



UPDATES

Research News

Events

Visitors

Commercialization

Functional-Industrial
Linkage

Awards & Recognitions

Publications

Field Trainings

Hindi Programmes

Swachh Bharat Abhiyan

Staff Welfare Activities

Editorial Board

K V H Sastry

G Krishnan

M Bagath

C Devaraj

M Gopi

Published by

Raghavendra Bhatta
Director, ICAR-NIANP



Director's Desk



As we are advancing with the time towards the end of raging Pandemic 2021, we hope the New Year is going to be one of the memorable and fruitful year. I wish you all a healthy and prosperous New Year 2022.

Nutrition plays a primary role in enhancing the efficiency of production in farm animals. The energy and protein are the major nutrients required to a large extent which is essential for optimizing production and reproduction in farm animals. However, vitamins and minerals cannot be ignored for their known importance in health and production. ICAR-NIANP, Bengaluru is working in the area of animal nutrition and physiology for the last 25 years and has come up with many farmers friendly technologies that are directly field orientated such as Area Specific Mineral Mixture, Hydroponic Fodder Production, Anti-methanogenic Agents, Reprofat etc. These technologies have effectively augmented of the productive and reproductive performance of farm animals especially in dairy animals.

I am pleased to share that the institute has signed MoU for 'Hydroponic Fodder Production' with M/s Hydro Greens, Bengaluru during August 2021. Further, NIANP has advanced in addressing the current global issue of 'climate change', it has carried out systematic and comprehensive research and developed phyto-sources based anti-methanogenic products such as 'Harit Dhara' and 'Tamarin Plus'. To ensure the widespread availability of anti-methanogenic supplement across different parts of the country and seasons, the ICAR-NIANP and M/s Radiant Chem Industries, Chennai entered a functional-industry-linkage through a MoU for undertaking collaborative research to develop anti-methanogenic products using industrially available tannins. NIANP organized a hands-on training programme on 'Livestock methane emission: Assessment, impact and amelioration strategies' in collaboration with ILRI, Nairobi, Kenya and ICAR, New Delhi from 26 to 28th October 2021. A short-term hands-on training programme on 'Semen evaluation techniques and nutritional management of breeding bulls' was organized during 2-4th December 2021 in association with Department of Animal Husbandry and Veterinary Services, Karnataka for the benefit of Veterinarians and Technicians working in the frozen semen banks.

ICAR-NIANP has been awarded a mega project under the NICRA. This funding will help us to take up advanced research work in the state-of-the art climate chamber facility.

I compliment the entire team of ICAR-NIANP for their hard work and dedication for transforming this Institution into a centre of excellence.

Raghavendra Bhatta

Raghavendra Bhatta
Director

Research News

Bull Fertility Prediction: Comprehensive and Precise Strategies

Low reproductive efficiency is a serious concern in dairy animals and especially in buffaloes. Though various factors affecting the field fertility rate have been reported, the influence of bull is significant as one bull produces thousands of semen doses for artificial insemination. In order to assess bull fertility in semen

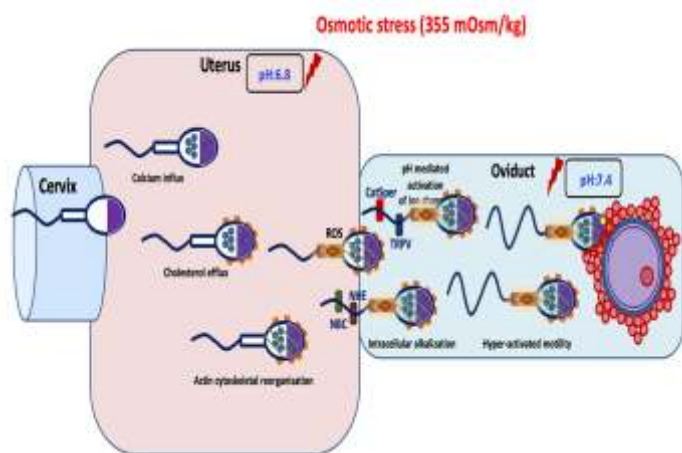


Fig 1. Osmotic stress and pH gear up the sperm to acquire fertilization competence

banks, various semen evaluation tests are developed and none of them are accurate enough to predict the semen quality and bull fertility. The hypoosmotic swelling-Giemsa (HOS-G) test developed at ICAR-NIANP by considering the sperm functional membrane and acrosomal integrities has been found to have significant positive correlation with the field fertility rate. Furthermore, sperm adaptation ability in the female reproductive tract is important for successful fertilization. The adaptation changes in response to hyperosmotic (355 mOsm) and pH (7.4) is indicative of semen quality and fertilizing ability (Fig 1). Based on this information an Android app has been developed for the benefit of semen banks.

In order to improve the accuracy of bull fertility prediction ability, whole sperm transcriptome sequencing has been carried out in cattle and buffaloes. The total RNA content is 20-30 fg/ sperm and the RNA is highly fragmented in the buffalo than in the cattle sperm. At the Reproductive Physiology laboratory, ICAR-NIANP the bioinformatics pipeline for the analysis of sperm RNA-seq data has been standardized. The study revealed that TopHat2, cufflinks and edgeR are suitable softwares for the analysis of fragmented RNA from sperm. Based on the sequenced data, the buffalo sperm transcriptome database has been established. Exploration of the sperm transcriptome pool revealed that the genes regulating sperm membrane attributes such as functional membrane integrity and acrosomal integrity were closely associated with conception rate, indicating that these genes were promising candidate genes influencing bull fertility. Upon inclusion or combination of the expression levels of multiple genes that are regulating spermatogenesis, sperm functional attributes, fertilization process and early

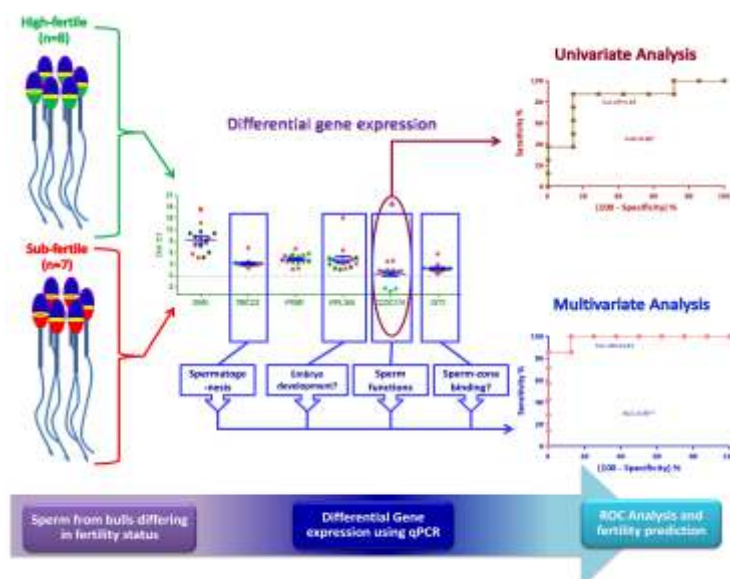


Fig 2. Genes influencing the bull fertility

embryonic development, the accuracy of the bull fertility prediction model has been improved (Fig 2).

The whole proteome of buffalo sperm was enriched with sexual reproduction process, thermogenesis, oocyte meiosis and vascular smooth muscle contraction apart from metabolic pathways. In good quality semen, proteins involved in the mesenchyme migration, the fluid shear stress and morphogenesis were abundant, while in poor quality semen, amino acids degradation pathways were enriched. The sperm with high antigenic potential had sperm membrane protection during cryopreservation and the whole proteome analysis revealed the proteins that were responsible for high antigenicity. The variations in the proteomic composition between high and low antigenic potential can be used as potential markers for the selection of breeding bulls.

Sperm are metabolically active cells and respond to the metabolites such as calcium, urea, amino acids, etc., present in the luminal fluids. Calcium levels promote motility and fertilizing ability of sperm. Urea levels in the reproductive tract secretions influence the functional ability of the sperm. The bulls with high levels of urea in the seminal plasma had higher percentage of ejaculate rejection rate. In repeat breeding cows also high blood urea nitrogen levels were reported to be one of the cause of infertility. High urea nitrogen levels in uterine fluid may also affect sperm function. Supraphysiological levels of urea affect sperm functional membrane integrity and mitochondrial membrane potential and thereby may lead to fertilization failure or early embryonic death.

Hence, tests to measure membrane integrities and adaptation ability of the sperm to the stressors in female reproductive tract are strong indicators of semen quality. The composition and the abundance of signature biomolecules determine the male fertility. Assays kits and prediction models developed based on these biomolecules can be used to precisely diagnose bull fertility.

Events

Technical Webinar

On the occasion of 75th year of Indian Independence - Azadi Ka Amrit Mahotsav, ICAR-NIANP, Bengaluru organized a technical webinar on 14th July, 2021 for the field officers of Animal Husbandry, KVKs and Milk Unions in Karnataka on 'Fodder and Farming'. It has highlighted the need for scientific feeding and ration balancing to improve productivity in livestock.



Institute Management Committee

The Institute Management Committee meeting was held at ICAR-National Institute of Animal Nutrition and Physiology, Bengaluru on 5th August 2021 under the chairmanship of the Director, Dr Raghavendra Bhatta.



Technical Seminar

On the occasion of Azadi Ka Amrit Mahotsav, ICAR-NIANP, organized a three-day technical seminar on 'Feeding and semen quality management in breeding bulls' during 21 - 23rd September 2021 for the officers of Nandini Sperm Station, Bengaluru.



Hands-on Training Programme

An International training programme on 'Livestock methane emission: Assessment, impact and amelioration strategies' was jointly organized by the ILRI, Nairobi, Kenya and ICAR, New Delhi at ICAR-NIANP, Bengaluru during 26 to 29th October 2021. Twenty-five participants from 10 states have attended the programme which consisted of the virtual lecture series and hands-on training.



Krishi Mela

ICAR-NIANP participated in the Krishi Mela organized by University of Agriculture Sciences, Bengaluru at GKVK campus from 11 to 14th November 2021. The Institute has put up exhibition stall showcased various technologies developed by the Institute.



ICAR-NIANP Foundation Day

ICAR-NIANP celebrated its 26th Foundation Day on 24th November 2021. Dr Rameshwar Singh, Hon'ble Vice-Chancellor, Bihar Animal Sciences University, Patna and Professor Dr Jagadeesh Bayry, IIT, Palakkad, Kerala, graced the occasion.



Training Programme

A short-term hands-on training programme on 'Semen evaluation techniques and nutritional management of breeding bulls' was organized at ICAR-NIANP, Bengaluru from 2 to 4th December 2021. The training has been organized as a part of 'Azadi Ka Amrit Mahotsav' in association with Department of Animal Husbandry and Veterinary Services, Karnataka.



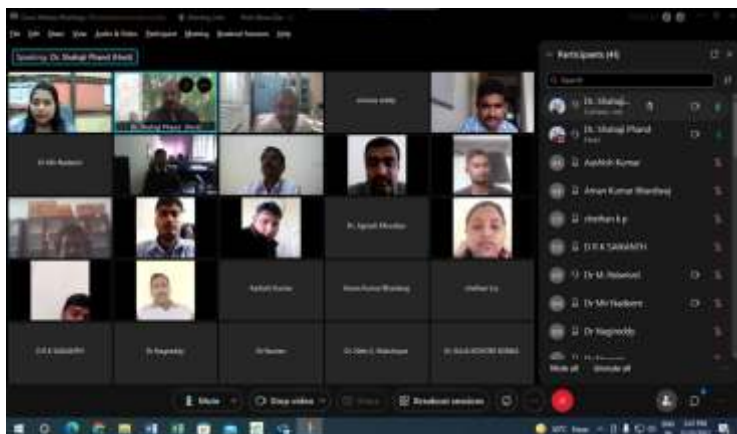
Institute Animal Ethics Committee

The second Institute Animal Ethics Committee meeting of the year was held on 12th November 2021 virtually at ICAR-NIANP, Bengaluru under the Chairmanship of the Director, Dr Raghavendra Bhatta to discuss the new projects to obtain IAEC clearance.



Training Programme

ICAR-NIANP, in collaboration with MANAGE, Hyderabad organized three-day online training programme on 'Nutrition and fertility management of dairy animals in changing climate scenario' during 21 - 23rd December 2021. Total of 55 officers from Animal Husbandry Department of different States, KVK and State Veterinary Universities participated in this event.



Visitors

Shri Ramalinga Reddy MLA

The Honorable, Member of the Legislative Assembly, BTM Layout, Bengaluru Shri Ramalinga Reddy MLA visited ICAR-NIANP, Bengaluru on 10th August 2021 and he complimented the institute for the excellent research work and infrastructure development.



Former DG, ICAR and Regional Representative of ILRI

Dr S Ayyappan, Former DG, ICAR and Dr H Rahman, Regional Representative for South Asia, ILRI visited ICAR-NIANP, Bengaluru on 26th October 2021. The dignitaries visited various laboratory facilities and appreciated the ongoing research projects.



Vice Chancellor, BASU

Dr Rameshwar Singh, Vice Chancellor, Bihar Animal Sciences University, Patna, Bihar and Dr Jagadeesh Bayry, Professor, Indian Institute of Technology, Palakkad, Kerala visited ICAR-NIANP, Bengaluru on 24th November 2021 and interacted with scientists about the on-going projects and technologies developed by NIANP.



Commercialization

Area Specific Mineral Mixture

ASMM technology was commercialized with different firms earlier, considering its adoption pattern and the economic impact, after ten years of licencing, again M/s Nandi Agrovet, Bengaluru has renewed its agreement on 27th August 2021.



Hydroponic Fodder Production

The MoU was signed by the Director, NIANP, Dr Raghavendra Bhatta and the start-up company, M/s Hydro Greens Agri Solutions Pvt Ltd, Bengaluru on 26th August 2021 for hydroponic fodder production technology.



Functional-Industrial Linkage

NIANP developed anti-methanogenic products and to ensure the widespread availability across different parts of the country, ICAR-NIANP and M/s Radiant Chem Industries, Chennai entered a functional-industry-linkage through MoU for undertaking collaborative research to develop anti-methanogenic product(s) using industrially available tannins.



Awards & Recognitions

Dr A Dhali received 'ICAR-NIANP Best Research Paper Award-Student' for the Year 2020-21 for the research paper entitled 'An efficient nitroblue tetrazolium staining and bright-field microscopy based method for detecting and quantifying intracellular reactive oxygen species in oocytes, cumulus cells and embryos' published in *Frontiers in Cell and Developmental Biology*, 8: 764.



Dr Binsila BK received 'ICAR-NIANP Best Research Paper Award' for the Year 2020-21 for the research paper entitled 'Elucidating the processes and pathways enriched in buffalo sperm proteome in regulating semen quality' published in *Cell and Tissue Research*, 383: 881-903.

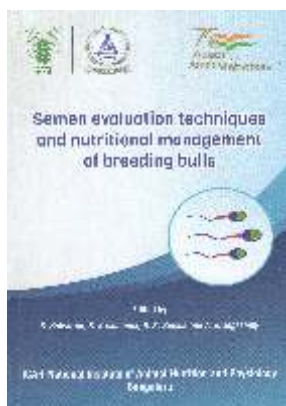


- Dr S Selvaraju conferred with 'ISSAR Fellowship Award' by Indian Society for the Study of Animal Reproduction Fellowship (ISSAR Fellow) for the year 2019-2020.
- Dr S Selvaraju conferred with 'NADS (I) Fellowship Award' by National Academy of Dairy Science, India w.e.f. January 2020.
- Dr S Selvaraju was recognized as a member of 'Editorial Board of Taylor and Francis' for the journal 'Systems biology in Reproductive Medicine'.
- Dr A Arangasamy received 'Reviewer Excellence Award 2021' for reviewing research papers in the *Indian Journal of Animal Research*, Agricultural Research Communication Centre, New Delhi.
- Krishnaiah MV received 'GB Singh Memorial Young Scientist Award 2019' for the research paper entitled 'Organic Zn and Cu interaction impact on sexual behaviour, semen characteristics, hormones and spermatozoal gene expression in bucks (*Capra hircus*),' *Theriogenology*, 130: 130-139 by the Indian Society for the study of Animal Reproduction in the International Symposium on 'Novel Knowledge, Innovative Practices and Research in Theriogenology' organized by ISSAR Kerala, virtually held during 27 - 29th December 2021 at College of Veterinary and Animal Sciences, Mannuthy, Thrissur.

- Dr Binsila BK received 'Best Oral Presentation' for the research paper entitled 'Influence of three-dimensional matrix system and hypoxia on long-term culture of sheep spermatogonial stem cells' presented in the International Symposium on 'Novel Knowledge, Innovative Practices and Research in Theriogenology' organized by Indian Society for the study of Animal Reproduction virtually held during 27 - 29th December 2021 at College of Veterinary and Animal Sciences, Mannuthy, Thrissur.
- Sharanya JN received 'Best Oral Presentation' for the research paper entitled 'Effect of dietary calcium and magnesium supplementation on skewing of sex ratio using New Zealand White Rabbits' in the International Symposium on 'Novel Knowledge, Innovative Practices and Research in Theriogenology' organized by Indian Society for the study of Animal Reproduction virtually held during 27 - 29th December 2021 at College of Veterinary and Animal Sciences, Mannuthy, Thrissur.
- Swathi D received 'Best Oral Presentation' for the paper entitled, 'Sperm expressed X-linked genes influence semen quality and field fertility rate in cattle and buffalo' presented in International Symposium on 'Novel knowledge and innovative practices in animal reproduction research and theriogenology' organized by Indian Society for the study of Animal Reproduction virtually held during 27 - 29th December 2021 at College of Veterinary and Animal Sciences, Mannuthy, Thrissur.
- Dr Binsila BK received 'Best Poster award' for research paper entitled 'Long term culture of sheep spermatogonial stem cells using three dimensional matrix system' presented in III Annual Conference of Animal Physiologists Association (APA) and National Symposium on Physiological Interventions for the Augmentation of Sustainable Animal Production during 24 - 25th September 2021.

Publications

The farmers-oriented technologies developed by ICAR-NIANP, Bengaluru during 1995 to 2020 was compiled on the occasion of Silver Jubilee of National Institute of Animal Nutrition and Physiology as 'Farmers Friendly Technologies' and published during 26th foundation day on 24th November 2021 by the Director and Vice Chancellor, BASU, Bihar.



The training manual on 'Semen evaluation techniques and nutritional management of breeding bulls' was published by ICAR-NIANP, Bengaluru. This manual contains basic information on semen evaluation techniques and management of breeding bulls which will be highly helpful for scientists and technicians working in semen banks.

Field Trainings

Small Ruminant Farming

ICAR-NIANP in association with Department of Animal Husbandry Govt of Karnataka and KVK, Hadonahalli, UAS, Bengaluru organized one day technical workshop for the progressive sheep and goat farmers on 'Improved methods of small ruminant farming' on 27th July 2021.



Livestock Feeding Management

On the occasion of Azadi Ka Amrit Mahotsav, ICAR-NIANP, Bengaluru organized a technical workshop for livestock farmers on 'Livestock feeding management and production' at KVK-Ramanagar on 6th September 2021.



Technical seminar

ICAR-NIANP in collaboration with Indian Dairy Association-South Zone and Veterinary College, Hassan organized a technical seminar for field officers of Hassan Milk Union and Hassan district Animal Husbandry department on 'Sustainability of dairy production' at Veterinary College, Hassan on 29th November 2021. About 150 Officers participated in the seminar and technical presentations and interactive session on feeding of dairy animals, green fodder production and fertility aspects were conducted.



Hindi Programmes**Hindi Workshop**

ICAR-NIANP, Bengaluru organized two Hindi workshops on 'E-tools for effective implementation of Rajbhasha' on 7th August 2021 and 'Noting and drafting in Hindi' on 14th December 2021. The quarterly meetings of OLI Committee were held on 17th July and 8th November 2021.

**Hindi Diwas**

Hindi Diwas was celebrated at ICAR-NIANP on 14th September 2021. Hindi week was observed from 14 to 21st September 2021 and various competitions such as Hindi song, quiz, translation, antakshari and poem recitation were organized, and prizes were distributed to the winners by the Director of the institute.

**Swachh Bharat Abhiyan****Cleanliness Drive**

ICAR-NIANP takes up the cleanliness drive regularly under 'Swachh Bharat Abhiyan' in the campus as well as at the adopted villages and schools around Bengaluru. Cleaning and gardening of campus with the team effort keeps NIANP ever green.

**Swachhhta Pakhwada**

Swachhhta Pakhwada was observed during 16 - 31st December 2021 at ICAR-NIANP, Bengaluru. On this occasion, various cleanliness drives were organised such as cleaning of institute and utilization of organic waste for generation of wealth from waste. Drawing and essay competitions were conducted for school children.

**Staff Welfare Activities****Independence Day Celebration**

ICAR-NIANP, Bengaluru celebrated 74th Independence Day on 15th August 2021. The Director hoisted the National flag and delivered the Independence day address.

**Kannada Rajyotsava**

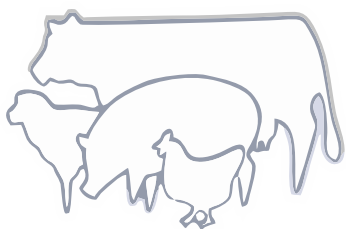
Kannada Rajyotsava was celebrated on 10th November 2021 at ICAR-NIANP, Bengaluru. Dr V Chandarshekarmurthy, the Chief Guest of the event highlighted the importance of Karnataka Heritage, culture and language, and distributed prizes to the winners of various competitions held on the eve of Kannada Rajyotsava.



ICAR-NIANP



Balanced Nutrition - Enhanced Production



संतुलित आहार - प्रवृद्ध उत्पादन



हर कदम, हर डगर
किसानों का हमसफर
भारतीय कृषि अनुसंधान परिषद

Agrisearch with a human touch