conducted with organic and inorganic media to find out the best method by which more biomass can be generated in a short time and by using lesser amount of chemicals. Brazilian PI Prof. Donato Aranda with Prof. Yordanka visited Tezpur University, IITGuwahati and Gauhati University during February 5-15, 2017.
2018-19	Previous year experiments continued. As per project provision, Mr. Doljit Borah, SRF, Indo-Brazil Project, Tezpur University visited School of Chemistry at Federal University of Rio de Janeiro (UFRJ), Brazil starting June 8, 2018 until December, 2019. During his stay, the Brazilian team counterpart with Mr. Borah worked together in the scheduled experiments described in the Project. Mr. Borah was accompanied by Prof. Dhanapati Deka, Principal Investigator and his period of stay in Brazil was from June 8, 2018 to June 30, 2018.
2019-20	<p>i. Renewable catalyst that was developed last year from bio waste viz. <i>Musa balbisiana</i> peel was used for biodiesel production. Development of renewable heterogeneous catalyst from dewatered and deoiled algal mass is been prepared and used for algal biodiesel production. The catalyst has been characterized by XRD, SEM, TEM, FTIR, EDX etc.</p> <p>ii. An underwater robot ,RAH system was developed and tested in .Gauhati University Raceway Pond for collection of algae.</p>



 Head
 Department of Energy
 Tezpur University

- iii. Oil extraction from algal mass in laboratory scale extraction facilities, oil analysis and utilization of oil for biodiesel production has been carried out. Biodiesel analysis has been done by NMR, and fuel properties determination was carried out by using standard methods.
- iv. Ethanol production from dewatered and deoiled algal mass and analysis the product by latest laboratory technique was carried out.
- v. Work on the development of low cost photo-bio-reactors (PBR) with incorporation of automated control system is under progress.

Signature of Faculty	Signature and Seal of Head of Department/ Centre/ Cell
 <p> Prof. Dhanapati Deka Principal Investigator Department of Energy Tezpur University Tezpur, Assam, India </p> <p> Name: Prof. D. Deka Designation: Professor & PI </p>	 <p> Head Department of Energy Tezpur University </p> <p> Name: Designation: </p>