CALL III

Project title: Archaebacteria and Eubacteria: Sustenance of Plants in Extreme Salinity and Thermal Regimes

Project Code	**:**	3001
Duration of the project	**:**	August 2012 – July 2015
PI Name	**:**	Dr. A K Saxena
CCPI Name	**:**	Dr. Rinku Day
Lead Centre	**:**	ICAR-IARI, New Delhi
Cooperating centre	**:**	ICAR-DGR, Junagadh

Objectives:

- To compare the mechanism of action of archaea, eubacteria and fungi in alleviation of salinity and moisture deficit stress
- To evaluate the feasibility of effective consortia based on microbes with complementary and supplementary mechanisms of alleviation for sustaining plant growth and nutrition under salinity and moisture stress

Achievements:

- Established a comprehensive database on archaea from extreme environments, uncovered their osmoadaptation mechanisms, and developed rhizospheric engineering technology with microbes to sustain plants in saline and moisture-deficit conditions.

Project title: State of diversity of commercially important seaweeds along the West Coast of India

Project Code	**:**	3002
Duration of the project	**:**	June 2011 – May 2015
PI Name	**:**	Dr. Monica G. Kavale
CCPI Name	**:**	Dr. V.V. Singh
Lead Centre	**:**	ICS College, University of Mumbai
Cooperating centre	**:**	ICAR-CMFRI, Mumbai

Objectives:

- To Survey the West Coast of India for seaweed species belonging to the genera *Porphyra*, *Enteromorpha*, *Caulerpa*, *Ulva* (used as food) and *Sargassum*, *Grateloupia*, *Hypnea*, *Dictyota*, *Padina*, *Gelidium*, *Gracilaria* and *Kappaphychus* (as a source of chemicals)

- To evaluate inter and intraspecific diversity of the surveyed genera vis-à-vis the coastal ecology

- To identify commercially important sites and evaluate their potential to sustainable exploitation

- To develop GIS-based thematic maps of potential seaweed sites along the West Coast of India

Achievements:

a) Publications:

- Kavale MG, Kazi MA, Murgan N, Sreenadhan P (2017) Nutritional profiling of *Pyropia acanthophora* var robusta (Bangiales, Rhodophyta) from Indian waters. Journal of Applied Phycology. doi: 10.1007/s10811-017-1096-4.

- Kavale MG, Kazi MA, Sreenadhan N (2015) *Pyropia acanthophora* var. robusta var. nov. (Bangiales, Rhodophyta) from Goa, India. Indian Journal of Geo-Marine Sciences. 44(6):866-873.

- Kavale MG, Kazi MA, Sreenadhan N, Singh VV (2015) Morphological, ecological and molecular characterization of *Pyropia vietnamensis* (Bangiales, Rhodophyta) from the Konkan region, India. Phytotaxa. 224 (1):45–58.

- Kazi MA, Kavale MG, Singh VV (2015) Morphological and molecular characterization of *Ulva chaugulii* sp. nov., *U. lactuca* and *U. ohnoi* (Ulvophyceae, Chlorophyta) from India. Phycologia. 55 (1):45-54.

- Kavale MG, Sreenadhan N, Singh VV (2014) Cultivation of *Kappaphycus alvarezii* (Doty) Doty ex P. C. Silva along the coast of Palshet, Guhagar, Maharashtra. Indian Journal of Geo-Marine Sciences. 45 (5):666-670.

Project title: Double herbicide tolerant transgenic rice: weed management

Project Code	:	3006
Duration of the project	:	June 2012- March 2017
PI Name	:	Dr. M.K. Reddy
CCPI Names	:	Dr. C. Parameswaran Rajesh
	:	Dr. M. Sheshu Madhav
Lead Centre	:	ICGEB, New Delhi
Cooperating centres	:	ICAR-NRRI, Cuttack
	:	ICAR-IIRR, Hyderabad

Objectives:

- Modification of rice genes to confer tolerance to the non-selective herbicides sulfonylurea and glyphosate
- Developing transgenic rice lines to confer tolerance to two non-selective herbicides and developing transgenic event linked molecular markers
- Evaluate the stability of the introduced mutations in EPSP synthase and acetolactate synthase and associated fitness cost effect if any on the transgenic plant phenotype

Achievements:

a) Publications:

- Manna M, Achary VMM, Islam T, Agrawal PK, Reddy, MK (2016) The development of a phosphite-mediated fertilization and weed control system for rice. Sci. Rep. 6:24941. doi: 10.1038/srep24941.
- Chandrasekhar K, Reddy GM, Singh J, Vani K, Vijayalakshmi M, Kaul T, Reddy MK (2014) Development of Transgenic Rice Harbouring Mutated Rice 5-Enolpyruvylshikimate 3-Phosphate Synthase (Os-mEPSPS) and *Allium sativum* Leaf Agglutinin (ASAL) Genes Conferring Tolerance to Herbicides and Sap-Sucking Insects. Plant Mol Biol Rep.32:1146–1157. https://doi.org/10.1007/s11105-014-0715-3.

b) Patent:

- Method of generating glyphosate tolerant transgenic plants, reagents and uses thereof (Patent file no. 3009/DEL/2015)

Project title: Deciphering molecular mechanism of induction of biotic stress tolerance by *Trichoderma spp.* in castor (*Ricinus communis* L.)

Project Code	**:**	3007
Duration of the project	**:**	June 2012- March 2017
PI Name	**:**	Dr. V. Dinesh Kumar
CCPI Name	**:**	Dr. Ragiba Makandar
Lead Centre	**:**	ICAR-DOR, Hyderabad
Cooperating centre	**:**	University of Hyderabad

Objectives:

- To evaluate colonization of castor roots by *Trichoderma spp*. and identify the strain(s) that induce systemic resistance
- To characterize the induced systemic resistance by *Trichoderma spp*. in castor

Achievements:

- Developed effective symbiotic Trichoderma strains for castor that induce systemic resistance and control fungal pathogens through comprehensive molecular studies, including signaling molecules, genes, and transcriptome changes associated with Trichoderma-induced systemic resistance.

Project title: Reduction of crop loss by using bio-acoustics and mechanized models of predatory birds

Project Code	**:**	3008
Duration of the project	**:**	June 2012- May 2015
PI Name	**:**	Dr. S.S. Mahesh
CCPI Name	**:**	Dr. V. Vasudeva Rao
Lead Centre	**:**	VLS, Bengaluru
Cooperating centre	**:**	AINP on Ornithology, ANGRAU, Hyderabad

Objectives:

- To record the alarm calls, distress calls and predator calls of birds in field and conduct sonogram analysis for incorporation in acoustic equipment
- To field evaluate alarm calls, distress calls, and predator calls in Sorghum and Sunflower crops

Achievements:

- Created an inventory of bird alarm calls with regional dialects and developed customizable, remotely upgradable acoustic devices for Sorghum and Sunflower crops, enabling effective bird dispersal and cost-efficient large-scale use across India.

Project title: Infertility in crossbred bulls: Spermatogenic cell markers for early prediction of fertility

Project Code	**:**	3009
Duration of the project	**:**	June 2012 – March 2017
PI Name	**:**	Dr. A. Kumaresan
CCPI Name	**:**	Dr. Savita Yadav
Lead Centre	**:**	ICAR-NDRI, Karnal
Cooperating centre	**:**	AIIMS, New Delhi

Objectives:

- Method for the culture of spermatogenic cells (SC)
- Differential protein expression profile in SC of bull calves (at different age groups) and crossbred bulls with high and low fertility
- Screening the cross-bred male calves from birth onwards for the identified SC markers

Achievements:

a) Publications:

- Rajak SK, Kumaresan A, Attupuram NM, Chhillar S, Baithalu RK, Nayak S, Sreela L, Singh RK, Tripathi UK, Mohanty TK, Yadav S (2017) Age-related changes in transcriptional abundance and circulating levels of anti-Mullerian hormone and Sertoli cell count in crossbred and Zebu bovine males. Theriogenology. 89:1-8.
- Rajak SK, Kumaresan A, Nayak S, Chhillar S, Attupuram NM, Aslam MKM, Baithalu RK, Mohanty TK (2016) Age-related changes in basal concentrations of FSH, LH and testosterone in indigenous and crossbred bovine males. The Indian Journal of Animal Sciences. 86 (10): 1150-1152.
- Tripathi UK, Chhillar S, Kumaresan A, Aslam MKM, Rajak SK, Nayak S, Manimaran A, Mohanty TK, Yadav S (2015) Morphometric evaluation of seminiferous tubule and proportionate numerical analysis of Sertoli and spermatogenic cells indicate differences between crossbred and purebred bulls. Veterinary World. 8(5): 645-650.
- Aslam MKM, Kumaresan A, Rajak SK, Tajmul M, Datta T, Kumar M, Kumar T, Srinivasan A, Yadav S (2015) Comparative proteomic analysis of Taurine, Indicine and crossbred (Bos taurus X Bos indicus) bull spermatozoa for identification of proteins related to sperm malfunctions and sub-fertility in crossbred bulls. Theriogenology doi: 10.1016/j.theriogenology. 2015.04.020.
- Rajak SK, Kumaresan A, Gaurav MK, Layek SS, Aslam MMK, Manimaran A, Mohanty TK (2014) Glial cell line Derived Neurotrophic Factor (GDNF) concentrations in seminal plasma of crossbred bulls producing good and poor ejaculates. The Indian Veterinary Journal. 91 (10):32-34.

- Rajak SK, Kumaresan A, Gaurav MK, Layek SS, Mohanty TK, Aslam MKM, Tripathi UK, Prasad S, De S. (2014) Testicular cell indices and peripheral blood testosterone concentrations in relation to age and semen quality in crossbred (*Holstein Friesian* x Tharparkar) bulls. Asian Australian Journal of Animal Sciences. 27(11):1554-1561 doi.org/10.5713/ajas.2014.14139.

- Rajak SK, Tripathi UK, Attupuram NM, Boro, P, Layek SS, Aslam MKM, Kumaresan A, Mohanty TK, Sreela L, Arul PM (2014) Relationship of blood and seminal plasma testosterone concentrations with semen quality in crossbred bulls. Indian Journal of Dairy Science. 67(2):162-167.

- Rajak SK, Vijetha BT, Kumaresan A, Layek SS, Mohanty TK, Gaurav MK, Chakravarty AK, Datta TK, Manimaran A, Prasad S (2014) Testicular cytology indicates differences in Sertoli cell counts between good freezer and poor freezer bulls. Indian Journal of Experimental Biology. 54(1):17-25.

- Tripathi UK, Aslam MKM, Pandey S, Nayak S, Chhillar S, Srinivasan A, Mohanty T, Kadam PH, Chauhan M, Yadav S, Kumaresan A (2014) Differential proteomic profile of spermatogenic and Sertoli cells from peri-pubertal testes of three different bovine breeds. Frontiers in Cell and Developmental Biology. 2:24. doi: 10.3389/fcell.2014.00024.

- Muhammad AMK, Kumaresan A, Sharma VK, Tajmul M, Chhillar S, Chakravarty AK, Manimaran A, Mohanty TK Srinivasan A, Yadav S (2014) Identification of putative fertility markers in seminal plasma of crossbred bulls through differential proteomics. Theriogenology. 82 (9):1254-1262.

- Rajak SK, Kumaresan A, Gaurav MK, Aslam MKM, Mohanty TK, Prasad S, Chakravarty AK, Venkatasubramanian V (2013) Testicular biometry and semen quality is not altered by the process of fine needle aspiration in crossbred bulls. Indian Journal of Animal Sciences. 83 (7):732–735.

Project title: Development of genetically engineered vaccines against economically important poultry viral diseases

Project Code	**:**	3010
Duration of the project	**:**	June 2012- May 2016
PI Name	**:**	Dr. Sohini Dey
CCPI Name	**:**	Dr. Bikash Mondal
Lead Centre	**:**	ICAR-IVRI, Izatnagar
Cooperating centre	**:**	ICAR-IARI, New Delhi

Objectives:

- To develop a multivalent viral vector vaccine against Newcastle disease and Infectious bursal disease of poultry by reverse genetics technology
- To develop plant virus gene-based expression vectors for expression of HN or F gene of Newcastle disease and VP2 gene of Infectious bursal disease viruses

Achievements:

a) Publications:

- Khulape SA, Maity HK, Pathak DC, Chellappa MM, Dey S (2015) Antigenic validation of recombinant hemagglutinin-neuraminidase protein of Newcastle disease virus expressed in Saccharomyces cerevisiae. Acta virologica. 59:240-246. DOI: 10.4149/av_2015_03_240.
- Dey S, Chellappa MM, Gaikwad S, Kataria JM, Vakharia VN (2014) Genotype characterization of commonly used Newcastle disease virus vaccine strains of India. PloS One 4:9(6): e98869.
- Khulape SA, Gaikwad SS, Chellappa MM, Mishra BP, Dey S (2014) Complete genome sequence of a Newcastle disease virus isolated from wild peacock in India. Genome Announcements 2(3). pii: e00495-14.
- Khulape SA, Gaikwad SS, Chellappa MM, Mishra BP, Dey S (2014) Genetic characterization and pathogenicity assessment of Newcastle disease virus isolated from wild peacock. Virus Genes. DOI 10.1007/s11262-014-1116-2.

Project title: Development of a bivalent marker vaccine against bovine herpesvirus-1 and brucella

Project Code	**:**	3011
Duration of the project	**:**	June 2012 – May 2015
PI Name	**:**	Dr. Praveen Gupta
Lead Centre	**:**	ICAR-IVRI, Izatnagar

Objectives:

- To develop a marker gene deleted BoHV-1 vaccine
- To develop a bivalent marker vaccine against BoHV-1 and brucella
- To develop rapid diagnostic tests for detection of BoHV-1 infections

Achievements:

a) Publications:

- Pawar SS, Meshram CD, Singh NK, Saini M, Mishra BP, Gupta, PK (2014). Development of a SYBR Green I based duplex real-time PCR for detection of bovine herpesvirus-1 in semen. Journal of Virological Methods. 208:6-10. DOI: 10.1016/j.jviromet.2014.07.027.

- Pawar SS, Meshram CD, Singh NK, Sonwane AA, Saini M, Rautmare SS, Muglikar DM, Mishra BP, Gupta PK (2014). Rapid detection of bovine herpesvirus-1 in bovine semen by loop mediated isothermal amplification (LAMP) assay. Archives of Virology. 159: 641-648. DOI: 10.1007/s00705-013-1869-2.

b) Patent:

- A rapid, sensitive and user-friendly visual LAMP-based assay for detection of infectious bovine rhinotracheitis (IBR) virus in bovine semen (Patent file no. 627/DEL/2012)

- Construction of glycoprotein E (gE) gene-deleted mutant of infectious bovine rhinotracheitis (IBR) virus Indian strain for DIVA-based marker vaccine (Patent file no. 1858/DEL/2014)

Project title: Development of live vaccine targeting the protein repair system(s) of *Salmonella*

Project Code	**:**	3012
Duration of the project	**:**	June 2012 – November 2015
PI Name	**:**	Dr. Manish Mahawar
Lead Centre	**:**	ICAR-IVRI, Izatnagar

Objectives:

- To identify targets of methionine sulfoxide reductase (MSR) and protein isoaspartate methyl transferase (PIMT)
- To make Salmonella mutant bank with (single/double/triple/quadruple deletions enzymes and in their targets) and compare the growth characteristics of the mutants with the parent Salmonella
- To evaluate the reversion possibility of the mutants.
- To evaluate the attenuation and vaccine potential of the mutant(s) in mice and then in poultry

Achievements:

a) Publications:

- Pesingi P, Kumawat K, Behera MP, Dixit SK, Goswami TK, Agarwal RK, Mahawar M (2017) Protein - L - Isoaspartyl Methyltransferase (PIMT) is required for survival of *Salmonella typhimurium* at 42 °C and contributes to the virulence in poultry. Frontiers in Microbiology 8: 1-9. DOI: 10.3389/fmicb.2017.00361.
- Dixit SK, Hota DP, Rajan P, Mishra PKK, Goswami TK, Mahawar, M. (2017) *Salmonella typhimurium* methionine sulfoxide reductase A (MsrA) prefers TrxA in repairing methionine sulfoxide. Preparative Biochemistry and Biotechnology. 47(2):137-142. https://doi.org/10.1080/10826068.2016.1185733.
- Sarkhel R, Rajan P, Gupta AK, Kumawat M, Agarwal P, Shome A, Lalsangpuii, Mahawar M (2017) Methionine sulfoxide reductase A of *Salmonella typhimurium* interacts with several proteins and abets in its colonization in the chicken. BBA General Subjects.861(12):3238-3245. doi: 10.1016/j.bbagen.2017.09.014.
- Dixit SK, Hota DP, Rajan P, Mishra PKK, Goswami TK, Mahawar M (2016) *Salmonella typhimurium* methionine sulfoxide reductase A (MsrA) prefers TrxA in repairing methionine sulfoxide. Preparative Biochemistry and Biotechnology http://dx.doi.org/10.1080/10826068.2016.1185733.
- Kumawat M, Pesingi PK, Agarwal RK, Goswami TK, Mahawar M (2016) Contribution of protein isoaspartate methyl transferase (PIMT) in the survival of

Salmonella typhimurium under oxidative stress and virulence. International Journal of Medical Microbiology. 306(4):222-230. DOI: 10.1016/j.ijmm.2016.04.005

- Trivedi RN, Agarwal P, Kumawat M, Gupta, VK, Goswami TK, Mahawar M. (2015) Methionine sulfoxide reductase A (MsrA) contributes to *Salmonella typhimurium* survival against oxidative attack of neutrophils. Immunobiology. 220: 1322–1327. DOI: 10.1016/j.imbio.2015.07.011.

- Dixit SK, Hota DP, Kumawat M, Goswami TK, Mahawar M (2014) Cloning and sequencing of protein L-isoaspartyl O-methyl transferase of *Salmonella typhimurium* isolated from poultry. Veterinary World. 7: 712-716.

Project title: Phytoplasma diseases of coconut and arecanut: Development of molecular diagnostics

Project Code	**:**	3013
Duration of the project	**:**	June 2012–May 2015
PI Name	**:**	Dr. Vinayak Hegde
Lead Centre	**:**	ICAR-CPCRI, Kasaragod

Objectives:

- To develop protein and DNA based diagnostics for coconut root wilt and arecanut yellow leaf disease phytoplasma

Achievements:

a) Publications:

- Nair S, Roshna OM, Soumya VP, Vinayaka H, Kumar MS, Manimekalai R, Thomas GV (2014) Real-time PCR technique for detection of arecanut yellow leaf disease phytoplasma. Australasian Plant Pathol. Doi:10.1007/s13313-014-0278-7

Project title: Early Detection of Pregnancy in Cow and Buffalo by Pregnancy Associated Proteins (PAPs)

Project Code	**:**	3014
Duration of the project	**:**	June 2012 – May 2015
PI Name	**:**	Dr. A.K. Mohanty
CCPI Name	**:**	Dr. Ashok K. Balhare
Lead Centre	**:**	ICAR-NDRI, Karnal
Cooperating centre	**:**	ICAR-CIRB, Hissar

Objectives:

- Analysis of isoforms of pregnancy-associated glycoproteins (PAGs) and their purification from placentome during early pregnancy
- Identification of candidate proteins likely to be detected in urine of cows and buffaloes based on studies in humans and bovines
- Immunoscreening of selected pregnancy associated proteins for development of early pregnancy diagnosis kit in cows and buffaloes

Achievements:

a) Publications:

- Rawat P, Bathla S, Baithalu R, Yadav M, Kumar S, Ali SA, Tiwari A, Lotfan M, Naru J, Jena M, Behere P, Balhara AK, Vashisth R, Singh I, Dang A, Kaushik JK, Mohanty TK, Mohanty AK (2016) Identification of Potential Protein Biomarkers for Early Detection of Pregnancy in Cow Urine using 2D DIGE and Label Free Quantitation. Clinical Proteomics 15:13:15. DOI: 10.1186/s12014-016-9116-y.
- Abdullah M, Mohanty TK, Patbandha TK, Bhakat M, Madkar AR, Kumaresan A, Mohanty AK (2015) Pregnancy diagnosis-positive rate and conception rate as indicator of farm reproductive performance. Indian Journal of Animal Research. 51(1):170-174.
- Bathla S, Rawat P, Baithalu R, Yadav M, Jasmine N, Tiwari A, Kumar S, Balhara AK, Singh S, Chaudhary S, Kumar LM, Behare P, Phulia SK, Mohanty TK, Kaushik JK, Nallapeta S, Singh I, Ambatipudi S, Mohanty AK (2015) Profiling of urinary proteins in Karan Fries cows reveals more than 1550 proteins. Journal of Proteomics. 127:193-201. DOI: 10.1016/j.jprot.2015.05.026.
- Abdullah M, Mohanty TK, Kumaresan A, Mohanty AK, Madkar AR, Baithalu R, Bhakat M (2014) Early Pregnancy Diagnosis in Dairy Cattle: Economic Importance and Accuracy of Ultrasonography. Advances in Animal and Veterinary Sciences. 2 (8): 464-467.

- Balhara AK, Gupta M, Mohanty AK, Phulia SK, Sharma RK, Singh S, Singh I (2014) Changes in sera proteome in relation to day of pregnancy in early pregnant buffaloes. Indian Journal of Animal Sciences. 84 (4):400–409.

- Balhara AK, Mohanty AK, Gupta M, Jamwal M, Sunesh, Phulia SK, Singh I (2014) Bioinformatics and functional analysis of proteins in serum of early pregnant buffaloes. Indian Journal of Animal Sciences. 84(2):140–145.

- Balhara AK, Gupta M, Singh S, Mohanty AK, Singh I (2013) Early pregnancy Diagnosis in Bovines: Current Status and Future Directions. The Scientific World Journal. Article ID 958540 http://dx.doi.org/10.1155/2013/ 958540.

Project title: Development of Transgenic Goat for Production of human Lactoferrin

Project Code : 3015
Duration of the project : June 2012 – May 2016
PI Name : Dr. M.S. Chauhan
Lead Centre : ICAR-NDRI, Karnal

Objectives:

- Establishing a protocol for developing transgenesis in goats
- Expression of human lactoferrin gene in goat mammary gland

Achievements:

a) Technology Developed:

- Human lactoferrin gene constructs have been developed.
- Established protocol for isolation and culture of goat mammary epithelial and fibroblast cells.
- Development of protocol for transfection of goat mammary epithelial and goat fibroblast cells with human lactoferrin gene construct.
- Established protocol for in vitro production of transgenic goat cloned embryos using transfected fibroblast cells by hand-guided cloning and embryo transfer (ET) to recipient goats.

Project title: Defense genes of tiger shrimp (*Penaeus monodon*) with respect to bacteria (*Vibrio harveyi*) and whitespot virus (WSSV) infection

Project Code	:	3016
Duration of the project	:	June 2012 – May 2016
PI Name	:	Dr. Subhendu Kumar Otta
CCPI Names	:	Dr. M.N. Venugopal
	:	Dr. K.V. Rajendran
Lead Centre	:	ICAR-CIBA, Chennai
Cooperating centres	:	KVAFSU, Mangalore
	:	ICAR-CIFE, Mumbai

Objectives:

- Detection and quantification of defense system of *P. monodon* by biochemical and hematological (CIBA)
- Characterization of promising antimicrobial peptides/defense genes in *P. monodpn* in respect to (COFM)
- Expression profile of defense genes in P.monodon in response to infection and during embryonic/early development (CIFE)
- To observe the sparing effect of defense genes in providing protection to shrimp (CIBA)

Achievements:

a) Publications:

- Deepika A, Sreedharan K, Rajendran K V (2020) Responses of some innate immune-genes involved in the toll-pathway in black tiger shrimp (*Penaeus monodon*) to *Vibrio harveyi* infection and onexposure to ligands *in vitro*. Journal of World Aquaculture Society. 1-11. https://doi.org/10.1111/jwas.12723.
- Deepika A, Sreedharan K, Rajendran KV (2019) Molecular characterisation, ontogeny and tissue level expression analysis of a downstream signalling molecule of the Toll-pathway, Dorsal (an NF-κB homologue) in black tiger shrimp (*Penaeus monodon*). Journal of Indian Fisheries Association 46(1):7-15.
- Sreedharan K, Deepika A, Paria A, Badekar MK, Makesh M, Rajendran KV (2018) Ontogenetic and expression of different genes involved in the Toll pathway of black tiger shrimp (*Penaeus monodon*) following immersion challenge with *Vibrio harveyi* and white spot syndrome virus (WSSV). Agri Gene. 8: 63-71 https://doi.org/10.1016/j.aggene.2018.05.002.
- Sreedharan K, Deepika A, Paria A, Babu Suresh PP, Makesh M, Rajendran KV (2017) Ontogeny and expression analysis of tube (interleukin-1 receptor-associated kinase-4 homolog) from *Penaeus monodon* in response to white spot syndrome virus infection

and on exposure to ligands. Agri Gene. 3: 21-31. doi.org/10.1016/j.aggene.2016.10.002.

- Banerjee D, Maiti B, Girisha SK, Venugopal MN, Indrani K (2015) Broad spectrum anti-bacterial activity of a recombinant phosphatase-like protein isolated from the shrimp *Penaeus monodon*. The Israeli Journal of Aquaculture– Bamidgeh. 67:1146-9.

- Dechammaa M.M, Rajeisha M, Maiti B, Mani MK, Karunasagar I (2015) Expression of Toll-like receptors (TLR), in lymphoid organ of black tiger shrimp (*Penaeus monodon*) in response to *Vibrio harveyi* infection. Aquaculture Reports. 1: 1-4. DOI: 10.1016/j.aqrep.2015.02.002.

- Banerjee D, Maiti B, Girisha SK, Venugopal MN, Karunasagar I (2015) A crustin isoform from black tiger shrimp, *Penaeus monodon* exhibits broad spectrum anti-bacterial activity. Aquaculture Reports. 2:106-111. http://dx.doi.org/10.1016/j.aqrep.2015.08.009.

- Deepika A, Sreedharan K, Paria A, Makesh M, Rajendran KV (2014) Toll pathway in tiger shrimp (*Penaeus monodon*) responds to white spot syndrome virus infection: Evidence through molecular characterisation and expression profiles of MyD88, TRAF6 and TLR genes. Fish Shellfish Immunology. 41(2):441-454. DOI: 10.1016/j.fsi.2014.09.026.

- Sindhupriya M, Saravanan P, Otta SK, Amarnath CB, Arulraj R, Bhuvaneswari T, Ezhil PP, Jithendran KP, Ponniah AG (2014) White spot syndrome virus (WSSV) genome stability maintained over six passages through three different penaeid shrimp species. Diseases of Aquatic Organisms. 111(1):23–9. DOI: 10.3354/dao02786.

Project title: Development of a protocol for targeted integration of genes in Catla (*Catla catla*)

Project Code	**:**	3017
Duration of the project	**:**	June 2012 – May 2015
PI Name	**:**	Dr. Hirak Kumar Barman
Lead Centre	**:**	ICAR-CIFA, Bhubaneswar

Objectives:

- To elucidate the genomic organization including regulatory elements for TLR22 from catla, *Catla catla*
- To establish culture protocol for enriched spermatogonial stem cells (SSCs) of catla
- To genetically modify catla SSCs in culture at defined genomic site of TLR22
- Generation of model catla carp lacking TLR22 gene for understanding defense mechanism against argulosis

Achievements:

a) Publications:

- Panda RP, Chakrapani V, Patra SK, Saha JN, Jayasankar P, Kar Banya, Sahoo PK, Barman HK (2014). First evidence of comparative responses of Toll-like receptor 22 (TLR22) to relatively resistant and susceptible Indian farmed carps to *Argulus siamensis* infection. Developmental and Comparative Immunology. 47:25–35. DOI: 10.1016/j.dci.2014.06.016.

- Barman HK, Mohanty R, Patra SK, Chakrapani V, Panda R, Prasanna N, Swapnarani J, Sasmita, Jayasankar, Pallipuram, Nandanpawar P (2015) Actin gene promoter of rohu carp (*labeo rohita*) drove reporter gene expressions in transgenic rohu and various cell lines including spermatogonial stem cells. cellular & molecular biology letters. 20 (2):237-247.

Project title: Countering Gastrointestinal Tract Pathogens by Adhesion-Promoting Probiotic Surface Proteins

Project Code	**:**	3019
Duration of the project	**:**	June 2012 – May 2015
PI Name	**:**	Dr. Jai Kaushik
Lead Centre	**:**	ICAR-NDRI, Karnal

Objectives:

- Comparative analysis of the adhesion of lactic acid bacteria (LAB) derived mucus-binding (Mub), fibronectin-binding (Fnbp), collagen-binding (Cbp) and surface-layer (Slp) proteins by using enteric cell lines
- Effect of various adhesion-promoting proteins on the exclusion of pathogens in mice.
- Microencapsulation of surface proteins to enhance their efficacy under *in vivo* Conditions.

Achievements:

- Developed stabilized recombinant adhesion-promoting proteins from probiotic LAB with demonstrated biotherapeutic potential, addressing probiotic safety concerns and enabling novel biomedical applications such as implant coatings, cell culture media, and targeted drug delivery.

Project title: Stock characterization, captive breeding, seed production and culture of hilsa (*Tenualosa ilisha*)

Project Code	**:**	3021
Duration of the project	**:**	November 2012 – November 2017
PI Name	**:**	Dr. V.R. Suresh
CCPI Names	**:**	Dr. Das Gupta
	:	Dr. Debasis Dey
	:	Dr. Shubhadeep Ghosh
	:	Dr. Mrs Vindhya Mohindra
	:	Dr. Sameer Bhattacharya
	:	Dr. Debnarayan Chattopadhyay
Lead Centre	**:**	ICAR-CIFRI, Barracpore
Cooperating centres	**:**	ICAR-CIFE, Kolkata
	:	ICAR-CIBA, WB
	:	ICAR-CMFRI, Vishakhapattanam
	:	ICAR-NBFGR, Lucknow
	:	Vishwa Bharti University (WB)
	:	ICAR-CIFA, WB

Objectives:

- Assessment of natural stock of hilsa and their habitat preference, biology and biochemical composition in different ecosystems (Hooghly, Narmada and Ukai reservoir)
- Develop knowledge base on genome-wide variation and population structure of hilsa to support breeding programmes for aquaculture and natural stock management (NBFGR)
- Evaluation of osmoregulatory and endocrine changes of hilsa in relation to ionic homeostasis and gonadal maturation
- Development and standardization of captive breeding, seed production and culture systems for hilsa
- Development of feeds for hilsa and augmentation of its homing by developing chemoattractants.

Achievements:

a) Publications:

- Suresh VR, Mandhir SK, Sajina AM, Manna RK, Mukherjee J, Banik SK, Maity T, Samanta R, Raman RK, Jayaraman J, Behera BK (2021) Reproductive potential and stock status of the anadromous shad, *Tenualosa ilisha* (Hamilton, 1822): Implications

for managing its declining fisheries in northern Bay of Bengal bordering India. Regional Studies in Marine Science. 44:101753. https://doi.org/10.1016/j.rsma.2021.101753.

- De D, Shyne Anand PS, Mukherjee S, Kumar P, Dayal JS, Raja R A, Bera A, Suresh VR, Vijayan KK (2020) Broodstock development and captive maturation of hilsa (*Tenualosa ilisha*) in a brackishwater pond-based system. Journal of Fish Biology. 1-14. https://doi.org/10.1111/jfb.14426.

- Sajina A M, Suresh V R, Sandhya K M, Mukherjee J, Manna R K, Banik S K, Maity T and Samanta R (2020) Growth overfishing of hilsa shad in Hooghly-Bhagirathi River system, India: Assessment and management implications. Indian Journal of Fisheries. 67(2): 1-7, DOI: 10.21077/ijf.2019.67.2.89171-01.

- Dechamma M, Mani MK, Rajesh M, et al. (2020) Differential expression of akirin gene in black tiger shrimp, Penaeus monodon, in response to immunostimulant administration and infection with *Vibrio harveyi* and White Spot Syndrome Virus. Journal of the World Aquaculture Society. 51(4):1054-1065. https://doi.org/10.1111/jwas.12704.

- Deepika A, Sreedharan K, Rajendran KV (2020) Responses of some innate immune-genes involved in the Toll-pathway in black tiger shrimp (*Penaeus monodon*) to Vibrio Harvey infection and on exposure to ligands *in vitro*. Journal of the World Aquaculture Society. 2020:1–11 https://doi.org/10.1111/jwas.12723.

- Das S, Barman S, Teron R, Bhattacharya SS, Kim KH (2020) Secondary metabolites and anti-microbial/anti-oxidant profiles in Ocimum spp.: role of soil physicochemical characteristics as eliciting factors, Environmental Research. 188:109749 https://doi.org/10.1016/j.envres.2020.109749.

- Saripalli G, Singh K, Kumar S, Gautam T, Raghuvanshi S, Prasad P, Jain N, Sharma PK, Balyan HS, Gupta PK (2020) Genome-wide analysis of H3K4me3 and H3K27me3 modifications due to Lr28 for leaf rust resistance in bread wheat (*Triticum aestivum*). Plant Molecular Biology. 104(1-2):113-136. DOI: 10.1007/s11103-020-01029-4.

- De D, Mukherjee S, Anand PSS, Kumar P, Suresh VR, Vijayan KK (2019) Nutritional profiling of hilsa (*Tenualosa ilisha*) of different size groups and sensory evaluation of their adults from different riverine systems. Scientific Reports. 9:19306. doi.org/10.1038/s41598-019-55845-w.

- Malick C, Chatterjee SK, Bhattacharya S, Suresh VR, Kundu R, Saikia SK (2019) Gustatory ultrastructures of an amphihaline migratory fish hilsa *Tenualosa ilisha*. Microscopy Research Technique. 2020:1–7. https://doi.org/10.1002/jemt.23439

- De D, Kumar P, Anand PSS, Biswas G, Mukherjee S, Ghoshal TK, Suresh VR, Vijayan, KK (2019) Embryonic development, larval rearing, and digestive tract and enzyme ontogeny of hilsa shad, *Tenualosa ilisha*. Journal of Coastal Research. 86 (Special Issue):73–81. doi: 10.2112/ SI86-011.1.

- Sajina AM, Suresh VR, Sandhya KM, Mukherjee J, Manna RK, Behera BK, Samanta R, Maity T, Banik SK (2019) Status of Hilsa Fishery in Hooghly-Bhagirathi River System and Associated Coastal Waters of Northern Bay of Bengal. Proceedings of the National Academy of Sciences, India Section B: Biological Sciences. doi.org/10.1007/s40011-019-01140-7.

- Divya BK, Mohindra V, Singh RK, Yadav P, Masih P, Jena1 JK (2018) Muscle transcriptome resource for growth, lipid metabolism and immune system in Hilsa shad, *Tenualosa ilisha*. Genes & Genomics. https://doi.org/10.1007/s13258-018-0732-y.

- Malick C, Chatterjee SK, Bhattacharya S, Suresh VR, Kundu R, Saikia SK (2018) Structural organization of the olfactory organ in an amphihaline migratory fish Hilsa, *Tenualosa ilisha*. Microscopy Research and Technique https://Doi. 10.1002/jemt.23095.

- Chattopadhyay, Chakraborty DNA, Roy PK, Mondal RN, Suresh VR, Banik SK (2018) First ever weaning and feeding behaviour of hilsa shad, *Tenualosa ilisha* (Hamilton, 1822) fry under captive culture in freshwater pond. Environment and Ecology. 36(2): 508-513.

- Chatterjee SK, Malick C, Bhattacharya S, Suresh VR, Kundu R, Saikia SK (2018) Ectopic expression of olfactory receptors and associated G-protein subunits in the head integument of the amphihaline migratory fish hilsa *Tenualosa ilisha*. Journal of Fish Biology. doi.org/10.1111/jfb.13801.

- Mandal S, Lal KK, Singh RK, Sah RS, Jena JK, Singh A, Mohindra V (2018) Comparative length-weight relationship and condition factor of hilsa shad *Tenualosa ilisha* (Hamilton, 1822) from freshwater, estuarine and marine environments in India. Indian Journal of Fisheries. 65(2): 33-41. doi:10.21077/ijf.2018.65.2.73732-04.

- Dutta S, Ray SK, Pailan GH, Suresh VR, Dasgupta S (2018) Alteration in branchial NKA and NKCC ion-transporter expression and ionocyte distribution in adult hilsa during up-river migration. Journal of Comparative Physiology. B, doi.org/10.1007/s00360-018-1193-y.

- Chatterjee SK, Malick C, Bhattacharya S, Kundu R, Suresh VR, Saikia SK (2018) Sensory pad'- A novel chemoreceptive device in Hilsa (*Tenualosa ilisha*) to support its amphihaline attribute. Acta Biologica Szegediensis. 62(1): 1-6. https: // doi:10.14232/ abs. 2018.1.1-6.

- Mandal S, Lal KK, Singh RK, Sah RS, Jena JK, Singh A, Mohindra V (2018) Comparative length-weight relationship and condition factor of Hilsa Shad *Tenualosa ilisha* (Hamilton, 1822) from freshwater, estuarine and marine environments in India. Indian Journal of Fisheries. 65(2): 33-41. doi: 10.21077/ijf.2018.65.2.73732-04.

- Chattopadhyay D, Chakraborty A, Ray PK, Mandal R, Banik SK, Suresh VR, Ghosh K (2018) Larval rearing of hilsa shad, *Tenualosa ilisha* (Hamilton 1822). Aquaculture Research. 2018:1–8. doi.org/10.1111/are.13934.

- Divya BK, Mohindra V, Singh RK, Yadav P, Masih P, Jena JK (2018) Muscle transcriptome resource for growth, lipid metabolism and immune system in Hilsa shad, *Tenualosa ilisha*. Genes & Genomics. doi.org/10.1007/s13258-018-0732-y.

- Saikia SK, Malick C, Chatterjee SK, Kundu R, Bhattacharya S, Suresh VR (2014) Identification of putative epidermal chemosensory cells and taste buds in an amphihaline fish Hilsa, *Tenualosa ilisha* (Hamilton, 1822). Journal of Fish Biology 14:579.

- De D, Anand S, Sinha PS, Subhasmita, Suresh VR (2013) Study on preferred food items of hilsa (*Tenualosa ilisha*). International Journal of Agriculture and Food Science Technology. 4(7):647-658.

Project title: Understanding plant-nematode interaction: Identification of plant and nematode genes involved in disease development

Project Code	**:**	3022
Duration of the project	**:**	June 2012 – May 2015
PI Name	**:**	Dr. K. Subramaniam
CCPI Names	**:**	Dr. Amar Kumar
	:	Dr. Anil Sirohi
	:	Dr. Pradeep Kr. Jain
	:	Shri Ravi Shankar
Lead Centre	**:**	IIT, Kanpur
Cooperating centres	**:**	Delhi University, Delhi
	:	ICAR-IARI, New Delhi
	:	ICAR-NRCPB, New Delhi
	:	IHBT, Palampur

Objectives:

- Identification and validation of nematode and plant genes (both coding RNAs and small non-coding RNAs) involved in the establishment of *Meloidogyne incognita*
- Manipulation of selected key nematode and plant genes and miRNAs to hinder establishment and propagation of the nematode in plants
- miRNA target identification and discovery of influenced regulatory networks, giving complete system level information and reasoning for the observed phenomenon, which will be helpful in designing a targeted approach for obtaining RKN resistant crop plants.
- Identification of gene targets for developing nematode control strategies in root-knot and lesion nematodes.

Achievements:

a) Publications:

- Jha A, Shankar R (2013) miReader: Discovering Novel miRNAs in Species without Sequenced Genome. PloS One 8(6): e66857. doi: 10.1371/journal.pone. 0066857**.**

Project title: Enhancing use efficiency of micronutrients: Novel delivery systems

Project Code	**:**	3023
Duration of the project	**:**	June 2012 – May 2017
PI Name	**:**	Dr. S.P. Dutta
CCPI Name	**:**	Dr. Kishore M. Paknikar
Lead Centre	**:**	ICAR-IARI, New Delhi
Cooperating centre	**:**	ARI, Pune

Objectives:

- To evaluate the efficiency of nano-based micronutrient formulations against the standard micronutrient fertilizers in wheat, pigeonpea and chickpea in different types of soils
- To study fixation, transformation and transport of zinc, iron and boron from the nano-based products in different types of soils
- To evaluate bioavailability of zinc, iron and boron applied through nano-based formulations
- To assess the impact of nano micronutrient formulations on root characteristics, nitrogen fixation and soil biota

Achievements:

a) Publications:

- Dapkekar A, Deshpande P, Oak MD, Paknikar KM, Rajwade JM (2018) Zinc use efficiency is enhanced in wheat through nanofertilization. Scientific Reports. 8:6832.
- Deshpande P, Dapkekar A, Oak M, Paknikar K, Rajwade J (2018) Nanocarrier-mediated foliar zinc fertilization influences expression of metal homeostasis related genes in flag leaves and enhances gluten content in durum wheat. PLoS ONE 13(1): e0191035.

Project title: Use of Machine-Vision for distinguishing among crop varieties

Project Code	**:**	3024
Duration of the project	**:**	July 2012 – September 2015
PI Name	**:**	Dr. Nachiket Kotwaliwale
CCPI Names	**:**	Dr. Monika Joshi
	:	Dr. K. K. Gangopadhyay
	:	Dr. Nabarum Bhattacharya
Lead Centre	**:**	ICAR-CIAE, Bhopal
Cooperating centres	**:**	ICAR-IARI, New Delhi
	:	ICAR-NBPGR, New Delhi
	:	C-DAC, Kolkatta

Objectives:

- To develop methodology for distinguishing among varieties/ germplasm of rice, Indian mustard, chickpea and okra using visible imaging
- To optimize imaging and image processing parameters under visible spectral domain.

Achievements:

a) Publications:

- Joshi MA, Aggarwal D (2014) Comparative assessment of human measurement with machine vision for establishing varietal distinctness in rice. Emerging Research in Comp. 748-755.
- Joshi MA, Aggarwal D (2014) Emerging techniques for DUS testing- use of Machine Vision and Image Analysis". Seed Quality Assurance TB- ICN: 126:268-272.

Project title: Green Fishing Systems for Tropical Seas

Project Code	:	3025
Duration of the project	:	June 2012 -May 2017
PI Name	:	Dr. Leela Edwin
CCPI Name	:	Shri R. Singh
Lead Centre	:	ICAR-CIFT, Cochin
Cooperating centre	:	Goa Shipyard Ltd, Vasco Da Gama, Goa

Objectives:

- Design and construction of a 19.8m energy efficient new generation combination fishing vessel
- Development of energy saving selective fishing gear systems through material substitution and design optimization

Achievements:

a) Publications:

- Sayana KA, Remesan MP, Madhu VR, Pravin P, Edwin L (2016) Appraisal of trawl designs operated along Kerala coast. Fishery Technology. 53 (1):30-36.
- Sherief PSM, Rithin J, Thomas SN, Edwin L (2015) Design and general features of Ray gillnets used in Kanayakumari Coast. International Journal of Engineering Trends and Technology. 25(3).
- Sherief PSM, Sreejith PT, Sayana K.A., Dhiju, D. P. H., Thomas, S. N., Remesan, M. P. and Edwin, L. (2015) Drift Gillnets made of Sapphire® and Polyamide in Gujarat, India. Fishery Technology 52:62 66.
- Ravi R, Vipin PM, Boopendranath M, Joshy CG, Edwin L (2014) Structural Changes in the Mechanized Fishing Fleet of Kerala, South India. Indian J. Fish. 61(2):1-6.
- Vipin PM, Ravi R, Pravin P, Thomas SN, Edwin L (2014) Longline Fishing for High Value Species off Southern India with Special Reference to Structural and Operational Changes. Fishery Technology 51:87-92.
- Prajith KK, Dhiju DPH, Edwin L (2014) Dolphin Wall Net (DWN) – An innovative management measure devised by ring seine fishermen of Kerala-India to reducing or eliminating marine mammal–fishery interactions. Ocean & Coastal Management.102:1-6. https://doi.org/10.1016/j.ocecoaman.2014.08.012.
- Dhiju DPH, Gopal N, Edwin L (2012) Labour Deployment and Wage Distribution in Ring Seine Fishery of Central Kerala. Agricultural Economics Research Review. 25 (1):107-114.

Project title: Development of Gossypol-free Lysine-rich Cottonseed cake by Solid State Fermentation

Project Code	**:**	3026
Duration of the project	**:**	June 2012 -May 2014
PI Name	**:**	Dr. V. Mageshwaran
CCPI Name	**:**	Dr. S.B. Majee
Lead Centre	**:**	ICAR-CIRCOT, Mumbai
Cooperating centre	**:**	Bombay Vet. College, Mumbai

Objectives:

- To identify effective microbial strains for detoxification of gossypol and improvement of lysine content in cottonseed cake
- To optimize solid state fermentation process for production of gossypol-free cottonseed cake with improved lysine content
- To establish mechanism of detoxification of gossypol and increase in lysine content during solid state fermentation
- To evaluate toxicity, quality and functional properties of the fermented cottonseed cake in poultry.

Achievements:

a) Publications:

- Mageshwaran V (2016) Optimization of solid-state fermentation process for gossypol detoxification in heat sterilized cottonseed cake by mixed fungal cultures. International Journal of Food and Fermentation Technology 6(1): 97-102. DOI: 10.5958/2277-9396.2016.00031.3
- Mageshwaran V, D'Souza C, Kambli ND, Kathe AA (2015) Fermentation Technology: A viable tool for value-addition to cotton by-products. Cotton Research Journal. 7(1): 54 – 60.
- Shaikh A, Kathe AA, Mageshwaran V (2014) Reduction of Gossypol and Increase in Crude Protein Level of Cottonseed Cake using Mixed Culture Fermentation. KKU Research Journal. 19:67-73.
- Mageshwaran V, Shaikh A, Kambli ND, Kathe, AA (2014) Gossypol detoxification in various cottonseed extractions by fungal cultures during solid state fermentation. Cotton Research Journal. 5(2):132-136.
- Mageshwaran V, Kathe AA (2013) Detoxification of gossypol in cottonseed meal by native fungal isolates under solid state fermentation. Cotton Research Journal. 5(2):81 – 89.

- Mageshwaran V, Kathe AA (2013) Detoxification of gossypol in cottonseed meal by Pleurotus flabellatus strain M-1 under solid state fermentation. Indian Journal of Animal Nutrition. 30 (3):313 – 319.

- Mageshwaran V, Kathe AA (2013) Detoxification of gossypol in cottonseed meal by Pleurotus flabellatus strain M-1 under solid state fermentation. Indian Journal of Animal Nutrition. 30 (3):313 – 319.

b) Patent:

- A novel process for gossypol reduction and nutritive quality improvement of cottonseed cake for its use in non-ruminants feed (Patent file no. 1477/MUM/2014)

Project title: Development of Spectroscopic Methods for Detection and Quantification of Adulterants and Contaminants in Fruit Juices and Milk

Project Code	:	3027
Duration of the project	:	June 2012–May 2015
PI Name	:	Dr. S. N. Jha
CCPI Name	:	Dr. K.K. Mondal
Lead Centre	:	ICAR-CIPHET, Ludhiana
Cooperating centre	:	ICAR-IARI, New Delhi

Objectives:

- To develop spectroscopic (UV, visual, NIR, IR) models for instant detection and quantification of ingredients of synthetic milk, aflatoxin M1 and soymilk in natural milk

- To develop spectroscopic (UV, visual, NIR, IR) models for instant detection and quantification of major microbial contaminants (*E. coli* O157:H7, *Salmonella enteridis*) and selected toxins (aflatoxin B1 and patulin) in apple and mango juice

- To devise PCR/spectroscopy-based kits for the detection of selected microbial contaminants, adulterants and toxins in fruit juices/milk

Achievements:

a) Publications:

- Jaiswal P, Jha SN, Kaur J, Borah A, Ramya HG (2018) Detection of Aflatoxin M1 in Milk using Spectroscopy and Multivariate Analyses. Food Chemistry. 238:209-2014.

- Jaiswal P, Jha SN, Kaur J, Borah A (2017) Detection and quantification of anionic detergent (lissapol) in milk using Attenuated total reflectance - Fourier Transform Infrared Spectroscopy. Food Chemistry 221: 815–821 https://doi.org/10.1016/j.foodchem.2016.11.095.

- Jha SN, Jaiswal P, Borah, A, Gautam A, Srivastava N (2015) Detection and quantification of urea in milk using Attenuated Total Reflectance -Fourier transform infrared spectroscopy. Food Bioprocess Techology 8: 926-933.https://doi.org/10.1007/s11947-014-1455-y.

- Jha SN, Jaiswal P, Grewal MK, Gupta M, Bharadwaj R (2015) Detection of adulterants and contaminants in liquid foods – A Review. Critical Reviews in Food Science and Nutrition. 56(10):1662-1684https://doi.org/10.1080/10408398.2013.798257.

- Kumar S, Mondal KK (2015) Visual detection of Escherichia coli contamination in milk and fruit juice using loop-mediated isothermal amplification. Journal of Food Science and Technology. 52:7417 7424. DOI: 10.1007/s13197-015-1779-2.

- Jaiswal P, Jha SN, Borah A, Gautam A, Grewal MK, Jindal G (2015) Detection and quantification of soymilk in cow-buffalo milk using attenuated Total reflectance fourier transform infra-red spectroscopy (ATR-FTIR). Food Chemistry. 168: 41–47 DOI: 10.1016/j.foodchem.2014.07.010.

Project title: Development of a multiplex microarray system for detection of food-borne and shrimp pathogens

Project Code	**:**	3028
Duration of the project	**:**	June 2012 – May 2015
PI Name	**:**	Dr. Owais Mohammad
CCPI Name	**:**	Dr. Tom Joseph
Lead Centre	**:**	AMU, Aligarh
Cooperating centre	**:**	ICAR-CIFT, Cochin

Objectives:

- Development of a microbial diagnostic DNA Microarray chip for detection and genotyping of FSSAI notified six food borne bacterial pathogens; *viz. Vibrio cholerae*, *Staphylococcus aureus*, *Shigella*, *Escherichia coli Salmonella typhi*, and *Listeria monocytogenes* and *OIE* notified shrimp pathogens; white spot syndrome virus, Infectious hypodermal and haematopoietic necrosis virus and yellow head virus

- Design, construction and application of low-cost biochip analyser for use in DNA microarray

- Detection of food-borne/shrimp pathogens and fungal toxins employing a chip/lateral flow system

Achievements:

a) Publications:

- Owais M, Kazmi S, Tufail S, Zubair S (2014). An alternative chemical redox method for the production of bispecific antibodies: implication in rapid detection of food borne pathogens. Plos one. 17; 9(3):e91255

b) Patent:

- Owais, M., Swaleha Z, Shadab K. Production of bispecific antibodies for rapid detection of food borne pathogens. Appln. No US 62/133,412 (US Patent)

Project title: Jute-based biocomposites for industry

Project Code	**:**	3029
Duration of the project	**:**	June 2012 – May 2015
PI Name	**:**	Dr. L. Ammayappan
CCPI Names	**:**	Er. S.K. Pandey
	:	Mr. Manik Bhowmick
Lead Centre	**:**	ICAR-NIRJAFT, Kolkata
Cooperating centres	**:**	ICAR-IINRG, Ranchi
	:	ICAR-CIRCOT, Mumbai

Objectives:

- To modify jute reinforcement textiles and matrix polymers by physico-chemical methods for improved processability and performance of biocomposites
- To develop jute-based reinforcing fabric for preparation of biocomposites for industrial application
- To develop jute-based biodegradable composites using indigenous biopolymers
- To train stakeholders

Achievements:

a) Publications:

- Ammayappan L, Ghosh RK, Dasgupta S, Chakraborty S, Ganguly PK (2018) Optimisation of alkali treatment condition on jute fabric for the development of rigid biocomposite. Journal of Industrial Textiles doi: 10.1177/1528083716667259.
- Ammayappan L, Chakraborty S, Pan NC (2018). Effect of areal density and layering of jute nonwoven fabric on the performance of biocomposite, Indian Journal of Natural Fibres 4(2): 25-32.
- Ammayappan L, Chakraborty S, Musthafa L, Ganguly PK, Pan NC (2018) Study on alkaline peroxide treatment on jute fabric and its effect on performance of biocomposite, Indian Journal of Natural Fibre 4(2): 33-41.
- Ammayappan L, Chakraborty S, Pan NC (2018) Effect of resin property on performance of biocomposites, Indian Journal of Natural Fibres 5(1): 45-54.
- Ammayappan L, Chakraborty S (2017) Coating of silver nanoparticles on jute fibre by *in situ* synthesis. Cellulose 24: 1563-1577. https://doi.org/10.1007/s10570-017-1204-2.
- Ammayappan L, Das S, Guruprasad R, Ray DP, Ganguly PK (2016) Effect of lac treatment on mechanical properties of jute fabric /polyester resin based biocomposite. Indian Journal of Fibre and Textile Research 41(3): 312-317.

- Ammayappan L, Debnath S, Ray DP, Ghosh RK, Dasgupta S, Mondal D, Chakraborty S, Islam S, Musthafa I (2015) Optimisation of sodium hydroxide treatment for improved reinforcement with unsaturated polyester resin. Journal of Natural Fibres. 1(2): 233-244.

- Mondal D, Ray DP, Ammayappan L, Ghosh RK, Banerjee P, Chakraborty D (2015) Pre-treatment processes of jute fibre for preparation of biocomposites, International Journal of Bioresource Science 2 (l): 7-14

b) Patent:

- A process for coating metal nanoparticles on surface of jute fibre/textiles for enhancing the functionality of jute fibre/fabric and jute-polymer resin biocomposite sheet obtained thereof. (Patent file no.1262/KOL/2015).

- A process for surface modification of jute fibre/fabric for improved interfacial adhesion characteristics and biocomposites obtained thereof. (Patent file no.1348/KOL/2015)

- Jute biocomposite comprising compatibiliser-treated jute fibrous material with induced hydrophobicity and a method of manufacture (Patent file no. E-1/26479/ 2019-KOL)

Project title: Understanding genetics and biosynthesis of gum in ramie (*Boehmeria nivea* L. Gaud.) for developing low- gum genotypes

Project Code	**:**	3030
Duration of the project	**:**	June 2012 -May 2016
PI Name	**:**	Dr. P. Satya
CCPI Name	**:**	Dr. D.P. Ray
Lead Centre	**:**	ICAR-CRIJAF, Barrakpore
Cooperating centre	**:**	ICAR-NIRJAFT, Kolkata

Objectives:

- To characterise components of gum in ramie
- To study the genetics of gum content in ramie

Achievements:

a) Publications:

- Banerjee P, Ray DP, Satya P, Debnath S, Mondal D, Saha SC, Biswas PK (2015) Evaluation of Ramie fibres quality: A Review. International Journal of Bioresource Science. 1 (2):71-75.
- Mondal D, Ray DP, Ammayappan L, Ghosh RK, Banerjee P, Chakraborty D (2015) Pre-Treatment Processes of Jute Fiber for Preparation of Biocomposites. International Journal of Bioresource Science. 2 (l): 7-14.
- Ray DP, Ammayappan L, Nayak LK, Ghosh RK (2016) Synthetic resins and their properties in respect of development of jute-based composite boards. International Journal of Agriculture, Environment and Biotechnology. 9(3): 443-450. DOI: 10.5958/2230-732X.2016.00057.7.
- Ray DP, Banerjee P, Satya P, Mitra S, Ghosh RK, Mondal SB (2014) Degumming of decorticated ramie fibre through novel chemical process. Indian Journal of Natural Fibres. 1(1):125-129.
- Satya P, Karan M, Jana S, Mitra S, Sharma A, Karmakar PG, Ray DP (2015) Start codon targeted (SCoT) polymorphism reveals genetic diversity in wild and domesticated populations of ramie (*Boehmeria nivea* L. Gaudich.), a premium textile fibre producing species. Meta Gene. 3:62-70. DOI: 10.1016/j.mgene.2015.01.003.
- Satya P, Mitra S, Ray, DP, Mahapatra BS, Karan M, Jana S, Sharma AK (2013) Rapid and inexpensive NaOH-based direct PCR for amplification of nuclear and organelle DNA from ramie (*Boehmeria nivea*), a bast fibre crop containing complex polysaccharides. Industrial Crops and Products. 50:532–536. https://doi.org/10.1016/j.indcrop.2013.07.049.

- Banerjee P, Ray DP, Satya P, Debnath S, Mondal D, Saha SC, Biswas PK (2015) Evaluation of ramie fibre quality: a review. International Journal of Bioresource Science. 2(1):65-69.

Project title: Bioremediation of contaminants in polluted sites: use of weedy plants

Project Code	**:**	3032
Duration of the project	**:**	April 2013 – March 2017
PI Name	**:**	Dr. P. J. Khankhane
CCPI Names	**:**	Dr. Ravinder Kaur
	:	Dr. D. K. Singh
Lead Centre	**:**	ICAR-DWSR, Jabalpur
Cooperating centres	**:**	WTC, ICAR-IARI, New Delhi
	:	Delhi University (DU), Delhi

Objectives:

- To evaluate terrestrial weedy plants for rhizofiltration of heavy metals in contaminated medium
- To determine ability of aquatic weed species for removal of nutrients and basic ions from polluted waters
- To assess capability of plants for phyto-transformation of soil applied herbicides in contaminated medium
- Microbe- plant relationship in bioremediation of heavy metals and agrochemicals
- Exploring possibilities of developing consortia of potential plants associated with microbes for multiple polluted sites

Achievements:

a) Publications:

- Sarathambal C, Khankhane PJ, Gharde Y, Kumar B, Varun M (2017) The effect of plant growth-promoting rhizobacteria on the growth, physiology, and Cd uptake of *Arundo donax* L. International Journal of Phytoremediation. International Journal of Phytoremediation 19 (4): 360–370.

Project title: Study of Demonstration traits of two weed species

Project Code	**:**	3033
Duration of the project	**:**	April 2013 – March 2016
PI Name	**:**	Dr. Bhumesh Kumar
CCPI Names	**:**	Dr. I.C. Barua
	:	Dr. M.T. Sanjay
	:	Dr. S.K. Guru
Lead Centre	**:**	ICAR-DWSR, Jabalpur
Cooperating centres	**:**	AAU, Jorhat
	:	UAS, Bangalore
	:	GBPUA&T, Pantnagar

Objectives:

- To see variation available with respect to known domestication traits among different subspecies/ecotypes of *Echinochloa crusgalli* and *Physalis sps*
- To study nutritional status of the available subspecies/ecotypes of *Echinochloa crusgalli* and *Physalis minima*

Achievements:

- Accomplished detailed phenotypic and genotypic characterization of domestication traits and nutritional composition in *Echinochloa crusgalli* and *Physalis minima*, elucidated the molecular biosynthetic pathways of β-carotene for potential bio-fortification, and formulated an alternative crop cultivation strategy to enhance food security and promote dietary diversity in response to climate-induced agricultural constraints.

Project title: Establishment of association of begomovirus species with yellow vein mosaic disease (YVMD) in wild and cultivated species of okra and identification of source of resistance to the most predominant virus

Project Code	**:**	3034
Duration of the project	**:**	April 2013 – March 2015
PI Name	**:**	Dr. M.K. Reddy
CCPI Name	**:**	Dr. V. Venkataravanappa
Lead Centre	**:**	ICAR-IIHR, Bangalore
Cooperating centre	**:**	ICAR-IIVR, Varanasi

Objectives:

- Survey and distribution of yellow vein mosaic disease in wild and cultivated species of okra from diversity rich region in India
- Molecular characterization of begomovirus diversity associated with yellow vein mosaic disease in bhindi in India
- To identify the sources of resistance to predominant begomoviruses associated yellow vein mosaic disease of bhindi (BYVMD)

Achievements:

a) Publications:

- Venkataravanappa V, Reddy LCN, Jalali S, Briddon RW, Reddy MK (2014) Molecular identification and biological characterisation of a begomovirus associated with okra enation leaf curl disease in India. European Journal of Plant Pathology volume. 141:217–235. DOI 10.1007/s10658-014-0463-0.
- Venkataravanappaa V, Prasannaa HC, Reddy LCN, Reddy MK (2014) Evidence for two predominant viral lineages, recombination and subpopulation structure in begomoviruses associated with yellow vein mosaic disease of okra in India. Plant Pathology. Doi: 10.1111/ppa.12292.

Project title: Development of solar-hybrid refrigeration technology for on-farm (or in production catchment) safe transient storage of horticultural produce

Project Code	**:**	3035
Duration of the project	**:**	May 2013 – March 2017
PI Name	**:**	Er. V.S. Reddy
CCPI Names	**:**	Dr. Panna Lal Singh
	:	Dr. R.F. Sutar
Lead Centre	**:**	SPRERI, Gujarat
Cooperating centres	**:**	ICAR-CIAE, Bhopal
	:	AAU, Anand, Gujarat

Objectives:

- Experimental determination of the heat load (respiration) of important commodities (fruits including mango/ vegetables/ flowers) of the region and validation
- Design, development and evaluation of a solar thermal, solar PV & biogas-based vapour absorption cycle refrigeration facility for short-duration transient/on-farm storage of fresh horticultural produce
- Development and evaluation of solar PV-powered based vapour compression cycle refrigeration facility for short-duration transient/on-farm storage of fresh horticultural produce
- Intensive evaluation of both the facilities, including investigation of techno-economic feasibility

Achievements:

a) Publications:

- Patel BB, Sutar RF, Saiyad MJS, Joshi DC (2016). Respiration behaviour and heat of respiration of mango (cv. Langdo) under different storage conditions", International Journal of Agriculture, Environment and Biotechnology 9(5): 855-859