

Experience

Institute	Place	Job	Duration	Nature of work
Towkok Gr of T Es	Sonari	Management Trainee	June–Sept,1980	Tea garden & factory management
Assam Agril Univ	Jorhat	SRA	April,84-July,85	Farmers field expts, ICAR Scheme
Assam Agril Univ	Jorhat	Lecturer	Aug.85-Dec,85	Teaching UG & PG courses, Res on pulse crops & mutation breed
Assam Agril Univ	Jorhat	Asstt. Prof	Jan,86-Aug,94	As above
Assam Agril Univ	Jorhat	Assoc Prof	Aug,94-April,95	Teaching UG & PG in Agril Biotech, Genet& Plant Breed, Res on BG algae.
Tocklai Expt Station Tea Res Association	Jorhat	Biotechnologist	April,95-Dec,97	Tea tissue & Protoplast cult. genome analysis, genetic transformation, Microb degradation of tea litters etc to value added compost.
Tocklai Expt Station	Johat	Dept Incharge	Dec,97-Aug,2K	Same as above as above.
Tocklai Expt Station	Jorhat	Head of Dept	Sept,00 – Mar,02	
Tezpur University	Tezpur	Professor & Head of Mol Biol & Biotech	March 02- April08	Teaching M Sc & Ph D Res on Petroleum Biotech, genomics & biochem of Medicinal Plants; yeast genomics. Dept managing
Tezpur University	Tezpur	Professor & Dean of Sci & Tech	April 08-Sept 2011	Same as above and School Management
Nagaland University	Lumami	Vice Chancellor	7 th Sept – till date	Academic, administration & Fin Management of the University

Present position with the pay scale

Vice Chancellor of Nagaland University (Central), present basic pay Rs 75,000 + 5,000/-pm.

Research Project carried out as Principal Investigator

Project title	Funding agency	Duration (yrs)	No of sci./ associates	Fund (Rs in lakh)
1. Collection, evaluation and improvement of <i>Azolla-Anabaena</i> symbiosis	ICAR	3 (1994-97)	1 RA	3.70 (completed)
2. Embryo rescue and haploidy for cold tolerant rice improvement	AAU	5 (1993-98)	PG student 1 Scientist (left)	2.00
3. Breeding tomato for fruit size and resis-	AAU	5 (1993-98)	PG student	1.20

tance/tolerance to late blight				1 Scientist (left)
4. Advanced work on Plant Biotechnology	Tea Board	5 (1995-00)	RFs 2	130.00
			2 Scis.	(completed)
5. A study on the utilisation of improved planting materials by the tea industry of NE India	Tea Board	1 (1999-00)	Sci. 1	1.80 (completed)
6. Recycling of tea and other organic wastes to value added compost	DBT	2 (1999-01)	RAs 2	14.30
			Sci. 1	(Completed)
7. Collection, conservation and evaluation of tea germplasm	Tea Board	5 (1999-04)	Scis. 3	40.40
8. Characterisation and improvement of tea through biotechnological tools	DBT	3 (2001-04)	RFs 2	38.20 (left completed)
			RAs 3	
9. Studies on functional genomics of tea, mentha and ashwagandha (New Millenium Technology Initiative: NMITLI)	CSIR	3 (2001-04)		42.00
10. Petroleum Biotechnology	ONGCL	9 (1998-07)	SRFs 2	189.00
11. Medicinal plants of NE India	NMPB	3 (2005-08)	PF 1	10.00
12. Bioremediation of contaminated	ONGC	5 (2009-14)	RF 4	70.03 (Contd)

Research achievements

1. Isolation and cloning of GUS gene into the pBin 19 plasmid; construction of the vector pBI 121 having the marker NPT II and reporter B-glucuronidase (GUS) genes.
2. Mobilisation of plasmid into *Eschericia coli* and *Agrobacterium tumefaciens* using E/pulse.
3. *Agrobacterium tumefaciens*-mediated genetic transformation of sugar beet with NPT II and GUS genes.
4. Electroporation-mediated transient expression of GUS gene in sugar beet protoplasts.
5. Histochemical assaying of GUS gene expression.
6. Polyacrylamide gel electrophoretic determination of GUS protein.
7. Gene copy number determination.
8. Associated with the development of green gram varieties AAU 34 and AAU 39.
9. Standardised the rapid *in vitro* culture technique of sugar beet.
10. Standardised the tissue culture technique of tea with *in vitro* rooting, hardening, accilimatisation and establishment of plants in the field.
11. Isolation and culture of tea protoplasts.
12. Genetic trasformation of tea with *Agrobacterium rhizogenes* carrying the Ri plasmid for hairy root development.
13. Isolation and multiplication of 12 strains each of anaerobic bacteria and fungi involved in the degradation of tea pruning litters and tea garden weeds.

14. Fifteen TV clones were nationally registered at the NBPGR, New Delhi with detailed characterisation including RAPD-based genetic fingerprinting.
15. Developed a bacterial consortium which can degrade crude oil contaminant in 180 d.
16. Isolated bacterial bio-surfactant was found to be much superior (55% recovery) to commercial surfactant SDS in the recovery of crude oil from the saturated sand pack column. The bio-surfactant was found to be stable at 100°C and also in a wide range of pH from 4–12.
- 17 The flavoury compound anethole (86%) was isolated from the wild plant *Etlingera linguiformis*. The chemical can be potentially used in as food and medicine additives. The anti-microbial activity of the compound was assessed. The karyotype and genotype of the plant was determined.
18. Field application of the bioremediation technique by ONGC.
19. Bacterial metabolite biosurfactant in crude oil lifting and recovery.
20. Designing of iron and silver nanobiopolymer particles as drug delivery agent.
21. Extraction and energy characterization of biodiesel from microalgae.

Research management

Tocklai Expt Station, TRA: The institute was in great turmoil when I joined as the Biotechnologist (Sr. Scientist) in 1995 due to prolonged agitation by the employees. There was no work ethics; scientists lost interest to carry on research works. Moreover, the agitating office bearers were mostly from the department of Botany where I joined and took over the charge.

The situation called for our full time effort to get the support of all members to bring back the work culture, regular attendance and punctuality. Clone improvement work which was almost abandoned was brought back to the right track with the preparation for the release of clones TV31 and TV32. The result-less tea biotechnology (tissue culture) work of 12 years was given a sound footing with the planting and cultivation of tissue culture-derived plants in the field.

With a step-by-step approach we were successful in introducing the daily work report by all employees of the department in-spite of the initial stiff resistance. Prior to moving out

of the institute, we could manage to get three mega research projects from Tea Board, DBT and DST.

The result oriented efforts were well appreciated by all concerned including the management, scientists and staff members of the institute.

Tezpur University: At the time of my joining in the department of Molecular Biology & Biotechnology as the lone Professor in March 2002, there were three Lecturers, joined before me in Feb – March 2002. The Reader and HoD left the University; another Reader was removed owing to some legal verdict, the lone Reader left for the USA for Post-doctoral research. It was indeed a very difficult period to carry out teaching and research with fresh three lecturers. We were fortunate to garner support from departments like Chemical Sciences and Mathematics to impart teaching alongside our Lecturers to DBT-sponsored students. We could get full support and cooperation from our students admitted through CEEB. All throughout, scholars and students helped us to manage laboratories. They dedicatedly took part in the organization of various seminars, trainings and also in shifting the entire department to the present building from the temporary shed.

For gearing up the departmental laboratories, M Sc research project was successfully introduced in 2004, long before DBT's decision. At the time of joining, most of the equipment were out of order and few sophisticated ones were lying uninstalled. Necessary repairing and installations were done with full support of the University administration.

The Centre for Petroleum Biotechnology established for five years in 1999 with ONGC's funding lacked progress. With the support of all concerned, bioremediation of contaminant petroleum (microbial consortium) and enhanced oil recovery (bacterial biosurfactant) technologies were subsequently transferred to the funding agency.

From 2005-08, a total of eight scholars obtained Ph D degree from the department. Over sixty research papers so far were published and almost equal numbers presented by faculties in national/international journals and seminars. Almost all our students (95%) have been appointed and pursuing Ph D/Post Doc research in national and international institutes of the country and abroad.

The department succeeded in getting FIST level-I support. A BIF was established in the department with funding of the DBT. We were also assured of providing sizable funding for research and teaching by the DBT. The 11th plan visiting team highly appreciated the

activities of the department. The department was assessed to be the 16th best in the country in biotechnology teaching.

Acted as Resource Person in

1. DBT sponsored popular lecture series for college and university students.
2. DBT sponsored national training and demonstration on tissue culture and genetic engineering
3. ICAR sponsored national training and demonstration on crop germplasm conservation and crop breeding.
4. Summer Institute of Central School, College and University teachers
5. TRA sponsored training of Sr. and Jr. Executives of the tea industry
6. TRA sponsored field management courses.
7. To train state Government officials of Nagaland in tea cultivation and processing.
8. In refresher/training courses of Assam University, Defense Research Laboratory, Assam Agril. University, Regional Research Laboratory etc.

Acted as Referee/Expert/Member in National bodies/research projects/journals

1. Expert member, Assessment Committee, All India Co-ordinated project on *Albizia* species operated by the Indian Forest Research Institute.
2. Referee-Indian Journal of Genetics and Plant Breeding, IARI, New Delhi
3. UGC-Refresher Course Centre-Resource Person on Life Sciences in Assam University, Silchar.
4. Expert Member, Research Committee, National Research Centre on Yak, ICAR, Dirang, Arunachal Pradesh.
5. Organizing Secretary, National Seminar on ‘Hydrocarbon degrading microbes’, 22nd-23rd Dec., 2003.
6. Member, Organizing Committee of the National Workshop on ‘Science & Technology for regional development: case for North east India’. Feb. 3rd – 6th, 2004, Indian Institute of Technology, Guwahati.
7. Expert, nominated by the Director General, ICAR, New Delhi to the DPC for the promotion of ARS scientists.

8. Chairman, Selection Committee for the appointment of Project Assistants/Fellows and Research Associates in RRL, CSIR, Jorhat in 2003, 2004 & 2005
9. External Expert for the appointment and promotion of scientists and others in National Research Institute on Rain Forests and Deciduous Trees, ICFR, Jorhat.
10. External expert for the appointment and promotion of scientists and others in DRL, DRDO, Jorhat.
11. Organizing Secretary, DNA double helix Golden Jubilee National Seminar-cum -Exhibition, Tezpur University (Central), Napaam on 31st October, 2003.
12. Member, National Organizing Committee, First National Symposium on “Muga Silkworm Biochem., Mol. Biol. & Biotech. to improve silk production”, RRL, Jorhat on 11 – 12th Nov., 2004.
13. Expert Member of the Research Council of the Yak Research Centre, ICAR, Dirang, Arunachal Pradesh
14. Member, Board of PG Studies of North East Hill University, Shillong.
15. Member, Planning Board, Rajiv Gandhi University (Central), Itanagar, Arunachal Pradesh.
16. Executive Editor, International J. of Crop Science, India (2007-08)
17. Advisory Board Member, Institute of Biotech. and Allied Sci. Training, Sikar, Rajasthan
18. Reviewer of *J of Genet & Plant Breed*, *Afr. J. of Envnt. Sci. & Tech.* (Permanent), *Colloids and Surfaces B: Biointerfaces*, *J. of Hazard. Mat. and Chemosphere*.
19. Project Evaluator, IGOU, New Delhi.
20. Planning board member of Rajib Gandhi University (Central University)
21. Member of Board of Post Graduate study, Biotechnology and Bioinformatics, NEHU, Shillong.
22. Guwahati Neurological Research Centre: Especially invited talk on Molecular Genetics (2008).
23. Invited talk on CEP on Biomass: Technology intervention for sustainable management (8-12th November, 2010) in Defense Research Laboratory, Tezpur.
24. Act as Organising Secretary of the National Seminar on “Medicinal Plant and Microbe Diversity and their Pharmaceuticals, Deot. Of M.B.B.T., Tezpur University.
25. Sharing a session as Chairman in Session IV of NATPAS, School of Sci. & Tech. 2011.

26. Member of Nomination Council, Infosys Awards.
 27. Expert members of University of Tunku Abdul Rahman (Malaysia), Dibrugarh University, Gauhati University, Agri. University of Raipur and Calcutta University.
 28. Member of the Research Advisory Committee, Central Muga and Endi Research & Training Institute, Central Silk Board, Ministry of Textile, Lakhdogarh, Jorhat, Assam.
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Administrative Experience

1. Member, Board of Studies, Faculty of Agriculture, Assam Agricultural University, Jorhat from August, 1994 to April, 1995.
 2. Incharge, Botany Department, Tocklai Experimental Station, TRA, Jorhat from Dec., 1997 to August, 2000.
 3. Head, Botany Department, Tocklai Experimental Station, TRA, Jorhat from Sept., 2000 to March, 2002.
 4. Member, Scientific Advisory Committee, Tocklai Expt. Station, TRA, Jorhat 1997- 2002.
 5. Member, Agricultural Sub-Committee, Tocklai Expt. Station, TRA, Jorhat from 1997 - 2002.
 6. Head, Deptt. of Mol. Biology & Biotechnology, Tezpur University (Central), Napaam, Tezpur from April, 2002 - 2008.
 7. Member, Research Committee, Tezpur University, Napaam, Tezpur from April 2002 to 2004.
 8. Chairman, Board of Studies, Deptt. of Mol. Biol. & Biotechnology, Tezpur University, Napaam, Tezpur from April, 2002 to till date.
 9. Chairman, Departmental Research Committee, Deptt. of Mol. Biol. & Biotechnology, Tezpur University(Central), Napaam, Tezpur from April, 2002 to till date.
 10. Chairman, Training & Placement Com, Tezpur University, Napaam, Tezpur, 2003 to 2004.
 11. Chairman, Quality Control Committee, Tez Univ, Napaam, Tezpur from 2003 to till date.
 12. Member, Security Committee, Tezpur University Napaam, Tezpur from 2003 to till date.
 13. Chairman, Quarter Allotment Committee, Tezpur University, Napaam, Tezpur 2008 – 2011.
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14. Member, Review Committee, Act, Statutes and Ordinances of the Tezpur University in 2003.
 15. Member, Library Committee, Tezpur University Napaam, Tezpur from April, 2002 -2011.
 16. Presenting Officer, Tezpur University Napaam, Tezpur twice in 2003 and in 2004.
 17. Member, Space Allotment Committee, Tezpur University Napaam, Tezpur for 2004-06.
 18. Member, Insurance Investment Com, Tez Univ, Napaam, Tezpur from 2003 to till date.
 19. Member, Purchase Improvement Committee, Tezpur University, Napaam, Tezpur, 2003.
 20. Head, ONGC-sponsored Centre for Petroleum Biotechnology, Tezpur University, Napaam, Tezpur from April, 2002 to 2008.
 21. Secretary, Executive Committee, Centre for Petroleum Biotechnology, Tezpur University, Napaam, Tezpur from April, 2002 to 2008.
 22. Chairman, Construction Monitoring Team, Tezpur University, Napaam from 2007.
 23. Member, Panning and Academic Committee, TU, Napaam from 2002 - 06.
 24. Member, Academic Council, Tezpur University, Napaam, from 2006.
 25. Member, Board of Management, Tezpur University, Napaam from 2005 – 07 & 2010-11.
 26. Dean, School of Science & Technology, TU, Napaam, Tezpur 2008 -2011.
 27. Chairman, Grievance Redressal Committee, TU, Napaam.
 28. Chairman, Campus Beautification Committee, TU, Napaam.
 29. Director/Coordinator, IQAC (NAAC), TU, Napaam 2005 to 2011.
 30. Remained In-charge VC Office thrice during the station leave of the Permanent VC.
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Industrial Research

1. Tocklai Experimental Station, Tea Research Association, Jorhat is the premier organization carrying out research exclusively on the Indian Tea Industry. I had the experience of working as a senior scientist and Head of the Botany Deptt. of the Organization for 7 years.
2. In Tezpur University, Napaam, Tezpur, Assam Headed the ONGC sponsored Centre for Petroleum Biotechnology for 8 years.
3. Establishment of the Centre for Petroleum Biotechnology as a permanent one from 2010 with ONGC and Tezpur University funding.
4. Secured an industry (ONGC) project as the PI with Rs 70.03 lakh in 2009 for five years.

Syllabus prepared

1. Agricultural Biotechnology at Assam Agril. University, Jorhat, Assam
2. Molecular Biology & Biotechnology in Tezpur University, Tezpur, Assam
3. *Part of Food Processing & Technology (FPT): Microbiology, Food Microbiology and Food Biotechnology (for establishing the Dept of FPT in TU, Tezpur)*
4. *Nanotechnology course (in part)*
5. Five year Integrated Biotechnology programme course syllabus.
6. Preparation M Sc Mol Biol & Biotechnology syllabus in line with DBT national syllabus.
7. *M Sc in Forest Sciences, Nagaland University, Lumami*
8. *M Sc in Environment Sciences, Nagaland University, Lumami*
9. *Biotechnology, Nagaland University, Lumami*
10. *Centre for Earth Science, Nagaland University, Lumami*
11. *Centre of Advance Biosciences, Nagaland University, Lumami*

Teaching Courses

Genetics and Cytogenetics, Genetic Engineering, Advanced Genetic Engineering (Ph D), Plant Tissue and Cell Culture, Plant Biotechnology, Management and Legal Issues in Biotechnology (IPR and Patenting), Nanotechnology, Bioelectronics (Biology part), *Food Microbiology, Food Biotechnology (teaching since the establishment of the Dept of FPT in TU in 2005)*, Basic Biology and Environment Biotechnology.

Departmental achievements during the Headship

1. The Department of Mol Biol & Biotechnology, Tezpur University was adjudged to be the 16th best in the country in a nation-wide survey conducted by IIM on behalf of the DBT, Govt of India. In fact it is the best in East and North-East and 9th in North, East and NE India.
2. The Department was provided special assistance of Rs. 10.0 lakh by the UGC for limited infrastructure creation.
3. The Department was granted FIST-level 1 grant (*ca.* Rs. 2.0 crore) by the Department of Science & Technology, Govt. of India.
4. The Department was sanctioned an amount of Rs 3.00 crore by the Department of Biotechnology for infrastructure development under a special assistance program.

5. During the last seven years the Department generated about Rs. 4.50 crore external funding through various research projects granted by DBT, NMPB, DRL and the oil industry ONGC.
6. Faculties of the Department published about 50 research papers in good impact factor bearing national and international journals.
7. About 85% of the passed out students are pursuing higher studies securing various fellowships in some of the best national (CCMB, IISc, JNU, BARC, IITG etc) and international institutes in Germany, USA, Singapore etc; 12% in jobs in University, College and Industry.
8. Obtained the SAP programme of UGC.
9. More than 36 of 100 students cleared UGC/CSIR NET-JRF, DBT-JRF, ICMR-JRF, GAT in during 2002-2008.

Experience in Laboratory building layout and Institutional Budget

Tocklai Expt. Station, TRA, Jorhat: Designed the floor area and labs in the new Botany & Biotechnology (1,600 sq m) building, shifted the entire 90 year old dept to the new building in 1999.

Tezpur University, Tezpur, Assam: The Dept of Mol Biol & Biotech was shifted to the allotted administrative building from a temporary shed in 2004. The big halls were modified as per requirement of laboratories with glass walls.
Construction New Biotechnology building and shifting of the Dept in to it.
Preparation of 10th and 11th five year Plan budget.

Nagaland University, Lumami:

1. Preparation of Status papers on the University all four campuses and submitted to the MHRD.
2. Preparation of the 12th five year Budget proposal.
3. Reorganization of Administration and Establishment under new Registrar (i/c) and two Deputy Registrars.
4. Reorganization and revamping of Examination and Academic sections under new CoE (i/c) and two new Deputy Registrars.

5. Starting of the Boys' Gymnasium at HQ: Lumami.
6. Construction of Play Ground and one Ph D Girls' Hostel, Women Play ground and other facilities, establishment of Day Care Centre and a KV school at HQ: Lumami.
7. Construction of KVK, Lumami Administrative and Housing buildings.
8. Construction of Administrative, Academic, Hostel and Housing buildings in Kohima Campus, Meriema.
9. Construction of Administrative, Two Academic, Library and Hostels in Medziphema (SASRD).
10. Library automation in all three campuses of the University.

Research Contribution

Pre – Doctoral Research

Since joining as a Lecturer in Assam Agricultural University (Deptt. of Plant Breeding & Genetics) I started working on pulse crops like soyabean and greengram alongwith my teaching assignments. The sole cause for the attraction towards pulse crops was 'dietary protein deficiency' in NE India.

Green gram: In collaboration with the Asian Vegetable Research and Development, Taiwan 120 breeding lines of green gram were assessed in the University. Two high yielding varieties were developed and released as AAU34 and AAU39.

Fruit size improvement and late blight tolerance in tomato

The wild tomato species *Lycopersicon pimpinellifolium*, resistant to late blight disease was hybridized with the variety VC 48-1 (*L. esculentum*). Lines with large fruits and tolerance to the disease were selected.

(a) Doctoral Research (including DIC)

Genetic transformation of sugarbeet

A rapid and large scale multiplication through tissue culture of this crop was standardized. Suspension culture and leaf mesophyll protoplasts were successfully isolated and cultured with the development of macro-calli.

The marker NPT II and reporter GUS genes were cloned in to plasmids pBin 19 and pUC8: GUS using CaMV-35S promoter and NOS-terminator sequences. The recombinant plasmids were mobilized in to *A. tumefaciens* by tri-parental mating and finally genes were transferred in to sugar beet. A total of 40-50 copies were integrated in 6 different sites of the sugar beet genome and expressed.

(b) Research after the Doctoral period

Embryo rescue and haploidy in cold tolerant rice improvement:

Boro season is the best for rice cultivation in Assam. But, most of the high yielding varieties can not be cultivated during this season due to their cold injury during tillering, flowering and grain filling resulting in low productivity. Japonica varieties are cold tolerant; but hybridization with indica varieties for the transfer of this trait leads to hybrid seed sterility and immature seed drop.

Japonica 4 varieties were crossed with five indica varieties. The immature hybrid embryos were cultured in suitable media. The F₁ plants obtained were planted in pots and F₂ plants were developed through selfing. The F₂ plants exhibited tolerance to low temperature during winter.

Cytogenetic study of diploid and colchiploid tea

The karyotype of Assam tea (*Camellia assamica*), China tea (*C. sinensis*) and Cambod tea (*C. assamica* ssp lasio calyse) was established. Tetraploid shoots were developed by treating buds with 0.2% colchicine.

Externally funded projects

At AAU, Jorhat: ICAR Project: Study on morphogenetic variation in *Azolla pinnata*

& *Anabaena azollae* (Rs 10.0 lakh)

Azolla strain collected from different parts of the region were studied for their growth and development. Their cultivation practices under laboratory condition throughout the year was standardized. A total of 19 strains were found to be fast growing. The BGA from leaf cells was isolated and the characteristics like cells and heterocysts per chain/per cell as well as their nitrogen fixing ability were studied. Two strains were found to be better nitrogen fixer. The plasmid DNA was isolated from each strain of BGA. Most of the strains were found to contain only one plasmid except one having two plasmids. Esterase and GOT

isozymes were studied in *Azolla* strains; the strains were found to have 4 loci for the esterase and 2 loci for GOT.

At Tocklai

Tea Board 8th plan project – Application of biotechnology in tea (Rs 1.33 crores)

Tea tissue culture was standardized with the field establishment of plants. Three somaclonal variant clones were identified to be tolerant to the pest ‘tea mosquito bug (*Helopeltis theivora*)’. The technique of genetic transformation by infecting *in vitro* tea shoots with *Agrobacterium rhizogenes* carrying the root hair inducing Ri plasmid. The transformed tea shoots produced roots not only from the base but also from all over the surface.

Tea Board project – Use of improved planting materials by the tea industry of NE

India (Rs 2.0 lakh)

Since 1949 Tocklai developed 195 improved cultivars of tea (30 TV, 151 TRA/garden clones and 14 bicalonal seed stocks). Commercial cultivation of improved cultivars began since 1955-60. In 1960, tea productivity in NE India was about 900 kg/ha MT. But; with the popularization of improved cultivars, productivity increased beyond 1,800 kg/ha MT by 1999-2000. The area under improved cultivars has increased from 0% in 1955-60 to 48.6% in 1999-2000.

DBT project – Recycling of tea and other organic wastes to value added compost

(Rs 16.0 lakh)

Vermi-composting of tea pruning litter was found to be ineffective. On the basis of composting ability through weight reduction, nutrient (N:P:K) enrichment, cellulose and pectin degradation and production of cellulase enzyme 6 bacterial and 7 fungal strains were used to formulate a mixed microbial broth for the anaerobic composting of tea garden weeds and tea pruning litters. The compost produced contained 3-4 fold more nitrogen and phosphorous as compared to the raw material (N-0.8%, P₂O₅-0.1% and K₂O-1.1%). However, there was a depletion of potassium.

Tea Board 9th Plan Project – Collection, conservation and evaluation of tea germ-plasm (Rs 39.0 lakh)

Establishment of Tea Field Gene Bank: Under the project we have established the largest Tea Field Gene Bank of the country in the station with 2,303 germplasm accessions. The bank has been developed as a National facility.

Categorization and characterization of accessions: Germplasm accessions have been categorized on the basis of their resemblance to Assam, China, Cambod and hybrid types and also on various branch and leaf characteristics. Metric and other morphological, physiological, anatomical and biochemical characters of the germplasm accessions were also studied. Characterization at molecular level, starting with TV and generative clones, has been taken up using 16 different oligo-primers. Banding profile of genomic DNA of the clones has been documented for registration purpose.

CSIR NMITLI coordinated project (New) – Functional genomics of tea, mentha and Aswagandha (Rs 40.0 lakh)

Under the project biochemical analysis of total catechins, EC, ECG, EGCG has been done from the shoots of extreme type clones. Owing to joining in Tezpur University, the PIship was handed over to the Head & Dy Director, Biochemistry, TES, TRA, Jorhat.

DBT-coordinated project –Characterization and Biotechnological improvement of tea (Rs 40.0 lakh)

Just after the receipt of the sanction letter of the project, the PIship was handed over to the Head & Dy Director, Biochemistry, TES, TRA, Jorhat.

At Tezpur University

ONGC sponsored project: Petroleum biotechnology (Rs 1.89+0.57crores, Industrial)

1. Developmental bacterial consortia to degrade petroleum hydrocarbon contamination

Under the ONGC-sponsored Petroleum biotechnology project, two bacterial consortia were developed which could degrade crude oil contamination from soil in 180 days. The bio-remediated soil was found to be suitable for the cultivation of rice crop. In field scale bio-remediation experiments, the bacterial consortia developed could reduce 10 and 20% crude oil contamination level to 3 - 5% in 180 days making it suitable for rice cultivation. The technology generated has been tried in a Group Gathering Station of ONGC, Jorhat, Assam.

2. Bio-surfactant in microbial enhanced oil recovery

Bio-surfactant producing 4 bacterial isolates was obtained from oil well sites of Assam and Assam-Arkan basin. The bio-surfactant was isolated, purified and dried for subsequent

use. The microbial bio-surfactant was bio-chemically characterized and was found to be mostly rhamnolipids, C₈₋₁₀ and C₁₀₋₈. The bio-surfactant could recover 60% crude oil from saturated sand pack column, which was 4 – 5 times higher than the commercial surfactant sodium dodecyl sulphate (SDS). The requirement of the bio-surfactant was lower than that of SDS for the critical micelle concentration (CMC). The bio-surfactant was found to be thermo-stable at 100°C and also stable over a wide range of pH 4 – 11. Bio-surfactant was also found to enhance bio-remediation of crude oil as well as solubility of polycyclic aromatic hydrocarbon component of crude oil, which are highly carcinogenic and hydrophobic in nature.

National Medicinal Plants Board sponsored project – Assessment of medicinal plants of North East India used in different ailments (Rs 10.0 lakh)

1. Isolation and structural elucidation of an aromatic compound from medicinal plant

The flavoury compound from the medicinal plant *Etlingeria llinguiformis* f. *assamica* was isolated. The compound was identified to be anethole. The rhizome of the plant possesses the highest composition of anethole with 86% as compared to 82-84% in anise seed. The compound has the vast potentiality for the food and medicinal industries.

Chromosome number, Karyotype and genome size of the plant were determined. For genome size determination, a new method was developed and published.

2. Nutraceutical potentiality of *Spondias pinnata* (amara)

The mature Fruits of this perennial local plant of North East India was found to be rich in crude protein, crude fiber, starch and reducing sugars. The fruits were also found to be rich in mineral compositions of phosphorous, iron, calcium and potassium.

3. Antimicrobial activity of fruit extracts of *Meyna spinosa* (kutkura)

The methanolic extract of the fruits of the medicinal plant *Meyna spinosa* possessed antimicrobial activity against the bacteria *Bacillus subtilis*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Escherichia coli* and yeast *Candida albicans*.

4. Karyotype determination of *Schumannianthus dichotmus*, a traditional plant of Assam

The karyotype study of this perennial shrub revealed chromosome number to be 2n=20, with the total genome length of 12.7 µm. The length of chromosome was found to vary between 0.8 – 2.2 µm with the predominance of metacentric and sub-metacentric behaviour.

Bioremediation of crude oil-contaminated soil – ongoing

Genomics of yeasts used in the traditional beer industry of Assam

The starter culture used by the Ahom community of Assam for the preparation of homestead liquor contains a yeast load of 5.06×10^6 per g and fungal load of 5.92×10^6 per g. Three yeast isolated were identified as *Candida versatilis* and 2 fungal strains isolated were identified as *Mucor indicus* and *Amylomyces rouxii*. The fungal species hydrolyze starch to glucose prior to fermentation by yeast to alcohol.

Bioremediation of crude oil contaminated soils (ONGC funded, Rs. 70.03 lakh for 5 yrs)

The project has been started from April, 2009. We have could identify some bacterial products which could reduce the bioremediation time period from 180 days (generated under the ONGC-Petroleum biotechnology project). Moreover, we isolated a number of new bacterial isolates showing potential for the task.

Two very promising bacterial isolated were isolated and cultured for the production of biopolymer. The polymer was biochemically characterized to be one of the best.

Biosurfactant producing superior bacterial stains and culture media were formulated. The biosurfactants were found to be superior.

Carbon sequestering and biodiesel producing micro algae were isolated and their culture conditions were standardized. Two strains were found to be very promising.

Metagenomic and Bioinformatics research

The stated research works have been carried out with three Ph D scholars since the last three years for the exploitation of industrial enzymes.

Supervision of Students/Scholars

Completed: M. Sc. research project supervision - 36 nos.

Ph D research - 06

On-going: Ph. D. research project supervision - 08

Ph D Scholars and title of thesis (completed)

1. Dr. Naba Bordoloi: Biochemical and molecular characterization of certain bacteria for application in bioremediation of petroleum contaminated soil.
2. Dr. Dhiren Chowdhury: Floral biology, karyotype, biochemical and genomic study of

Etilingera species – A medicinal and aromatic plant.

3. Dr. Ranjan Kandali: Structural elucidation of major bioactive compounds and genome analysis of *Spondias pinnata* Kurz and *Streblus asper* Lour.
Associate Professor, Bishwanath College of Agriculture
4. Dr. Jitu Buragohain: Assessment on biodiversity of medicinal plants: cytological, biochemical and molecular characterization of a few major plants.
5. Dr. Khanindra Ratna Barman: Biochemical and molecular genetic assessment of yeast strains used by certain tribal communities of Assam in alcohol production”.
6. Dr. Jyoti Prasad Saikia: Molecular and Biochemical characterization of four Araceae species.

Ph.D. Scholars (Continuing)/Research Group

1. Pinkee Phukon: Bacterial Biopolymer.
2. Pranjal Bhorali: Bioremediation of Crude oil contaminated soil.
3. Moyur Mousum Phukon: Algal Biodiesel.
4. Angana Ray: Phytopharmaceuticals for Hair Growth
5. Krishna Gogoi: Isolation of medicinal compound and use of waste for alcohol production.
6. Kalpana Sagar: Metagenomics.
7. Yasir Basir: Metagenomics.
8. Salam Pradeep Singh: Metagenimics through bioinformatics tools (RA)

Patents: Obtained

1. ‘Bioremcons’ No. 264/KOL/2010
 2. ‘Biosurf’ No. 265/KOL/2010
- Filed: 3

DNA sequences deposited in Gene banks

1. Pseudomonas aeruginosa strain BP C1 16S ribosomal RNA gene, partial sequence

GenBank: **JQ796859.1** [FASTA Graphics](#)

LOCUS JQ796859 1471 bp DNA linear BCT 16-MAY-2012

DEFINITION Pseudomonas aeruginosa strain BP C1 16S ribosomal RNA gene, partial sequence. ACCESSION JQ796859 VERSION , JQ796859.1

GI:387305311

KEYWORDS. SOURCE Pseudomonas aeruginosa ORGANISM [Pseudomonas aeruginosa](#)

Bacteria; Proteobacteria; Gammaproteobacteria; Pseudomonadales; Pseudomonadaceae; Pseudomonas.

REFERENCE 1 (bases 1 to 1471) AUTHORS Phukon,P. and Kumar,B.K.

TITLE Genome sequence of biopolymer producing Pseudomonas aeruginosa isolated from crude oil contaminated soil, JOURNAL Unpublished

REFERENCE 2 (bases 1 to 1471) AUTHORS Phukon, P. and Konwar, B.K.

TITLE Direct Submission

JOURNAL Submitted (16-MAR-2012) Molecular Biology & Biotechnology, Tezpur University, Napaam, Tezpur, Assam 784028, India

2. Pseudomonas aeruginosa strain BP C2 16S ribosomal RNA gene, partial sequence

GenBank: JQ866912.1 [FASTA Graphics](#)

LOCUS JQ866912 1440 bp DNA linear BCT 23-MAY-2012

DEFINITION Pseudomonas aeruginosa strain BP C2 16S ribosomal RNA gene, partial sequence.

ACCESSION JQ866912 VERSION JQ866912.1 GI:387912650

KEYWORDS, SOURCE Pseudomonas aeruginosa

ORGANISM [Pseudomonas aeruginosa](#)

Bacteria; Proteobacteria; Gammaproteobacteria; Pseudomonadales; Pseudomonadaceae; Pseudomonas.

REFERENCE 1 (bases 1 to 1440) AUTHORS Phukon, P. and Konwar, B.K.

TITLE Molecular identification of extremophilic Pseudomonas by 16S rDNA sequence

JOURNAL Unpublished REFERENCE 2 (bases 1 to 1440)

AUTHORS Phukon,P. and Konwar,B.K.

TITLE Direct Submission

JOURNAL Submitted (30-MAR-2012) Molecular Biology & Biotechnology, Tezpur University, Napaam, Tezpur, Assam 784028, India

3. Pseudomonas aeruginosa strain BBK9 16S ribosomal RNA gene

GenBank flat file: LOCUS JX843420 733 bp DNA linear BCT 26-NOV-2012

DEFINITION Pseudomonas aeruginosa strain BBK9 16S ribosomal RNA gene, partial sequence, ACCESSION JX843420, VERSION JX843420

KEYWORDS

SOURCE Pseudomonas aeruginosa, ORGANISM Pseudomonas aeruginosa

Bacteria; Proteobacteria; Gammaproteobacteria; Pseudomonadales; Pseudomonadaceae; Pseudomonas.

REFERENCE 1 (bases 1 to 733)

AUTHORS Bharali,P. and Konwar,B.K.

TITLE Direct Submission

JOURNAL Submitted (18-SEP-2012) Department of Molecular Biology and Biotechnology, Tezpur University, Nappaam, Tezpur, Assam 784028, India

COMMENT ##Assembly-Data-START##

Sequencing Technology :: Sanger dideoxy sequencing

##Assembly-Data-END##
FEATURES Location/Qualifiers, source 1..733, /organism="Pseudomonas aeruginosa"
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rRNA <1..>733, /product="16S ribosomal RNA"

04. *Pseudomonas aeruginosa* strain JBK7 16S ribosomal RNA gene

LOCUS JX843421 686 bp DNA linear BCT 26-NOV-2012
DEFINITION *Pseudomonas aeruginosa* strain JBK7 16S ribosomal RNA gene, partial
sequence., **ACCESSION** JX843421, **VERSION** JX843421

KEYWORDS

SOURCE *Pseudomonas aeruginosa*, **ORGANISM** *Pseudomonas aeruginosa*
Bacteria; Proteobacteria; Gammaproteobacteria; Pseudomonadales;
Pseudomonadaceae; *Pseudomonas*.

REFERENCE 1 (bases 1 to 686)

AUTHORS Bharali,P. and Konwar,B.K.

TITLE Direct Submission

JOURNAL Submitted (18-SEP-2012) Department of Molecular Biology and
Biotechnology, Tezpur University, Nappam, Tezpur, Assam 784028,
India

COMMENT ##Assembly-Data-START##

Sequencing Technology :: Sanger dideoxy sequencing, ##Assembly-Data-END##

FEATURES Location/Qualifiers
source 1..686, /organism="Pseudomonas aeruginosa", /mol_type="genomic DNA"
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rRNA <1..>686
/product="16S ribosomal RNA"

05. *Pseudomonas aeruginosa* strain JBK1 16S ribosomal RNA gene

LOCUS JX843422 854 bp DNA linear BCT 26-NOV-2012
DEFINITION *Pseudomonas aeruginosa* strain JBK1 16S ribosomal RNA gene, partial
sequence., **ACCESSION** JX843422, **VERSION** JX843422

KEYWORDS

SOURCE *Pseudomonas aeruginosa*, **ORGANISM** *Pseudomonas aeruginosa*
Bacteria; Proteobacteria; Gammaproteobacteria; Pseudomonadales;
Pseudomonadaceae; *Pseudomonas*.

REFERENCE 1 (bases 1 to 854), **AUTHORS** Bharali,P. and Konwar,B.K.

TITLE Direct Submission

JOURNAL Submitted (18-SEP-2012) Department of Molecular Biology and
Biotechnology, Tezpur University, Nappam, Tezpur, Assam 784028,
India

COMMENT ##Assembly-Data-START##,

Sequencing Technology :: Sanger dideoxy sequencing, ##Assembly-Data-END##

FEATURES Location/Qualifiers
source 1..854, /organism="Pseudomonas aeruginosa", /mol_type="genomic DNA"

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/db_xref="taxon:287"
rRNA <1..>854, /product="16S ribosomal RNA"

06. Pseudomonas aeruginosa strain BBK1 16S ribosomal RNA gene

LOCUS JX843423 674 bp DNA linear BCT 26-NOV-2012
DEFINITION Pseudomonas aeruginosa strain BBK1 16S ribosomal RNA gene, partial
sequence., **ACCESSION** JX843423, **VERSION** JX843423
KEYWORDS .
SOURCE Pseudomonas aeruginosa, **ORGANISM** Pseudomonas aeruginosa
Bacteria; Proteobacteria; Gammaproteobacteria; Pseudomonadales;
Pseudomonadaceae; Pseudomonas.
REFERENCE 1 (bases 1 to 674)
AUTHORS Bharali,P. and Konwar,B.K.
TITLE Direct Submission
JOURNAL Submitted (18-SEP-2012) Department of Molecular Biology and
Biotechnology, Tezpur University, Nappam, Tezpur, Assam 784028,
India
COMMENT ##Assembly-Data-START##
Sequencing Technology :: Sanger dideoxy sequencing, ##Assembly-Data-END##
FEATURES Location/Qualifiers
source 1..674
/organism="Pseudomonas aeruginosa", /mol_type="genomic DNA"
/strain="BBK1", /isolation_source="crude oil contaminated soil"
/db_xref="taxon:287"
rRNA <1..>674, /product="16S ribosomal RNA"

Publications of Prof. Bolin Kumar Konwar

Articles on Science topics - English 15 Assamese – 70 Book and chapters: 03
Popular articles (Assamese): 62 Project reports: 12 Scientific reports: 12

List of Research Publications/Presentations – 188 (a: 63 + b: 41 + c: 84)

(a) Publications in referred national and international journals

01. Environmental influence on the estimates of genetic parameters in soybean. **Konwar, B. K.** and Talukdar, P., *J. Res* 5 (2): 135-142, 1984.
02. Environmental sensitiveness of genetic association of yield and yield attributing characters in soybean (*Glycine max* L. Merrill.). **Konwar, B. K.** and Talukdar, P., *J. Res.* 5 (2): 9-14, 1987.
03. Pattern of genetic variability in soybean. **Konwar, B. K.**, *J.Res.* 11 (1): 20-25, AAU, Jorhat, Assam, 1991.

04. *Agrobacterium tumefaciens*-mediated genetic transformation of sugar beet (*Beta vulgaris* L.), **Konwar, B. K.**, *Plant Biochem. & Biotech.* 3: 37-41, 1994.
05. Genetic engineering in tea: I. molecular genetic markers. Bera, B., **Konwar, B. K.** and Singh, I. D. *Two and a Bud*, 42(1): 2-6, 1995.
06. Genetic engineering in tea: II. gene transfer. **Konwar, B. K.** *Two and a Bud*, 42(2):13-20, 1995.
07. Isolation and culture of leaf mesophyll protoplasts of sugar beet. **Konwar, B. K.**, *Crop Improvement* 20 (1):69-77, 1993.
08. Plant regeneration in three genotypes of sugar beet. **Konwar, B. K.**, *Crop Improvement*, 20 (1): 88-97, 1993
09. Genetic variability in pigeon pea. **Konwar, B. K.** and Hazarika, M. H. *Crop Improvement* 15 (1): 100-104, 1988.
10. Environmental impact on different characteristics of soybean (*Glycine max* L Merrill.). **Konwar, B. K.** and Talukdar, P., *Soybean Genetics Newsletter*, Iowa State University, USA12: 28-32, 1988.
11. Stability analysis of yield and its components in soybean. **Konwar, B. K.** and Talukdar, P., *Crop Improvement* 13 (1): 172-175, 1986.
12. Phenotypic stability of soybean genotypes for field germination. Talukdar, P. and **Konwar, B. K.**, *Soybean Genetics Newsletter*, Iowa State University, USA 11: 38-41, 1984.
13. Japonica x indica rice hybrids through embryo rescue technique. Sarma, D., **Konwar, B. K.** and Deka, P. C. *Rice Biotechnology Quarterly* Vol. 25, 1996, RBQ 9.
14. Patenting and its application for the legal protection of crop plants including tea. **Konwar, B. K.**, *Two and a Bud* 45 (1): 5-7, 1998.
15. Hairy root development in tea through *Agrobacterium rhizogenes*-mediated genetic transformation. **Konwar, B. K.**, Das, S. C., Bordoloi, B. J. and Dutta, R. K., *Two and a Bud* 45 (2): 21-22, 1998.
16. Female fertility in clones KP 6/25 and Mornoi 30, Ahmed, N. and **Konwar, B. K.**, *Two and a Bud* 46 (2): 37-39, 1999.

17. Rooting of in vitro shoots and field establishment of tissue culture-derived tea plants in the field. **Konwar, B. K.**, Bordoloi, B. J., Dutta, R. K. and Das, S. C., *Two and a Bud* 46 (2): 26-32, 1999.
18. Biodiversity of tea in North East India and their conservation at Tocklai. **Konwar, B. K.**, *Two and a Bud* 46 (2): 7-12, 2001.
19. Transient expression of B-glucuronidase activity in electroporated sugar beet protoplasts. **Konwar, B. K.**, *JASS* 10(1):14-18, 2001.
20. Biodiversity and molecular characterization of tea genetic resources using DNA markers. Bera, B. **Konwar, B. K.**, Saikia, H. and Mazumder, S. C., *Two and a Bud* 49, 2005: 30 – 37.
21. Morphophenology and karyotype study of *Patidoi* (*Schumannianthus dichotomus* (Roxb.) Gagnep. synonym *Clinogyne dichotoma* Salisb.) – a traditional plant of Assam. Dhiren Chowdhuri and **Bolin Kr. Konwar** (2006). *Curr. Sci*, Vol. 91 (5): 648.
22. A new less expensive method for genome size determination of plants. **B.K. Konwar**, D. Chowdhury, J. Buragohain & R. Kandali (2007). *Asian J. Plant Sci.* 6 (3): 565 – 567.
23. Ethnomedicinal plants used in skin diseases by some Indo-Mongoloid communities of Assam. Jitu Buragohain and **B. K. Konwar** (2007). *Asian J. Expt. Sci.* 21 (2): 283- 290.
24. An efficient and reliable method of DNA extraction from *Meyna spinosa*: a traditional medicinal plant from North East India. Jitu Buragohain and **B. K. Konwar** (2008). *J of Biochem and Biotech* 17 (1): 103-105.
25. Microbial surfactant-enhanced mineral oil recovery under laboratory conditions. Bordoloi, N. K. and **Konwar, B. K.** (2008). *Colloids and Surfaces B: Biointerfaces* 63: 73 - 82.
26. Genome size determination of *Zanthoxylum oxyphyllum* and *Meyna spinosa* by flow cytometry: A preliminary study. Jitu Buragohain and **B. K. Konwar** (2008). *J Cell Tissue Research* 8(1): 1249-1252.
27. Bacterial biosurfactant in enhancing solubility of petroleum hydrocarbons. **B. K. Konwar** and N. K. Bordoloi (2008). *Journal of Petrotech Society* V: 45-52.
28. Genome size determination of *Zanthoxylum oxyphyllum* and *Meyna spinosa* by flow cytometry: a preliminary study. Buragohain, J. and **Konwar, B. K.** (2008). *Journal of Cell and Tissue Culture* 8: 1249-1252.

29. Bacterial biosurfactant in enhancing solubility and metabolism of petroleum hydrocarbons. N. K. Bordoloi and **B. K. Konwar**. *Journal of Hazardous Materials* 170 (2009): 495-505.
30. Investigation of antioxidant property of iron oxide particles by 1¹-1¹ diphenylpicrylhydrazyle (DPPH) method. S. Paul, J. P. Saikia, S. K Samdarshi and **B. K. Konwar** (2009). *Journal of Magnetizm and Magnetic Materials*, 321 (21): 3621-3623 (November).
31. Biocompatible epoxy modified bio-based polyurethane nanocomposites: mechanical property, cytotoxicity and biodegradation. Suvangshu Dutta, Niranjana Karak, Jyoti Prasad Saikia and **Bolin Kumar Konwar** (2009). *Bioresource Technology*, 100 (24): 6391-6397 (December).
32. Antioxidant activity and haemolysis prevention efficiency of polyaniline nanofibers. Somik Banerjee, Jyoti P. saikia, A. Kumar, **B. K. Konwar** (2010). *Nanotechnology* 21: 045101 (8pp).
33. Antibacterial property of medicinal plants used in Assamese traditional medicine for the treatment of dysentery and diarrhea. Luna Barooah and **B. K. Konwar** (2010). *Journal of Eco-friendly Agriculture* 5 (1):40-42:2010.
34. Swift heavy ion irradiation induced enhancement in the antioxidant activity and biocompatibility of polyaniline nanofibers. A Kumar, Somik Banerjee, Jyoti P saikia and **B K Konwar** (2010). *Nanotechnology* 21: 175102 (8pp, cited in **Nature India**).
35. Nickel oxide nanoparticles: A novel antioxidant. Jyoti Prasad Saikia, Samrat Paul, **Bolin Kumar Konwar**, Sanjoy Kumar Samdarshi (2010). *Colloids and Surfaces B: Biointerfaces* 78: 146 – 148.
36. Biodegradation of Epoxy/MF Modified Polyurethane Films Derived From a Sustainable Resource. Suvangshu Dutta, Niranjana Karak, Jyoti Prasad Saikia and **Bolin Kumar Konwar**. (2010). *Journal of Polymer and Environment* (DOI 10.1007/s10924-010-0161-8), ISSN: 1572 – 8900 (Electronic version) IF: 1.51.
37. Physicochemical properties of starch from aroids of north east India. Jyoti Prasad Saikia, **B K Konwar** (2009), *International Journal of Food Properties* (DOI10.1080/10942912.2010.491929), ISSN: 1532–2386, IF: 1.165 (<http://www.tandfonline.com/doi/abs/10.1080/10942912.2010.491929>).

38. Ultrasonication: enhances the antioxidant activity of metal oxide nanoparticles. Jyoti Prasad Saikia, Samrat Paul, **Bolin Kumar Konwar**, Sanjoy Kumar Samdarshi (2010). *Colloids and Surfaces B: Biointerfaces* 79: 521 – 523.
39. Biocompatible novel starch/polyaniline composites: characterization, anti-cytotoxicity and antioxidant activity. Jyoti Prasad Saikia, Somik Banerjee, **Bolin Kumar Konwar**, Ashok Kumar (2010). *Colloids and Surfaces B: Biointerfaces* 81: 158 - 64.
40. Biochemical composition and bioactivity of four edible aroids. J. P. Saikia and **B. K. Konwar** (2010), *Journal of Root Crops* (<http://www.isrc.in/ojs/files/journals/5/articles/161/submission/review/161-384-1-RV.doc>), ISSN: 0378-2409, ICR NAAS rating 4.0.
- 41 ‘Poly (ethyl glycol)-magnetic nanoparticles-curcumin’ trio: directed morphogenesis and synergistic free radical scavenging. Rocktotpol Konwar, Jyoti Prasad Saikia, Niranjan Karak, **Bolin Kumar Konwar**. (2010). *Colloids and surfaces B: Biointerface* 81: 578 – 586.
42. Synthesis of silver–polystyrene nanocomposite particles using water in supercritical carbon dioxide medium and its antimicrobial activity. I.R. Kamrupi, Pinkee Phukon, **B. K. Konwar** and S.K. Dolui. (2011). *The Journal of Supercritical Fluids*. Vol 55: 1089-1094.
43. Microalgae *Chlorella* as a potential bioenergy feed stock. M. M. Phukon, R. S. Chutia, **B. K. Konwar** and R. Kataki. (2011). *Applied Energy* Vol 88(10): 3307 – 3312.
44. Genome size determination and RAPD analysis of four edible aroids of North East India. Jyoti Prasad Saikia, **Bolin Kumar Konwar** and Susmita Singh (2010). *IIOAB Journal* 1: 25 – 30, IC value: 4.55.
45. Physico Chemical analysis of an edible *Colocasia esculenta* var. ghee kachu starch. *Journal of Root Crops* (<http://docs.exdat.com/docs/index-95391.html>), IC rating: 4.0.
46. Production and physiochemical characterization of a biosurfactant produced by *Pseudomonas aeruginosa* OBP1 isolated from the petroleum sludge. P. Bharali and **B. K. Konwar** (2011). *Applied Biochem. & Biotech.* DOI/10.1007/S 12010-011-9225-Z.
47. Crude biosurfactant from thermophilic *Alcaligenes faecalis*: Feasibility in petro-spill bio-remediation. P. Bharali, S. Das, **B. K. Konwar** and A. J. Thakur (2011). *Int J Biodeterioration & Biodegradation* 65 (5): 682-690.

48. Bio-plastic (P-3HB-co-3HV) from *Bacillus circulans* (MTCC 8167) and its biodegradation. Pinkee Phukan, J. P.Saikia and **B. K. Konwar** (2011). *Colloids and Surfaces B: Biointerfaces* 92 (2012) 30– 34, IF: 2.939.
49. Enhancing the stability of colloidal silver nanoparticles using polyhydroxyalkanoates (PHA) from *Bacillus circulans* (MTCC 8167) isolated from crude oil contaminated soil. Pinkee Phukan, J. P.Saikia and **B. K. Konwar** (2011). *Colloids and Surfaces B: Biointerfaces* 86:314-318, IF: 2.939.
50. Isolation and Characterization of Active Compound from Fruits of Medic Plant *Spondias pinnata* Kurz. R. Kandali and **B. K. Konwar** (2011). *Indian Journal of Agril. Biochem* 24(1): 29-33 (NAAS rating 4.2).
51. *In silico* structure assessment analysis of core domain of six protein data bank entries of HIV-1 Integrase. Salam Pradeep Singh and B. K. Konwar (2012). *Journal of Computational Biology and Bioinformatics Research* 4 (1): 01-07.
52. Production and Physico-chemical characterization of a biosurfactant produced by *Pseudomonas aeruginosa* OBP1 isolated from petroleum sludge. Pranjal Bharali and **Bolin Kumar Konwar** (2011). *Appl Biochem Biotechnol*, 164:1444–1460.
53. Evaluation of biosurfactant mediated enhanced remediation of crude oil-contaminated soil and phytoassessment of remediated soil with paddy (*Oryza sativa* L.). P. Bharali, N. Bordoloi and **B. K. Konwar** (2012). HAZMAT-D-11-06060, *Journal of Hazardous Materials* (Under Review).
54. Molecular docking studies on analogues of quercetin with D-alanine: D-alanine ligase of *Helicobacter pylori*. Salam Pradeep Singh, Rocktotpal Konwar, **Bolin Kumar Konwar** and Niranjana Karak (2012). *Medicinal Chemistry Research*, DOI 10.1007/s00044-012-0207-7.
55. "Silver-embedded modified hyperbranched epoxy/clay nanocomposites as antibacterial materials" Buddhadeb Roy, Pranjal Bharali, **B.K. Konwar** and Niranjana Karak (2012). *Bioresource Technology* (Accepted, Manuscript Number: BITE-D-12-00866R4).
56. Modified Hyperbranched Epoxy/Clay Nanocomposites: Anti-fungal, Thermal and Biodegradation Study. Buddhadeb Roy, Pranjal Bharali, **B.K. Konwar** and Niranjana Karak (2012). *Colloids and Surfaces B: Biointerfaces* (Accepted).

57. Enumeration and comparative efficacy study on the antibacterial behavior of methanolic extract of *Eclipta alba* against selected bacterial strains JEP-D-12-00342, Anggana Ray, P. Bharali and **B. K. Konwar** (2012). *Journal of Ethnopharmacology* (Accepted).
58. Synthesis, characterization and properties of a castor oil modified biodegradable poly(esteramide) resin. Sujata Pramanika, Kalpana Sagar, **Bolin Kumar Konwar**, Niranjana Karak (2012). *Journal Progress in Organic Coatings* (Accepted).
59. "Rhamnolipid (RL) from *Pseudomonas aeruginosa* OBP1: A novel chemotaxis and antibacterial agent". P. Bharali and **B. K. Konwar** (2012). *Colloids and Surfaces B: Biointerfaces* (Accepted).
60. "Rhamnolipid Protects Silver Nanoparticle (SNP) from Salt". P. Bharali and **B. K. Konwar** (2012). *Colloids and Surfaces B: Biointerfaces* COLSUB-D-12-01039R1 (accepted for Publication).
61. Biosynthesis and characterization of a new copolymer, poly(3-hydroxyvalerate-co-5-hydroxydecanoate), from *Pseudomonas aeruginosa*. Pinkee Phukan, Binod Pokhrel, **B. K. Konwar** and S. K. Dolui (2012). *Biotechnol Lett.* DOI 10.1007/s10529-012-1119-9.
62. Molecular docking studies of quercetin and its analogues against human inducible nitric oxide synthase. Salam Pradeep Singh and **Bolin Kumar Konwar** (2012). SpringerPlus 1: 69 (Springer).
63. Strategy in metagenomic DNA isolation and computational studies of humic acid. Pradeep Singh, Kalpana Sagar and **Bolin Kumar Konwar** (2012). *Current Res. in Micrib. and Biotech.* (Aizeon Publishers).
64. Bio-diesel derived waste raw glycerol: a potential substrate for the production of biosurfactant by *Pseudomonas aeruginosa* JBK1 with possible application on hydrocarbon bioremediation. Pranjal Bharali, Jyoti Prasad Prasad Saikia, Nipu Dutta, Salam P Singh, Shaymalima Gogoi, Lohit C Bora, P Debnath and **Bolin K Konwar** (2013), *Colloids and Surfaces B: Biointerfaces* (Accepted).
65. Colloidal silver nano particle/rhamnolipid (SNPRL) composite as novel chemotaxis antibacterial agent. Pranjal Bharali, Jyoti Prasad Prasad Saikia and **Bolin K. Konwar** (2013), *Colloids and Surfaces B: Biointerfaces* (Accepted).

(b) Papers published in Proceedings/Souvenirs of national/international seminars

1. N₂-fixing ability and genetic variability in *Azolla-Anabaena* symbiosis. Borgohain, R; Hazarika, M. H. and **Konwar, B. K.**, *Proc. on Recent Advances in Sciences*, National Sem., Dibrugarh University, 1994, pp 101-108.
2. Collection, evaluation of azollae of NE India and its application to rice crop. Borah, R. C.; Barthakur, D. and **Konwar, B. K.**, *Proc. Int. Symp. on Rainfed Rice Prod. Strategy for 21st Century*, AAU, Jorhat, 25-27th Nov., 1997.
3. Plant transformation through *Agrobacterium tumefaciens*. **Konwar, B. K.** Course Manual on *Tissue Culture and Biochemical Techniques for Crop Improvement with special reference to citrus and tea*. Nov., 1995, Agril. Biotech, AAU and Tockali Expt. Station, TRA, Sponsored by DBT, Govt. of India, New Delhi, pp 66-75.
4. *Agrobacterium*-mediated 'leaf disc' transformation. **Konwar, B. K.** Course Manual on *Tissue Culture and Biochemical Techniques for Crop Improvement with special reference to citrus and tea*. Nov., 1995, Agril. Biotech, AAU and Tockali Expt. Station, TRA, Sponsored by DBT, Govt. of India, New Delhi, pp 180-182.
5. Embryo rescue in japonica X indica hybrid rice (*Oryza sativa* L). Sarma, D, and **Konwar, B. K.**, *Proc. on Recent Advances in life sciences*, National Seminar, Dibrugarh University, 1994 pp 95-100.
6. Electroporation and genetic transformation in plants. **Konwar, B. K.**, *Lect. series organised by Tocklai Expt. Station, TRA, Jorhat; Sponsored by the DBT, New Delhi 1997* (booklet).
7. Gene transfer in plants. **Konwar, B. K.** *Research booklet on DIC & Ph D work, Published by the Agril. Biotech. Prog., AAU, Jorhat; sponsored by DBT, New Delhi, 1992.*
8. Rapid regeneration of sugar beet (*Beta vulgaris* L) from in vitro cultures. **Konwar, B. K.** and Coutts, R. H. A., *Proc. VII Int. Conf. on Plant Cell and Tissue culture*, Amsterdam, The Netherlands, 1990.
9. Contribution of the North Eastern region for the enrichment of citrus wealth in India. **Konwar, B. K.**, *Proc VI National Citrus Seminar, AAU, Jorhat, 1997.*
10. Plant tissue culture. Das, S. C. and **Konwar, B. K.** Presented in the lecture series organised at the Tocklai Expt. Station, TRA, Jorhat and sponsored by the DBT, New Delhi, Govt of India, New Delhi, 12th Sept., 1997 (booklet).

11. Karyotype study and polyploidy inducibility in tea (*Camellia sinensis* L. O. Kuntze). Matharoo, A. K. and **Konwar, B. K.**, *Proc of Seminar on Agric. Sci. Soc. of NE India*, AAU, Jorhat, Assam, Nov 27-28, 1997, pp 64-68.
12. Segregating lines from embryo rescued japonica x indica rice (*Oryza sativa* L.) crosses for cold tolerance. Sarma, D. and **Konwar, B. K.** *Proc of Seminar on Agric. Sci. Soc. of NE India*, AAU, Jorhat, Assam, Nov 27-28, 1997, pp 58-63.
13. Innovative approaches in tea breeding and fertility maintenance by microbes. **Konwar, B. K.**, *Hand book of the field management course*, Tocklai Expt. Station, TRA, Jorhat, Assam, July 30th1997.
14. Sustained assessment and improvement of medicinal plant wealth of North East India. **Konwar, B. K.**; Buragohain, J. and Chaudhary, D. *Proce. National Workshop on 'Science & Technology for regional development: case for North East India'*. Feb. 3rd – 6th, 2004, Indian Institute of Technology, Guwahati, pp 105-115.
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37. Petroleum biotechnology research. **B. K. Konwar** (2007). *Petrotech Society Seminar on R&D-Round Table Conference (Oral Presentation)*, March 20th 2007, New Delhi.
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80. Biochemical studies of yeast strains isolated from traditional starter cultures used by Karbi and Mising communities of Assam, India. K. R. Barman and **B. K. Konwar** (2011). *Proce. National Seminar on Biochemical and Biotechnological research approaches for bioresource management of North East Inia towards sustainable rural development*. 11 – 12th November, 2011: 49.
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82. Biodiversity and Bioresources. **B. K. Konwar** (2012). *Mission Conclave, NEPED, NEPeD, NBDA, NBRM and NBHM*, Nagalandl Bamboo and Honey Bee Mission Complex, Six Mile, Dimapur, Nagaland , 20th July, 2012.
83. ITKS and farmers’ variety, Presidential address by B. K. Konwar. National Seminar-cum-Farmers’ Scientists Interaction on Progressive Agriculture (Friday, 16th November), North East Region Agri Expo 2012, 15th – 17th November.
84. From Oral Traditions to Literary Progression, B K Konwar (opening remarks), Hornbill literature fest 2012-12-05, 06.12.2012, Venue: Kisama Bamboo Heritage Hall, Kohima, Nagaland.

Any other information relating to bio-resource development and utilization programs:

1. Enriched the Tea Field Gene Bank to about 2,000 accessions from 1,000 at Tocklai Experimental Station, Tea Research Association, Jorhat by adding new genotypes. In fact, next to China with 2,500 accessions, this is the second largest collection of tea germplasms.

Declaration

I declare that the information presented above is true to the best of my knowledge and belief.

Place: Nagaland University (Central), HQ: Lumami

B. K. Konwar

Date : 13.03.2013