

Bioinformatics Infrastructure Facility

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Summary of the progress made by the centre from its inception:

Bioinformatics Centre, Mizoram University was established in 2008 under the BIF financial assistance of Department of Biotechnology (DBT), Govt. of India. So far, the Centre has published more than 10 papers in reputed journals and organized more than 20 National workshop/ training programs. The Centre has conducted workshops for Research scholars, Ph. D students and faculties on areas like Molecular modeling, Molecular Phylogeny & evolutionary biology, DNA & Protein Sequence analysis, computational biology, functional annotation and biodiversity database development etc. The BIF centre has been conducting introductory workshops for School students as well.

Total funding received so far:

Financial year	2008 – 09	2009 – 10	2010 - 11	2011 - 12	2012 - 13
Amount Received (Rupees in lakhs)	Rs. 15.0	Rs. 5.77	Rs.12.81	Rs. 7.46	Rs.12.06

Infrastructure facilities in the Bioinformatics Centre:

Computer & Communication facilities:

1 High end HP (Proliant ML 370G5) and 1 mid range (ML350G5Servers)

20 HP computers,

2 Apple Macintosh Systems,

1 Laptop (HP ProBook 4320s Notebook),

1 HP Color DeskJet Printer (L7380),

1 HP LaserJet printer (2015N),

1 Xerox Copier (Toshiba E-Studio 166).

The computers are connected to the internet (2Mbps) by WiFi with adequate power backup (6 KVA UPS).

Lab furniture

20 Computer table, 10 Computer chair (Steel frame PCH-41031), 10 Revolving Chair (PCH-5001T), 2 Working tables, 1 almirah.

Scientific Software packages

Commercial package: Biosuite, Sigma Plot, Genious Pro, PAUP, SQL server 2008, Visual Studio 2008, NTYSys-pc.

Bioinformatics freewares: Modeller 9v5, AutoDock, Phylip, MEGA5, TreeView, RNA Structure 4.5, Fast PCR, Primer Premier 5, Bio Edit, Phylip, ClustalW, Visual FoxPro, , MDL ISIS Draw, GENEDOC, Amplifx 1.4 ,MISA, clustalW2, TREECON for Windows, Gene Designer, Rasmol, Oligo Analyzer, Vector NTI, MAFFT, GRAIL, Mr.Bayes.

Major research activities in Bioinformatics and its related fields:

- Comparative genomics and Mito-genomics.
- Molecular Phylogenetics and DNA Barcoding, Molecular Markers.
- Bioprospecting of plant bioresources for novel products/ genes/ metabolites and micro-propagation & genetic improvement through biotechnological approaches.
- Microbial exploration; Plant -microbe interaction and effect of abiotic stress in microorganisms.

Initiation of R&D activities in Bioinformatics:

The research work in the BIF Centre focuses on

- Molecular Phylogenetics and Evolution
- Metagenomics and Next Generation Sequencing (NGS)

- Gene Ontology
- Molecular Docking

Research publications:

2009

1. **N. Senthil kumar**, Pushkala Varma and G. Gurusubramanian (2009) Larvicidal and adulticidal activities of some medicinal plants against the Malarial Vector, *Anopheles stephensi* (Liston). *Parasitology Research* 104:237–244.
2. Brindha Senthil Kumar (2009) Mizoram Butterflies Data Storage - Retrieval Using Client-Server Technology. ICFAI University J. Comp. Sci. (In press)
3. **Senthil Kumar, N.** and Gurusubramanian, G. (2009) Bioinformatics and its application in genome research. In: Bioinformatics – Concept and Application, pp.31-44. Santanu Banik (Ed.), Department of Biotechnology, Ministry of Science and Technology and Bioinformatics infrastructural facility centre, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University, Aizawl, Mizoram.
4. Gurusubramanian, G. and **Senthil Kumar, N.** (2009) Biological databases – Searching and data retrieval. In: Bioinformatics – Concept and Application, pp.9-18. Workshop Manual of Bioinformatics Training Course. Santanu Banik (Ed.), Published by Department of Biotechnology, Ministry of Science and Technology and Bioinformatics infrastructural facility centre, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University, Aizawl, Mizoram.
5. Gurusubramanian, G. **Senthil Kumar, N.** and Bhattacharya, J. (2009) Basic concepts of phylogenetic systematics and their applications, pp. 43-58. In: Bioinformatics – General Concepts and Applications. Workshop Manual of Bioinformatics Training Course. Published by Department of Biotechnology, Ministry of Science and Technology and Bioinformatics Infrastructure Facility (BIF), Department of Biotechnology, Mizoram University, Mizoram.
6. **Senthil Kumar, N.**, Gurusubramanian, G. and Bhattacharya, J. (2009) From sequencing to database and from database to sequence analysis, pp. 63-110. In: Bioinformatics – General Concepts and Applications. Workshop Manual of Bioinformatics Training Course. Published by Department of Biotechnology, Ministry of Science and Technology and Bioinformatics Infrastructure Facility (BIF), Department of Biotechnology, Mizoram University, Mizoram.

2010

7. Mukesh Kumar Yadav, Bandavari Kishore Babu, Anil Kumar Saxena, **Bhim Pratap Singh**, Kiran Singh and Dilip Kumar Arora. Real time PCR assay

- based on Topoisomerase-II Gene for detection of *Fusarium udum*. *Mycopathologia* (2010). DOI 10.1007/s11046-010-9382-6.
8. **N.Senthil Kumar** and G.Gurusubramanian (2011) Sequence Analysis, In: Bioinformatics and its Application in Animal Science, pp.26-31. Tolengkomba and Shyamsana Singh (Ed.), Bioinformatics infrastructural facility centre, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University, Aizawl, Mizoram. March 10-11, 2011 pp.26-31
 9. Atom Anupama Devi and **Robert Thangjam** (2011): *In vitro* regeneration of *Parkia timoriana* DC. (Merr.) using cotyledonary node explants. In: Souvenir cum Abstract Volume of the National Symposium on Recent Advances in Plant Tissue and Biotechnological Researches in India organized by M.N. Institute of Applied Sciences, Bikaner from 4th to 6th February 2010.
 10. Lalremsiami Hrahsel and **Robert Thangjam** (2011): *In vitro* regeneration of *Vanda coerulea* Giff. via protocorm like body (PLB) formation. In: Souvenir cum Abstract Volume of the National Symposium on Recent Advances in Plant Tissue and Biotechnological Researches in India organized by M.N. Institute of Applied Sciences, Bikaner from 4th to 6th February 2010.
 11. PC Lalrinfela and **Robert Thangjam** (2011): Genome characterization of banana varieties of Mizoram using inter-retrotransposon amplified polymorphism (IRAP) and PCR-RFLP of internal transcribed spacer (ITS) marker. In: Souvenir cum Abstract Volume of the National Symposium on Recent Advances in Plant Tissue and Biotechnological Researches in India organized by M.N. Institute of Applied Sciences, Bikaner from 4th to 6th February 2010.

2011

12. Pranjal Kalita, S. Brindha, K. Soundararajan and **N. Senthil Kumar** (2012) Analysis of aminoacids pattern in receptor tyrosine kinase using Boolean Association Rule. *Bioinformation* 8(8): (in press)
13. Zothansanga, **N. Senthil Kumar** and G. Gurusubramanian (2012) Isolation and characterization of *Bacillus thuringiensis* Berliner from natural habitats of Mizoram, Northeast India. *Journal of Molecular Microbiology and Biotechnology* (in press)
14. Lalrotluanga, Lalchawimawii Ngente, **N. Senthil Kumar** and G. Gurusubramanian (2012) Insecticidal and repellent activity of *Hiptage benghalensis* L. Kruz (Malpighiaceae) against mosquito vectors. *Parasitology Research* (in press)
15. Tejmala, H., Brindha, S., Gurusubramanian, G. and **Senthil Kumar, N.** 2011. In-silico comparison of distal-less protein variation in insects. *Science Vision*, 11(4):189-197.
16. D. Anitha, **N. Senthil Kumar**, D. Vijayan, K. Ajithkumar and G. Gurusubramanian (2011) Characterization of *Bacillus thuringiensis* isolates

- and their differential toxicity against *Helicoverpa armigera* populations. *Journal of Basic Microbiology* 51: 107-114.
17. Lalrotluanga, **N. Senthil Kumar** and G. Gurusubramanian (2011) Evaluation of the Random Amplified Polymorphic DNA assay for the detection of DNA damage in mosquito larvae treated with plant extracts. *Science Vision* 11 (3): 155-158
 18. R. Laltanpuui, Rita Zomuanpuui, Tejmala Hijam, G. Gurusubramanian and **N. Senthil Kumar** (2011) RAPD- PCR characterization of insecticide resistant and susceptible *Anopheles* species. *Science Vision* 11 (3): 159-164.
 19. Catherine, V., Zothansangi, Gurusubramanian, G. and **Senthil Kumar, N.** (2011) Morphological and molecular studies of six *Junonia* species of butterflies using RAPD-PCR technique. *Science Vision*, 11(3):141-146.
 20. Zothansangi, Catherine, V., **Senthil Kumar, N.** and Gurusubramanian, G. (2011) Genetic variation within two cryptic species of *Cirrochroa* by RAPD-PCR technique. *Science Vision*, 11(3):141-146.
 21. S. Brindha, Sangzuala Sailo, Liansangmawii Chhakchhuak, Pranjal Kalita, G. Gurusubramanian and **N. Senthil Kumar** (2011) Protein 3D structure determination using homology modeling and structure analysis. *Science Vision*, 11(3):125-133.

2012 & 2013

22. **Thangjam, R.** (2012) In vitro regeneration and *Agrobacterium tumefaciens*-mediated genetic transformation of *Parkiatimoriana* (DC.) Merr.: a multipurpose tree legume. *Acta Physiologiae Plantarum* 34:1207-1215.
23. **Thangjam, R.** (2012) Genome characterization of banana genetic resources of Mizoram, India. *Science Vision* 12 (1): 1207-1215.
24. **Thangjam, R.** (2012) Sulphur free-radical reactivity of thioproline and crude extracts of *Parkiatimoriana* (DC.) Merr. *Environmental Engineering* 17(S1): S9-S13.
25. **Thangjam, R.** (2012) Biotechnological Methods for Sustainable Utilization of Banana Genetic resources of Manipur, India. *Biodiversity status and conservation strategy with special reference to Northeast India, (Book)*.
26. **Thangjam, R.** (2013) DNA Barcoding as a tool for rapid identification of plants: a case study in banana family (Musaceae). *Bioresources and Traditional Knowledge of Northeast India (Book)* 21-24.
27. **Thangjam, R.** (2013) Genetic diversity among edible banana varieties found in Mizoram, India. *Bioresources and Traditional Knowledge of Northeast India (Book)* 55-59.
28. **Thangjam, R.** (2013) Evaluation of genetic diversity and approaches for conservation of conservation of *Parkiatimoriana* (DC.) Merr. *Environment, Biodiversity and Traditional System (Book)* 283-288.
29. Lalrotluanga, Lalchawimawii Ngente, **Senthil Kumar, N.** and Gurusubramanian G. (2012) Insecticidal and repellent activity of *Hiptage*

- benghalensis* L. Kruz (Malpighiaceae) against mosquito vectors. *Parasitology Research*, 111:1007-1017.
30. Zothansanga Ralte, Gurusubramanian G. and **Senthil Kumar N.** (2012) RAPD-PCR characterization of *Bacillus thuringiensis* soil isolates from Mizoram with insecticidal activity against *Culex tritaeniorhynchus*. *International Journal of Fundamental & Applied Sciences*, 1(3), 55-60.
31. Brindha, S.K., Sangzuala Sailo, **Senthil Kumar, N.** and Gurusubramanian, G. (2012) Prop: J-Tool to Predict the Subcellular Location of Proteins Based on physiochemical Characterization. *Interdisciplinary Sciences: Computational Life Sciences* 4:1-6.
32. Vikas Kumar Roy, **N. Senthil Kumar** and G. Gurusubramanian (2012) Proteins – structure, properties and their separation by SDS-polyacrylamide gel electrophoresis. *Science Vision* 12(4):170-181.
33. Pranjal K, Brindha S, Soundararajan K, **Senthil Kumar N** (2012). Analysis of aminoacids pattern in receptor tyrosine kinase using Boolean Association Rule. *Bioinformation* 8(8): 342-345.
34. Rita Zomuanpuia, Lal Ringngheti, Brindha, S., Gurusubramanian, G., **Senthil Kumar N.** (2013) ITS2 characterization and *Anopheles* species identification of the sub-genus *Cellia*. *Acta Tropica* 125, 309-319.
35. **Senthil kumar, N.**, Gurusubramanian, G. and Murugan, K. (2013) Joint Insecticidal Action of *Bacillus thuringiensis kurstaki* with *Annona squamosa* L. and *Prosopis juliflora* Swartz DC on *Helicoverpa armigera* (Hübner) (Lepidoptera:Noctuidae). *Proceedings of the Zoological Society, Kolkata* (DOI 10.1007/s12595-013-0059-2).
36. Brindha, S., Zothansanga, Ajit Kumar, P., Vineet Kumar, M., Biku, M.C., Bhim, P.S., Gurusubramanian, G. and **Senthil Kumar, N.** (2013) Characterization of *Bacillus thuringiensis* Cry1 class proteins in relation to their insecticidal action. *Interdisciplinary Sciences: Computational Life Sciences* 5: 127-135.
37. Amrita Kumari Panda, Satpal Singh Bisht, SurajitDeMondal, N. Senthil Kumar, G. Gurusubramanian, and Ashok Kumar Panigrahi (2013). *Brevibacillus* sp. as biological tool: A short review. *Antonie van Leeuwenhoek* (in press).

Existing BIF staff:

Current Scholars			
Name of the staff	Designation	Period of working	Absorption status
Thokchom Lellel	JRF	April, 2013-till date	Temporary

Ravi Prakash Yadav	JRF	June, 2013 - till date	Temporary
Previous Scholars			
Mr. Sangzuala Sailo	Project Fellows	Sept.2009 - July2012	Temporary
Mrs. S. Brindha	Project Fellows	Sept.2009- Mar.2012	Temporary
Mr. PC Lalrinfela	Project Fellows	Sept.2012--Feb2013	Temporary

Types of services provided:

Centre is providing facilities to M. Sc students to complete their project work in Bioinformatics and Biotechnology. Research Scholars/ Ph.D students and Project Fellows of the School of Life Science and other departments are using the Bioinformatics lab. Facilities for their research work. M.Sc Life Science students are being offered project work in Bioinformatics during their final semester.

Sl. no	Name	Working period
Tranieeship		
1	Ms. Atom Annupama Devi	Oct.2010--Mar.2011 Nov2012--Oct.2012
2	Ms. Tejmala Hijam	Oct.2010--Mar.2011
3	Mr. Zothantluangi	Oct.2011--Mar.2012
4	Mr. K. Lalawmpuia	Oct.2011--Mar.2012
Studentship		
1	Mr. Zothanmawia	Mar.2010-Aug. 2011
2	Mr. Ajit Kumar Passari	Oct.2010--Mar.2011
3	Ms. Doris Zodinpuui	Oct.2011--Mar.2012
4	Mr. Vanlalhrauaia	Oct.2011--Mar.2012
5	Ms. K. Vanlalhmangaihi	Aug. 2012--Sept. 2012
6	Mr.Ricky Sapkota	Sept. 2012
7	Mr.BeipahnieKhaiBeite	Sept. 2012
8	Mr. David C. Yim	Apr.2013-July2013

9	Ms.RK Mandakini Devi	Apr.2013-July2013
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e- journal Access facility:

Bioinformatics Centre has special Journal access facility under DBT's e-Library Consortium (DeLCON). A good numbers of high impacted and peer reviewed journals are accessible from the centre. There are about 525 journals now for access.

Workshop/ Training conducted:

- i) A training program was conducted on 26-27 March 2009 on "**Bioinformatics-General Concepts and Applications**".
- ii) A training program was conducted on 27 Nov. 2009 on "**Bioinformatics Current Approaches and Applications**".
- iii) A training program was conducted on 29 -30 March 2010 on "**Bioinformatics Current Approaches and Applications**" for University and College students.
- iv) A workshop on "**Molecular Phylogenetics and Evolution**" was conducted on 22-24 Nov. 2010. About 75 participants from Mizoram University, Tripura University and Assam University attended the program.
- v) A training course on "**Bioinformatics – An Introduction**" was given to Synod Higher Secondary School students (15 no's) was conducted on 12 March 2011.
- vi) A workshop on "**Bioinformatics – Structure and Determination of Macromolecules**" was conducted on 28-29 March 2011.About 100 participants from Mizoram University and Assam University attended the program.
- vii) A workshop on "**Random Amplified Polymorphic DNA (RAPD) Marker its applications**" was conducted on May 19-23 2011. About 75 participants from Mizoram University and Assam University attended the program.
- viii) A training course on "**Bioinformatics - An Introduction**" was given to St. Paul's school students (15 no's) was conducted on 02 April 2011.
- ix) A training course on "**Bioinformatics - An Introduction**" was given to St. Synod School, Aizawl, Mizoram students (15 no's) was conducted on 02 April 2011.

- x) A training course on **“Bioinformatics – Structure and Determination of Macromolecules”** on 28-29 March 2011.
- xi) A workshop on **“RAPD Markers and its Application”** was held on 13-14 May 2011.
- xii) A training Course on Bioinformatics – **“Proteins and their structure and prediction”** on 23-24 Nov. 2011.
- xiii) A National seminar on **“Recent trends in biological sciences”** was held on 2-3rd April, 2012.
- xiv) A **“Remedial Coaching Classes for M.Sc Biotechnology Students”** for 1 week 13-22, August 2012.
- xv) A One-day **“Outreach Program in Biotechnology & Bioinformatics”** for College students on 4th Aug 2012.
- xvi) A special lecture cum Interactive session on **“Advance studies and Hands-on training on plant DNA Fingerprinting”** for Masters Students, research fellows and faculty members was held on 6th Aug. 2012.
- xvii) A special lecture cum Interactive session on **“Introduction to RNAi technology & NMR: fromsmall to large biomolecules”** for Masters students, research fellows and faculty members was held on 23rd Aug. 2012.
- xviii) A National Workshop on **“Molecular phylogenetics and Evolution”** on 26-28 November, 2012.
- xix) A National Workshop on **“Structure determination of Macromolecules”** on 26-28 March, 2013.
- xx) A special lecture cum Interactive session on **“Pharmacogenomics: Polymorphism and Genotype-Phenotype correlation of drug response in Indian population”** for Masters Students, research fellows and faculty members was held on 16th May 2013.
- xxi) A training Course on Bioinformatics **“A primer in Bioinformatics and Biotechnology”** for school students was held on 8th June 2013.
- xxii) A special workshop on **“Advanced techniques in Biotechnology & Bioinformatics”** or college teachers was held on 19-23th Aug. 2013.
- xxiii) A training Course on **“Introduction to Bioinformatics”** for school students was held on 2nd Oct. 2013.

- xxiv) A training Course on “**Introduction to Bioinformatics**” for RIPANS College Aizawl, students was held on 26th Oct. 2013.
- xxv) A training Course on “**Introduction to Bioinformatics**” for M. Sc. students was held on 5-6th Nov. 2013.

Training programmes proposed to be conducted during the current financial year:

- i) A one day workshop on browsing genomes with ENSEMBLE.
- ii) A one day workshop on Gene Annotation and Cytoscape.

Training/ workshop/meeting attended by members of BIF centre:

- 1) **Mr. Sangzuala Sailo**, Project Fellow, BIF centre attended the Bioinformatics workshop on “**Genomics, Proteomics, Drug design and High performance computing**” at the Supercomputing Facility for Bioinformatics and Computational Biology, IIT, New Delhi during 30 Sept. – 06 October 2009.
- 2) **Ms. Brindha Senthil Kumar**, Project Fellow, BIF centre attended the workshop on “**Application of Neural Network**” at Guwahati University during 15 – 17 December 2009.
- 3) **Dr. Thangjam Robert Singh** attended the **3rd Annual NEBInet (DBT-Bioinformatics) Coordinators Meeting at IBSD, Imphal** during Nov.12-13, 2010.
- 4) **Dr. Thangjam Robert Singh** attended the **Refresher course on Biochemistry**, UGC Academic Staff College, Manipur University, 20th December 2010 to 10th January, 2011.
- 5) **Dr. N. Senthil Kumar** attended the **Refresher course on Modern biotechnological techniques** during Jan. 10 – 22, 2011 at Manipal Life Sciences Centre, Manipal University.
- 6) **Dr. N. Senthil Kumar** attended the **XXII All India BTISnet (DBT – Bioinformatics) coordinator’s meeting at Pondicherry University**, Pondicherry during Feb. 03 – 04, 2011.

- 7) **Dr. N. Senthil Kumar** attended the **4th Annual NEBInet (DBT-Bioinformatics) Coordinators Meeting at NERIST, Arunachal Pradesh** during Nov.12-13, 2011.
- 8) **Dr. N. Senthil Kumar** attended the **XXIII All India BTISnet (DBT – Bioinformatics) coordinator’s meeting at University of Jammu, Jammu** during Feb. 03 – 04, 2012.
- 9) **Dr. Thangjam Robert Singh** Coordinated the **5th NEBInet (North-East Bioinformatics Network) Coordinators meeting (as Coordinator) at Mizoram University as a coordinator of BIF Centre, sponsored by DBT** during 11-12 October, 2012.
- 10) **Dr. Thangjam Robert Singh** attended **National Symposium on Bioinformatics: Role of Bioinformatics in Biodiversity Management at National Botanical Research Institute, Lucknow** during 2nd February 2013.
- 11) **Mr. Ravi Prakash Yadav, JRF, BIF centre** attended **National Training Workshop on "Molecular Docking and Simulation for identification of novel molecules for Agricultural & Veterinary applications"** in MBGE, College of Basic Sciences & Humanities GBPUAT Pantnagar, Uttarakhand during 13-17th Sept. 2013.

Acting as Resource Person (by the coordinator, BIF):

Details	Venue	Date
Signal Transduction; Evolutionary significance of Insect-plant Interactions.	NEHU, Shillong	May 29 2009
Training program on Application of Bioinformatics in Biological studies.	G. C College, Silchar, Assam	July 25 - 26, 2009
Training course on Current Trends in Bioinformatics Teaching and Research.	Gauhati University, Assam	Aug.10 -12, 2009
National Seminar on Application of Bioinformatics in biodiversity.	S.Kula Women’s college, Manipur	Oct. 25 - 26, 2009
2 nd Annual NEBInet (DBT-Bioinformatics) Coordinators Meeting.	CVS, AAU, Guwahati	Nov.12-13, 2009
National level Seminar on Application of medicinal plants & their diversity.	Govt. Arts college, Dharmapuri	Jan. 06, 2010
IX National level Biological congress on Biotechnology: Great expectations and achievements.	Muthyammal College of Arts & science, Rasipuram	Jan. 09, 2010
National Seminar on Recent	Hindusthan College,	Jan. 22,

perspectives in Nanotechnology.	Coimbatore	2010
RNAi and its Application in Insect Pest Management.	CES, IISc, Bangalore	Feb. 2010
XXI All India BTISnet (DBT – Bioinformatics) coordinator's meeting.	CARI, Port Blair	Feb. 03 – 04, 2010
Bioinformatics and its application in MAPs. National level workshop cum training program on Recent advances in Medical and Aromatic plants during.	Dept. of HAMP, Mizoram University	March 2010
Tools and Techniques in Bioinformatics. National workshop on some emerging areas of Biotechnology and Bioinformatics during.	Karimganj College, silchar, Assam	March, 2010
Insect-Plant Interactions.	Orientation course, School of Environ. Science, Mizoram University	Oct., 2010
Tools and Techniques in Bioinformatics at National workshop on some emerging areas of Biotechnology and Bioinformatics.	Karimganj College, silchar, Assam	Feb.22, 2011
Bioinformatics and PCR technology.	DBT–Institutional Biotech Hub, RIPANS, Aizawl	April, 2011
Application of Bioinformatics in Medicinal Plant Research at National level workshop cum Training program on Recent Advances in Medicinal & Aromatic Plants	Dept. of Horticulture and Aromatic Plants, Mizoram University, Aizawl	April 19, 2011
DNA as Molecular Marker.	Central Agricultural University, Aizawl	Sept. 09, 2011
RNAi interference in Insect Pest Management in the National Seminar on Emerging Trends in Biosciences and Future prospects.	Pachhunga University College, Aizawl	Nov. 29-30, 2011.
Bioprospecting and Inventorization of Plant Genetic Resources of NE India for Improvement & Sustainable Production.	DBT Program Support Centre, Indian Institute of Technology Guwahati, Guwahati, India	Oct. 01, 2012
Educational opportunities in Food Processing.	national institute of food technology and entrepreneurship Management & indian institute of crop processing technology at aizawl	Feb. 2, 2012
Identification and Phylogeny of Insect species through DNA Barcodes in the 3rd International Conference on Climate change and sustainable Management of Natural Resources.	ITM University, Gwalior	Feb. 05-07, 2012

RAPD Analysis and DNA Barcoding - Lectures and practical demonstrations in the training program on Molecular Techniques and their Application in Veterinary Research.	Assam Agricultural University, Guwahati	Feb.18-19, 2012
DNA barcoding as a tool for Rapid identification of plants: a case study study in banana family (Musaceae).	Department of environmental science & Department of Botany, Pachhunga University College, Aizawl	March 7-8, 2013
Attended Crick Symposium – Genetics to molecules to therapies	Beveridge Hall, Senate House, University of London, WC1E 7HU London, United Kingdom	March 11, 2013
Attended 1st Oxford workshop and Symposium (NGS2013)	Wolfson college, Oxford organized by bioteXcel consulting, Oxford (UK)	March 12-13, 2013
Attended EMBL- EBI Careers and Open Day	European Bioinformatics Institute, Cambridge	March 14, 2013
Acted as judge for oral presentations in the Annual Student Conference 2013	The Natural History Museum, London, UK	March 18 – 19, 2013
Attended seminar on Statistics in trials – Making complexity work	New Hunt's House Lecture Theatre 1, Guy's Campus, SE1 1UL London, United Kingdom.	March 20, 2013
Attended Next Generation sequencing conference	Kennedy LT, Institute of Child Health, London, WC1N 1EH London, United Kingdom	March 26, 2013
Attended Identifying casual variants in NGS data: A hands-on workshop for analysis and biological interpretation of human DNA Re-sequencing data	University College, London organized by Ingenuity systems, UK.	March 27, 2013
Attended Ensemble workshop on “Browsing Genomes with Ensembl”	University of Cambridge organized by EBI-EMBL, UK	April 02, 2013
Attended Seminar on Strictly Science: Future debate	GR Lecture Theatre Imperial College London, Exhibition Road, SW7 2AZ, South Kensington, United Kingdom.	April 11, 2013
Attended British Society for Gene and Cell Therapy (BSGCT) Public Engagement Day 2013	The Windsor Building, Royal Holloway, University of London, TW20 0EX Egham, United Kingdom	April 17, 2013
Attended Gene Ontology Annotation Workshop	University College London, UK.	April 18-19, 2013
DNA barcoding Technique: a tool for authentic identification of medicinal plants (invited lecture).	Department of Chemistry, Manipur University, Canchipur, Manipur	May 6-7, 2013
Introduction to Plant Biotechnology.	State Biotechnology Hub,	June 8

	Department of Biotechnology, Mizoram University	2013
Delivered a lecture on DNA Barcoding and Metagenomics in the training program on “ PCR based molecular techniques in Biological research.	Assam Agricultural University, Guwahati	Sept. 18-20, 2013
Delivered a lecture in the workshop on Application of Bioinformatics in Molecular Biology Research	Gurucharan College, Silchar	Sept. 28-29, 2013
Attended 20 th DeLCON Nodal officer’s meeting.	IIT, Guwahati, Assam	Oct. 28-29, 2013

Collaborations with other departments and institutions at the national and international level:

National

- Under the DBT project, DBT mission for quality planting material production and utilization for the north east with different institutes of NE, TERI, Delhi.
- Under the DBT Twining project, determining the border line between Indian and Indochinese sub-regions through comparative phylogeography of butterflies of Northeastern India with Indian Institute of Science, Bangalore.

International

- Collaboration with Prof. Zeng- Fu, Xu, Laboratory of Molecular Breeding of Energy Plants, Xishuangbanna Tropical Garden, Chinese Academy of Sciences, Menglun, Mengla, Yunnan 666303, CHINA.

Databases/ Software packages developed:

- a. A Database on “**Butterflies of Mizoram**” was developed using VB 2008 and SQL server 2005 (Client-Server technology).
- b. A Database on “**Snakes of Mizoram**” was developed using PHP, Apache and MySql Server (Web -Server technology).
- c. A Database on “**Banana of North East India and Medicinal plants of Mizoram**” is under development using PHP, Apache and MySql Server (Web -Server technology).

- d. **PROT-PROP**: A Java- application to predict the subcellular location of a protein based on physiochemical properties. www.mzu.edu.in/schools/biotechnology.html
- e. **GC-Graphing**: A Java-application to plot GC contents of Intergenic and Intragenic regions of genome. www.mzu.edu.in/schools/biotechnology.html

Impact shown by the centre on the growth of biotechnology and allied areas:

BIF facility has been used in sequence analysis of various species of Mizoram and the following sequences have been deposited in NCBI:

Internal transcribed spacer-2 (ITS2) sequencing of ribosomal DNA done in:

- 24 Fungal isolates from Mizoram soils has been done (NCBI Accession No. HQ596902-25)
- 8 *Anopheles* species has been completed (NCBI Accession No.'s JN643725-28 and JN710012 - 15).

DNA Barcoding (COI gene) sequencing done in:

- 14 Butterfly species (NCBI Accession No. JN609220-23 and JN797782-91)
- 10 *Anopheles* species (NCBI Accession No.'s JN596970-74, JN832671-75)
- 6 species of dragon fly (NCBI Accession No.'s JN817424-29)

NBS-LRR resistance protein gene,

- 13 banana varieties (NCBI Accession No. HQ722029-41)

Bt crystal protein

- Btcry1 (NCBI Accession No. JN596969)
- Btcry2A (NCBI Accesssion No. JN215465)

Wild silk Moth COI, ITS2 and Dloop and NDI (NADH dehydrogenase 1) gene

- Antheraea assama (16S-KF164816, COI-KC968963, ITS2- KC879662, Dloop - KC879676, ND1-KC759168)

- Salassa tonkiniana (16S-KF164814, COI-KF164825, ITS2 - KC879674, Dloop-KC879688, ND1-KC759180)
- Attacus atlas (16S-KF164815, COI-KC968962, ITS2-KC879675, Dloop-KC879689, ND1-KC759181)
- Actias maenas (16S-KF164819, COI-KC968958 KC953839, ITS2-KC879663, Dloop- KC879677, ND1-KC759169)
- Antheraea helferi (16S-KF164818, COI - KF164826, Dloop - KC879685, ND1 - KC759177)
- Antheraea frithi (16S-KF164817, COI-KC968959, ITS2-KC879666, Dloop-KC879680, ND1-KC759172)
- Antheraea mylitta (16S-KF164820, COI-KC968964, ITS2-KC879664, Dloop-KC879678, ND1-KC759170)
- Archaeoattacus edwardsii (16S-KF164821, COI-KF164827, ITS2-KC879667, Dloop-KC879681, ND1-KC759173)
- Actias selene (16S-KF164822, COI-KC968960, ITS2-KC879672, Dloop-KC879686, ND1-KC759178)
- Salassa lemaii (16S-KF164823, COI-KC968961, ITS2-KC879670, Dloop-KC879684, ND1-KC759176)
- Cricula trifenestrata (16S-KF164824, Dloop-KC879687, ND1-KC759179)
- Loepa katinka (COI-KF164828, ITS2-KC879668, Dloop-KC879682, ND1-KC759174)
- Loepa sikkima (ITS2-KC879669, Dloop-KC879683, ND1-KC759175)
- Samia Cynthia (ITS2-KC879665, Dloop-KC879679, ND1-KC759171)
- Samia canningi (COI-KC953840)

Butterfly COI gene

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|------------------------------------|--------------------------------|
| -Parantica aglea (KC306718) | -Vindula erota (KC968944) |
| -Danaus chrysippus (KC306719) | -Acraea issoria (KC968945) |
| -Euploea mulciber (KC306720) | -Cirrochroa tyche (KC968946) |
| -Euploeasylvester (KC306721) | -Argyreus hyperbius (KC968947) |
| -Parantica sita (KC306722) | -Cirrochroa aoris (KC968948) |
| -Parantica melaneus (KC306723) | -Cethosia cyane (KC968949) |
| -Danaus genutia (KC306724) | -Vagrans egista (KC968950) |
| -Euploea midamus (KC306725) | -Vindula erota (JN797791) |
| -Tirumala septentrionis (KC306726) | -Cynitia lepidia (JN797790) |
| -Tirumala limniace (KC306727) | -Junonia almana (JN609221) |
| -Lethe rohria (JN797788) | -Lexias pardalis (JN797787) |
| -Lethe confusa (JN797789) | -Kallima inachus(JN797785) |
| -Euthalia phemus (JN797784) | -Junonia hierta (JN609220) |
| -Euthalia aconthea (JN797782) | -Junonia iphita (JN609223) |
| -Junonia lemonias (JN698955) | -Juonia atlites (JN609222) |

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|-------------------------------|----------------------------------|
| -Papilio polytes (KC810960) | -Jamides celeno (KC810959) |
| -Papilio memnon (KC810961) | -Ancistriodes nigrita (KC810958) |
| -Saranges dashara (KC810957) | -Graphium antiphates (KC810962) |
| -catopsila pomona (KC810963) | -Athyma ranga (KC810965) |
| -Graphium macareus (KC810966) | -Neptis miah (KC810964) |

Butterfly NDI (NADH dehydrogenase 1) gene

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|---------------------------------|--------------------------------|
| - Vindula erota (KC968950), | -Argyreus hyperbius (KC968951) |
| - Cirrochroa aoris(KC968952) | -Cethosia cyane (KC968953) |
| - Vagrans egista (KC968954) | -Cethosia biblis (KC968955) |
| - Phalantha phalanta (KC968957) | |

Future activities:

- To continue spreading awareness, knowledge sensitization by imparting hands-on training in the areas of Bioinformatics and Biotechnology to the students from various Schools, Colleges, Universities.
- Strengthening of research activities through the use of Bioinformatics and Biotechnology tools.
- To organize national and international conferences, workshops, seminars, lecture series of eminent scientists to provide scientific platform to the students and teachers to have interface with recent trends Bioinformatics and Biotechnology.
- Fostering partnership, collaborative research, industry institute partnership and entrepreneurship development to achieve better research outputs leading to applied and product based science.
- To achieve the status of centre for advanced studies in Bioinformatics and Biotechnology.