20. National Fund for Basic, Strategic and Frontier Application Research in Agriculture

Although most of the projects under the NFBSFARA are expected to have long-term focus for the application, results have started flowing in. In addition to the tangible results, the expectations from these projects are development of much needed and highly specialized quality human resource for globally competitive research and building-up rapport and partnership for collective exchange and development of ideas for innovative science. These expectations are gradually getting fulfilled. For example, among the fifty-three ongoing projects, forty are multi-institutional, and a number of them include reputed institutions of research outside the NARS.

During the year, a number of important activities regarding policy matters, calling for new projects, project monitoring and project execution were taken up. In the identified thrust areas for the XII Plan, 29 projects have been approved with a budget of ₹ 71.69 crore.

From this year, a new system has been introduced to assist project proponents, whose concept notes have been selected, in developing full proposals to increase frequency of selection of more meaningful proposals. This assistance has increased the success rate in getting approval of the Empowered Committee.

Nineteen out of the twenty-one projects awarded at the initiation of the National Fund have completed term on 31 March 2012. The NFBSFARA has 53 on-going projects at present with a budget of ₹173.54 crore.

The fourth call for submission of the research concept notes was made in August 2012. In response, 597 concept notes have been received. The process of their selection and award is in progress.

Monitoring and Evaluation

The Second Annual Review Workshop of the National Fund was organized on 23 and 24 July 2012 in the presence of the Empowered Committee and also of the Divisional Heads of the Council. The overall progress of the NFBSFARA was reviewed and the mid-course corrections and modifications were suggested. Progress of the nationally important mega project entitled 'Phenomics of Moisture Deficit and Low Temperature Stress Tolerance in Rice' was assessed by the Chairman of the Empowered Committee at the IASRI, New Delhi. A novel attempt has also been made to chalk out a path for integrating activities between this project and the other two projects entitled 'National Agricultural Bioinformatics Grid' and 'Bioprospecting of Genes and Allele Mining for Abiotic Stress Tolerance'. Two Advisory Committee meetings of 21 of the 22 projects initiated under Call II were completed. Third collective Advisory Committee meetings for the Thematic groups were held for four RNAi projects, four Alternate energy projects, four Abiotic stress projects on animal and fish, and four on Post-harvest technology and value-addition projects.

Based on the experience gained and learning from the execution of the Fund during XI Plan, the ICAR has planned to enlarge NFBSFARA substantially during the XII Plan.

SIGNIFICANT ACHIEVEMENTS

From the Call I, 19 projects that completed term on 31 March 2012, as many as 73 scientific papers have been published in peer-reviewed journals. And 4 patents have been filed and one has been obtained.

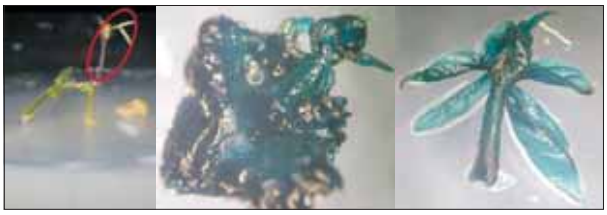
Patents filed/obtained

Sl No.	Project name	Patent title
Filed		
1.	Transcriptional level of developmentally important genes in buffalo pre-implantation embryos	Buffalo embryonic stem cell derived teratomas for the assessment of pluripotency
2.	Application of reverse genetics: a novel approach for studying the molecular basis of immune response in Indian cattle breed	A novel foot-and-mouth disease virus Asia I (Indian vaccine strain) replicon based viral vector for vaccine research and development
3.	Rumen microbial manipulations for mitigation of methane emission and productivity enhancement in dairy animals	Reduction of methane emission
4.	Role of small signal peptides in systemic defense response of Indian mustard (*Brassica juncea*) to aphids (*Lipaphis erysimi*)	A peptide elicitor of NPR1 and PR proteins mediated pathogen defense in Indian mustard (*Brassica juncea*)
Obtained		
5.	Increasing nutrient availability from roughage based rations through enhancing rumen efficiency or reducing enteric methane production by use of secondary plant metabolites	Fermentation vessel for conducting gas production studies (*in vitro*: Fabrication, protocol and uses)

Research Highlights

Plant sciences

- Transformation protocol for pigeonpea was optimized using *Agrobacterium* strain EHA105,



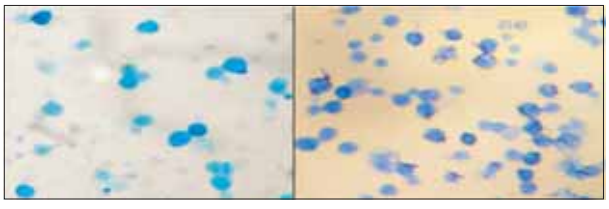
A. Efficient inhibition of chimeras in pigeonpea; **B.** Histochemical localization of GUS expression during regeneration; **C.** Shoot elongation

harbouring binary vector pBI121. Two antibiotics, Kanamycin during initial regeneration and Geneticin during shoot elongation, were used to efficiently screen out chimeras from pigeonpea tranformants.

- In sorghum, ovule-specific promoter FM 1 has been cloned from *Arabidopsis* and its expression has been validated. A unique target sequence of *SERK 1* gene (on chromosome 6) for RNAi silencing has been subcloned, and is being used in transformation of sorghum-plants.

Animal sciences and fisheries

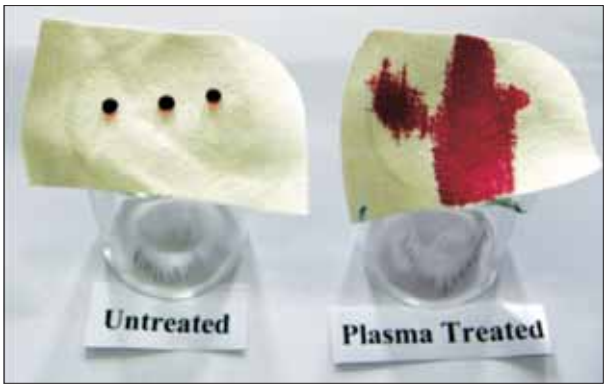
- Stem cell culture has been established using pig bone marrow mesenchymal stem cell lines. These cell lines will be used for producing transgenic pluripotent cells which in turn can be used for development of transgenic pigs. Immortalized Human Embryonic Kidney 293 (HEK 293) cells are being cultured for production of lentiviral particles. These particles will be used in the current project for reprogramming of pig cells to generate iPS cells and also for silencing target genes by RNA interference in reprogrammed iPS cells.
- A patent has been obtained on fermentation vessel for conducting rumen-gas production studies in *in-vitro*.
- *Argulus siamensis* has been identified as the most prevalent species, followed by *Argulus japonicus*, causing highly damaging parasitic disease, argulosis, in Indian aquaculture systems. A PCR-based marker for identification of two species has been developed.
- Parameters of infection for *in-vitro* challenge of head-kidney-derived macrophages with *Mycobacterium fortuitum* and *in-vivo* challenge of catfish and zebra fish have been optimized. A battery of tests (PCR as well as ELISA based) and microscopic smear examination for detection of *Mycobacterium paratuberculosis* and screening of infected animals have been optimized.
- Levels of expression of 5 genes, *BMP 15*, *GDF 9*, *MATER*, *ZAR 1* and *IGFBP 1*, were identified as markers for the development competence of oocytes to be used for *in-vitro* embryo production in buffaloes and in helping improve *in-vitro* production protocol.



Acid-fast staining of macrophages showing presence of bacteria inside them

Post-harvest technology and value-addition

- Indigenous lab-scale atmospheric pressure cold-plasma reactor with and without cooling system for environment friendly treatment of cotton-fabrics for effective dyeing and other qualities has been designed. Generation of atmospheric pressure cold plasma has also been achieved.



Surface modification of textile using plasma

- Pressure treatment at 400 MPa and above resulted in rapid dissociation of casein micelle. Micellar proteins are fully denatured and serum proteins denatured partially due to pressurization. In buffalo, disruption of casein micelle at 400 MPa or above pressure for 10 minutes indicated that casein fraction is the major site for high pressure-induced effect. The change in casein fractions affected viscosity and colour, apart from affecting HCT and rennet coagulation time (RCT). Shelf-life of high pressured (400 MPa for 10 min) treated samples of both cow and buffalo milk could be stored up to 20 days in refrigeration (5±2°C) without changing functional characteristics and spoilage. Above 400 MPa, the casein protein got denatured.
- An autoclavable microencapsulation system with multistage break-up two fluid nozzle has been developed for microencapsulation of sensitive food components, which are prone to contamination (microorganisms and their products) including bacteriocins. Microencapsulation of probiotic species of yeast, *Lactobacillus casei*, and pediocin, nisin, xylanase, pectinase and amylase has been done. Patent has been filed and technology has been transferred.

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