राडेअनुसं समाचार

NDRI News

राष्ट्र के डेरी स्वप्नों को समर्पित
Fulfilling Nation's Dairy Dreams

भाकृअनुप–राष्ट्रीय डेरी अनुसंधान संस्थान, करनाल
ICAR-NATIONAL DAIRY RESEARCH INSTITUTE, KARNAL

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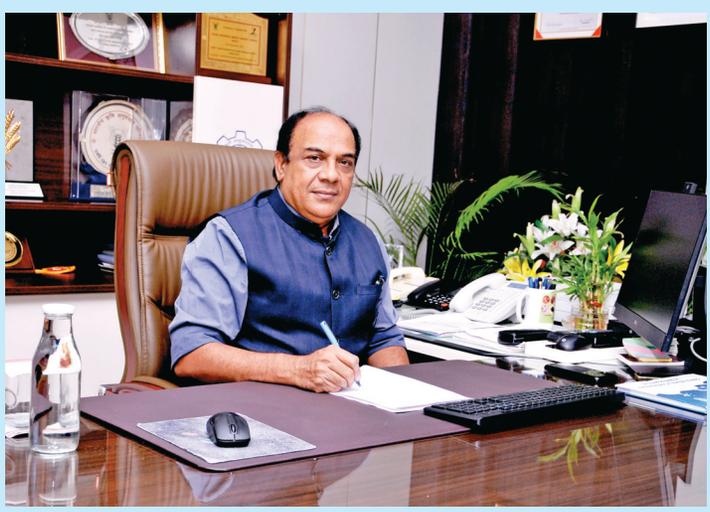
From the Director's Desk



Milk metabolite profiling offers valuable insights into animal health and productivity, with significant potential to enhance dairy production. Specific milk metabolites also help assess milk's suitability for dairy products, such as cheese, by indicating coagulation, curd yield, and heat stability. Thus, metabolomics aids in both animal health diagnosis and dairy quality evaluation, offering opportunities for timely interventions that could increase milk yield and improve quality control.

Metabolomics is an advanced omics technology focused on identifying and quantifying small molecules, known as metabolites, involved in an organism's metabolic pathways. These metabolites, typically less than 1500 Da, are found in various cells, tissues, and organs. Metabolomics primarily employs two approaches: targeted analysis, which selectively measures specific, predetermined metabolites, and untargeted profiling, which comprehensively analyzes a wide range of both known and unknown metabolites. This field is particularly valuable because metabolites are closely linked to an organism's phenotype, enabling the study of gene function and responses to biotic and abiotic stresses.

In recent years, livestock researchers have recognized metabolomics as a crucial area of study, using it to examine temporal changes in metabolic profiles across various tissues and body fluids, including rumen fluid, plasma, mammary gland, liver, and milk. Milk, in particular, is significant as it reflects the metabolic profile of the mammary gland, a central organ in milk production. Approximately 75% of detected metabolites originate from the mammary gland, and the metabolite signature can indicate the cow's health status. Numerous factors influence milk metabolite composition, including internal factors such as species, breed, and lactation status, as well as external factors like animal health, environmental temperature, and diet.

Analytical tools like gas chromatography-mass spectrometry (GC-MS), liquid chromatography-mass spectrometry (LC-MS), and Nuclear Magnetic Resonance (NMR) are commonly used for milk metabolomics, each with distinct advantages and limitations. A major benefit of milk as a metabolomics sample is the ease and non-invasive nature of collection, making it suitable for regular monitoring. However, detecting and quantifying the vast array of metabolites presents challenges due to the sample's complexity. Despite these challenges, mass spectrometry (MS)-based methods enable high-speed, sensitive, and high-throughput metabolite analysis, although they require advanced computational tools for data processing. Issues with standardization and reproducibility also need addressing to ensure consistent results across studies.

Recognizing metabolomics' role in dairy science, the ICAR-National Dairy Research Institute (ICAR-NDRI) has initiated projects to profile milk metabolites from various breeds

In this issue...

of cows (*Sahiwal*, *Tharparkar*, *Gir*, *Karan Fries*), buffaloes (*Murrah*), and goats (*Beetal*, *Barbari*, *Jamunapari*). Initial findings show that environmental conditions (thermo-neutral, winter, summer) significantly influence milk metabolites in cows, with differences observed across breeds. Goat milk studies reveal breed-specific variations in raw and processed milk metabolite profiles, impacting fermentation and renneting properties in yogurt and cheese production.

Broadening metabolomic studies to include more breeds and environmental conditions will enhance understanding of milk composition, helping identify breed-specific traits, environmental influences, and genetics-external condition interactions. Such insights could support selective breeding, optimized feeding, and tailored management practices, ultimately improving milk quality and dairy product yields across different regions and farming systems.

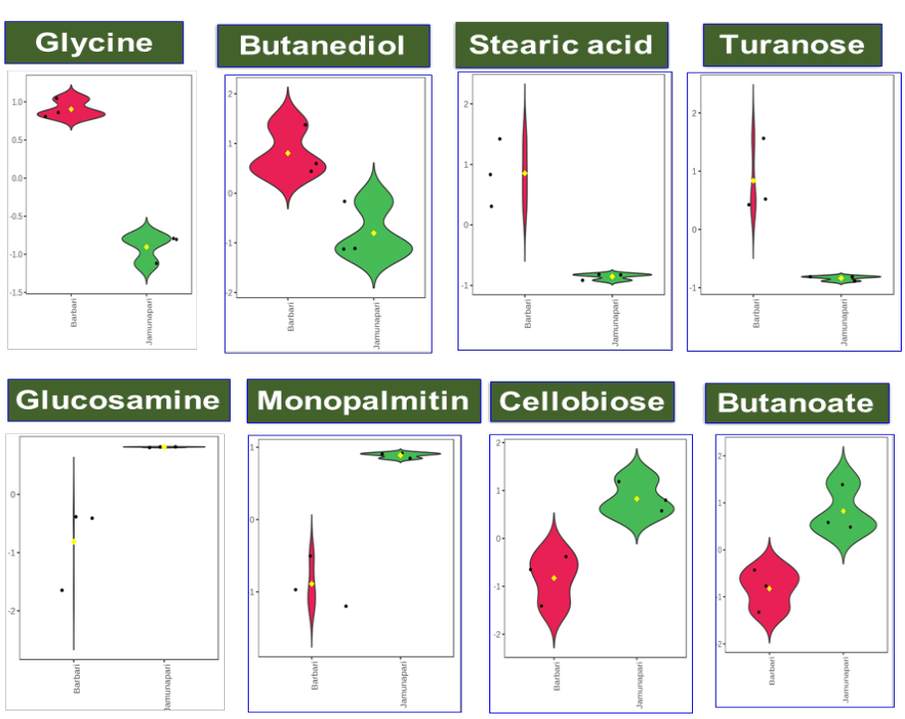
(Dheer Singh)
Director & Vice-Chancellor
ICAR-NDRI, Karnal

RESEARCH

Elucidation of compositional variability in the milk of *Barbari* and *Jamunapari* goats using metabolomics approach

(Heena Sharma, Ashish Kumar Singh, Saipriya Kanchanpally and Richa Singh)

This study aimed to elucidate the metabolite composition and differences in the milk of two indigenous goat breeds, *Barbari* and *Jamunapari*, using gas chromatography-mass spectrometry (GC-MS). Metabolite extraction and derivatization were carried out using a methanol and chloroform mixture (2:1 ratio) and methoxyamine hydrochloride (MOX reagent), respectively. The results identified 59 metabolites in *Barbari* milk and 63 in *Jamunapari* milk. Principal component analysis revealed distinct separation between the groups, highlighting clear differences in the milk metabolite profiles of the two breeds. Furthermore, 23 differential metabolites were identified, with 11 being lower in concentration ($p<0.05$) in *Barbari* milk, including most fatty acids and their derivatives. In contrast, carbohydrates and their derivatives were more concentrated ($p<0.05$) in *Jamunapari* milk. Metabolites namely, glycine, butanediol, stearic acid, turanose are comparatively higher ($p<0.05$; $\log_2$ FC>4.0) in *Barbari* milk while, glucosamine, monopalmitin, cellobiose and butanoate are higher ($p<0.05$; $\log_2$ FC>4.0) in *Jamunapari* milk. This study not only showcases the potential of metabolomics in uncovering the unique characteristics of *Barbari* and *Jamunapari* goat milk but also provides valuable data for breed-specific analysis of indigenous goat breeds.

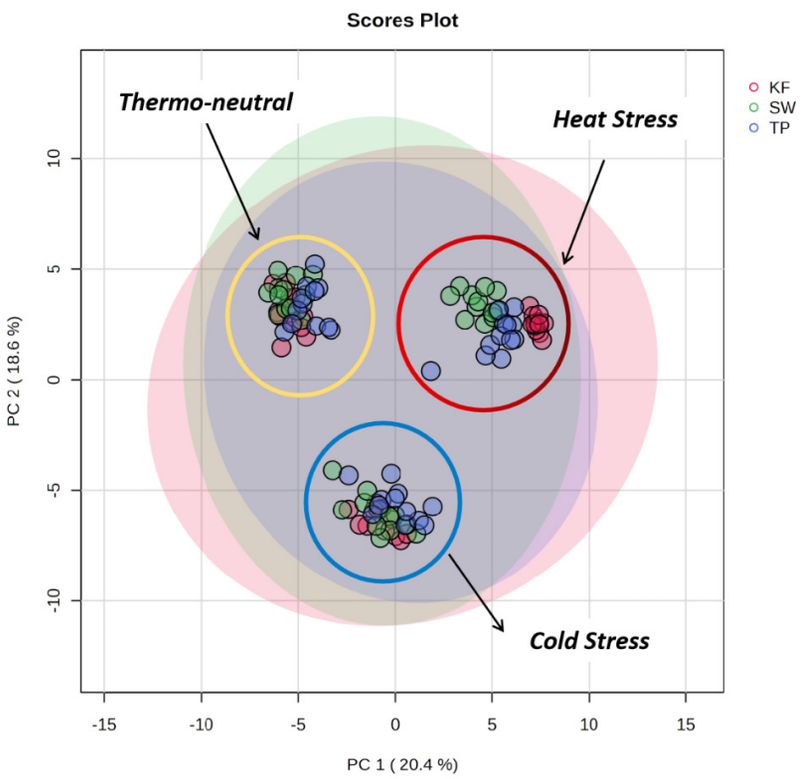


Violin plots ($p<0.05$, Log_2 Fold change>4.0) of differential metabolites

Seasonal Variations in Milk Metabolite Profiles of Sahiwal, Tharparkar, and Karan Fries Cattle: A Metabolomic Analysis

(Anusha Kishore, Richa Singh, Rajan Sharma and Sumit Arora)

Changes in the milk metabolite profile of Sahiwal, Tharparkar, and Karan Fries cattle were analyzed under thermo-neutral, cold stress, and heat stress conditions. Principal component analysis (PCA) revealed 57.2% variability, clearly separating milk samples into three clusters based on stress conditions. ANOVA identified 73 differential metabolites ($P < 0.05$). For all breeds, metabolites such as erythrotetrofuranose, talofuranose, glucopyranose, succinic acid, and oxalic acid were abundant during thermo-neutral conditions but decreased during heat stress and were lowest in cold stress. Conversely, 9,12-octadecadienoic acid, glycine, octanoic acid, and methylmaleic acid were highest during heat stress and decreased during thermo-neutral and cold stress. Additionally, 1,2-dimyristin and 1,3-dipalmitin peaked during heat stress but decreased during cold stress. In contrast, dihydroxyacetone, adipic acid, methylamine, N-acetylglucosamine, and galactopyranose were abundant during cold stress but decreased during heat stress and were lowest in thermo-neutral conditions. These shifts indicate that metabolic adjustments occurred to maintain body temperature, with lipids serving as a denser energy source under heat stress and carbohydrates providing quick energy during cold stress.

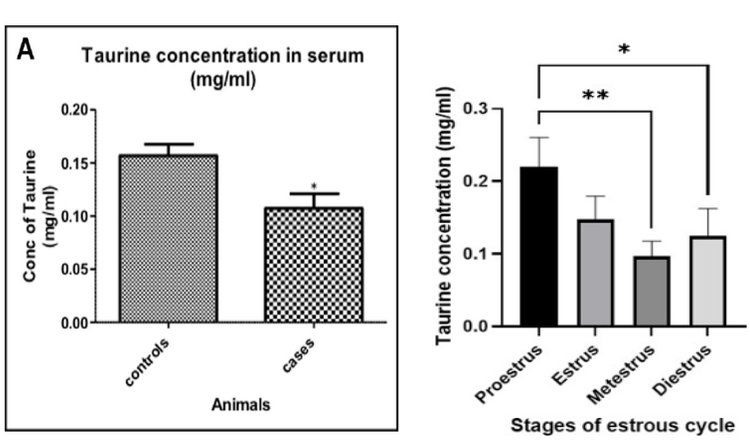


Principal component analysis (PCA) score plot illustrating the separation of milk samples from Sahiwal, Tharparkar, and Karan Fries cattle into three distinct clusters based on seasonal conditions: thermo-neutral, cold stress, and heat stress

The role of taurine in she-buffalo reproduction

(Mansi Joshi, Amrita Behera, Dheer Singh and Suneel Kumar Onteru)

Buffaloes often face issues with their ability to reproduce efficiently, which can be due to conditions like post-partum anestrus or silent estrus. In our previous research, we found that a metabolite called taurine was significantly lower in buffalo blood during post-partum anestrus. To understand more about taurine's role in buffalo fertility, we studied its levels during different stages of the buffalo reproductive cycle. We discovered that taurine levels were highest just before estrus, which is when buffaloes are most fertile. This suggests



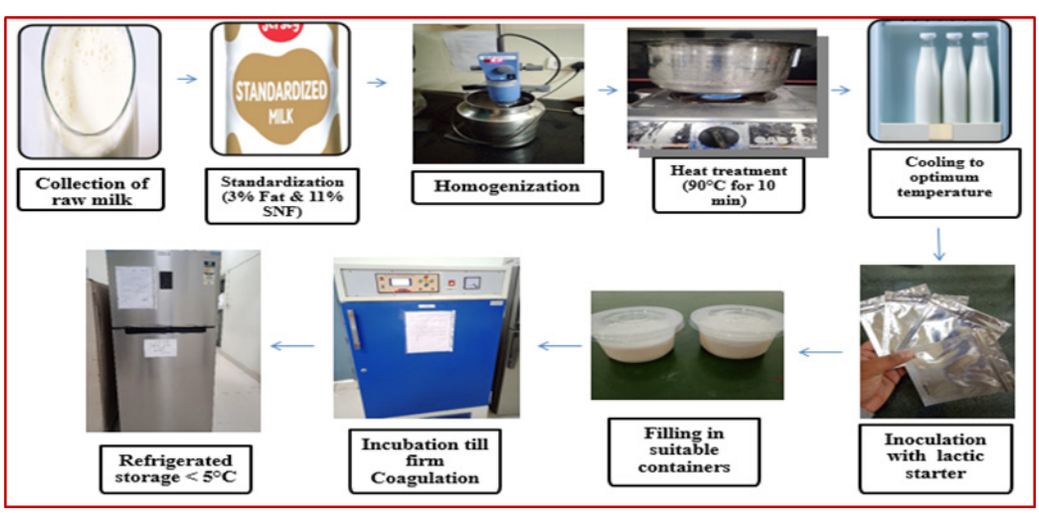
Buffalo serum taurine concentration in post-partum anestrus and cyclic buffaloes (left) and during estrous cycle of healthy buffaloes (right)

that taurine might play a key role in maintaining buffalo fertility. Interestingly, taurine levels were also higher in smaller developing follicles compared to larger ones in the ovaries, and it was linked to the steroid hormones involved in reproduction. Hence, giving taurine supplements to buffaloes experiencing post-partum anestrus might help them conceive more easily in the future. Additionally, monitoring taurine levels could also help farmers identify the best time for breeding buffaloes.

Technology on production of stable direct vat set liquid starter culture blend for fermented milk

(Pradip V. Behare, Reshab Majumdar, Diwas Pradhan and P. Narender Raju)

Small and medium-scale dairy producers face significant financial challenges when using commercial Direct Vat Set (DVS) liquid starter cultures for fermented milk production due to the high production costs associated with freeze-drying. Conventional liquid starter cultures have poor shelf life and require multiple steps of propagation to maintain their activity. To address this issue, there is a need for a cost-effective liquid starter culture blend in DVS form, which comprises high cell counts with greater metabolic activity. Formulating a thermophilic DVS liquid starter culture blend achieves high cell counts, metabolic activity, shelf stability, and cost-effectiveness, streamlining production compared to conventional liquid starters. The developed liquid starter culture blend can be easily adopted by small and medium-scale dairy manufacturers because it is made from GRAS organisms. It contains preservatives and cryoprotectants at GRAS levels. The preparation of this blend does not involve major process modifications and is cheaper compared to commercial DVS cultures.



Steps in manufacturing fermented milk using liquid direct Vat Set liquid starter culture

Institutional Technology Management Unit

Detail of Patents filed during July to September 2024: 03

Sl. No.	Title of Patent	Inventors	Application Number & Date of Filing
1.	Instant Desi Chhach Powder (DCP) & Process of Preparing the same	G.S. Meena, Mr. Subhadeep Manik, Dr. Ashish Kumar Singh and Dr. Yogesh Khetra	202411050894 03-07-2024
2.	Assay for detection of Bovine Pregnancy Associated Glycoprotein Isoform BuPAG-2	A.K. Mohanty, Sudarshan Kumar, Dr. Sushil Kumar, Dr. T.K. Mohanty, Dr. Rubina Kumari Baithalu, Dr. Munna Yadav and Shweta Yadav	202411057694 30-07-2024
3.	Mouse Monoclonal Antibodies against Bovine Pregnancy Associated Glycoprotein	A.K. Mohanty, Sudarshan Kumar, Dr. Sushil Kumar, Dr. T.K. Mohanty, Dr. Rubina Kumari Baithalu, Dr. Munna Yadav and Shweta Yadav	202411057692 30-07-2024

Detail of Patents granted during July to September 2024: 01

Sl. No.	Title of Patent	Inventors	Application Number & Date of filing	Application grant number and grant date
1.	A pail for cooling milk simultaneous to milking	Ravi Prakash and Menon Rekha Ravindra	202011033807 on 07/08/2020	545011 on July 15, 2024

EVENTS

- A 14 days training (July 15-28, 2024) program (Karyashala) under Accelerate Vigyan Scheme and sponsored by the Anusandhan National Research Foundation (ANRF) was organized on "*Harnessing Multi-Omics Big Data in Animal Science for Precision Agriculture*," during July 15-28, 2024. A total 25 participants from various organization participated in the training program.
- A one-month hands-on training on *"Quality Attributes of Lactic Fermented Spray-Dried Milk Prepared Using Paneer Whey"* was held from June 26 to July 25, 2024. Supported by SERB DST, this program aimed to enhance students' skills and knowledge in value-added fermented dairy products.
- The *"Hands-on Training Program in Dairy Engineering"* was organized at ICAR-NDRI, Karnal, from July 1-31, 2024. Five undergraduate students from Sam Higginbottom University of Agriculture, Technology, and Sciences (Prayagraj, Uttar Pradesh), Mehr Chand Mahajan DAV College for Women (Chandigarh), and NIMS University (Jaipur) participated in the training.
- A National workshop was organized by Artificial Breeding Research Centre under aegis of NAHEP on *"Recent advances in Computer-Assisted Sperm Analysis (CASA) and flow cytometry for bovine semen evaluation"* on July 29, 2024.
- ICAR-NDRI, Karnal, hosted a National Workshop on *"Application of Artificial Intelligence and Machine Learning in Dairy and Food Industry"* on July 31, 2024, uniting experts and students to explore AI's transformative impact.
- ICAR-NDRI organized a two-day workshop and Kisan Gosthi on *"Climate Resilient Agriculture for Cold Arid Ladakh"* at High Mountain Arid Agriculture Research Institute, University of Ladakh, on August 10-11, 2024. The workshop was sponsored by Department of Science and Technology (DST) and a total 75 participants attended including local farmers, researchers, and experts. Key speakers, including Dr. Anurag Saxena, Dr. Dheer Singh, Director and Vice-Chancellor of NDRI, Karnal, and Dr. Manmohan Singh Chauhan, Vice-Chancellor of GBPUAT, Pantnagar, highlighted advances in sustainable agriculture and livelihood improvement. Expert sessions covered best practices, entrepreneurship, and collaborative opportunities in Ladakh's unique climate. Forage crop seeds were distributed to 40 farmers for demonstration, enhancing practical knowledge on sustainable cultivation in cold arid regions.

Distribution of seed among the ladakh farmers on August 11, 2024

- An online program titled *'109 Bio-fortified and Climate-adapted varieties developed by ICAR dedicated to the Nation by the Hon'ble Prime Minister'* was held on August 11, 2024, at KVK, NDRI Karnal,

and Eastern Regional Station, Kalyani. About 100 farmers attended the program.

- A virtual telecast of the 'Nationwide Launch of the National Pest Surveillance System (NPSS)' by the Honorable Agriculture Minister took place on August 15, 2024, with 20 farmers participating.
- The 49th Extension Council Meeting took place at ICAR-NDRI, Karnal, on August 20, 2024.
- The NDRI Student Council's seven-day sports festival, "Capacity-2024," concluded at ICAR-NDRI, Karnal, on August 31, 2024. Organized during August 25-31, the event emphasized sports' role in character development. Around 200 students participated in the event.
- A seminar on *"Dried Distilleries Grains with Solubles"* (DDGS) was organized at ICAR -NDRI, Karnal, on September 9, 2024. The seminar was organized in collaboration with the All India Distilleries Association (AIDA), New Delhi. The seminar featured industry and academic experts discussing DDGS benefits, quality, and safety. Approximately 45 industry professionals attended the event.

Glimpses of the seminar on "Dried Distilleries Grains with Solubles" (DDGS) organized on September 9, 2024

- A 10-day hands-on training on *"Production of Functional Starter Culture and Fermented Dairy Products"* was held from September 10-19, 2024, under ICAR's Developmental Action Plan for Scheduled Caste. This program enhanced participants' knowledge and skills in starter cultures and various fermented dairy products, including Dahi, Yoghurt, and Probiotic Fermented Milk. Thirteen participants from Maharashtra, Gujarat, Haryana, and Uttar Pradesh attended, expressing satisfaction and recommending more such training sessions in the future to benefit others.

A group photograph of participants in training along with Dr Dheer Singh, Director & Vice-Chancellor NDRI, Dr Rajan Sharma, Joint Director (Research) and Faculty of Dairy Microbiology Division on September 10-19, 2024

EXTENSION

Dairy Extension Division

Kisan Sangosthis on Goat Farming in Hanumangarh and Bikaner districts of Rajasthan

A series of Kisan Sangosthis focused on scientific goat farming methods were held in collaboration with Krishi Vigyan Kendra (KVK), Nohar, and other institutions. The first event took place on September 18, 2024, in Ramsara village, followed by another on September 19, 2024 at the CAZRI Regional Station, Bikaner. Aimed at supporting Scheduled Caste farmers, these programs provided 52 bucks, two goats, and one male Murrah buffalo, along with blankets for 55 elderly women farmers. About 180 farmers participated, engaging with experts from various institutions on topics like deworming, vaccination, breeding techniques, and government schemes. The Sangosthis promoted knowledge enhancement and sustainable livestock practices.

Glimpses of Kisan Sangosthis organized at Hanumangarh on September 18, 2024

Glimpses of Kisan Sangosthis organized at Bikaner on September 19, 2024

On-site review of the Farmers First Project

On August 21-22, 2024, Dr. Ram Chand, Former ADG of ICAR and Project Management Committee member of the Farmer First Project, visited adopted villages to review project activities at NDRI, Karnal. He engaged with beneficiary farmers to collect feedback and assess

project benefits. Dr. Ram Chand reported to ATARI, Jodhpur, that the project has effectively transformed farmers into entrepreneurs, enhancing their socio-economic status through successful technology innovation and transfer initiatives.

Visit of Project management committiee for On-site review of the Farmers FIRST Project on August 21, 2024

Technology Demonstration, Field Activities and Animal Health Camp

A significant 86% of farmers reported challenges with repeat breeding in buffaloes, among other reproductive issues. To tackle this, thirteen demonstrations on Salivascope technology for estrus detection were held in Karnal and Jind districts, Haryana. Approximately 400 farmers attended these camps, alongside officials from the Haryana State Animal Husbandry and Dairying Department. Participants expressed high satisfaction with the Salivascope method, indicating its effectiveness in addressing reproductive challenges in buffaloes and promoting its adoption among farmers.

Demonstration of salivascope estrus detection to farmers under field condition

Establishment of Climate Resilient Dairy Farm School

Two climate resilient dairy farm schools are established and continuing in the Gudha and Phurlak villages of Karnal district. Twenty smallholder dairy farmers of the Gudha village participated in this school. Whereas, climate resilient dairy farm school of Furlak village is exclusively for women dairy farmers and 20 women dairy farmers are enrolled in this school. The curriculum consists of seven blocks for this school has also been developed.

Farmers interacting in climate resilient dairy farm schools

Krishi Vigyan Kendra

- On-campus training on Dairy Production and Breeding Management was held at KVK from August 8 to 12, 2024, with 56 farmers participating. Experts from different areas gave lectures and demonstrated the latest technologies to the participants.

Glimpse of training program on Dairy Production and Breeding Management on August 9, 2024

- A district-level awareness camp on Crop Residue Management was organized at Nissing Block on September 17, 2024, with 122 participants. Experts from KVK and ICAR-NDRI discussed

stubble burning and its harmful effects on the environment and animal health.

Interaction among expert and participants in awareness camp at Nissing Block on September 17, 2024

- An exhibition and scientist-farmer interaction program was held in conjunction with the 96th ICAR Foundation Day at Hassanpur village, Karnal, on July 16, 2024.

Interaction between scientist-farmer at Hassanpur village on July 16, 2024

HONOURS/ AWARDS/ RECOGNITIONS

- ICAR-NDRI Library received the award for *"Best e-Resource Sharing"* through the CeRA@J-Gate (Consortium of e-Resources in Agriculture) platform among deemed universities, state agricultural universities, and central agricultural universities for 2023. The award was presented by Prof. Nazir Ahmad Ganai, Vice-Chancellor of Sher-e-Kashmir University of Agricultural Sciences and Technology (SKUAST), Kashmir, on September 2, 2024, during the CeRA Workshop for the Northern Region held at SKUAST in Srinagar, Kashmir.

Vice-Chancellor of SKUAST-Kashmir, presenting award to officials of ICAR-NDRI on September 2, 2024

- Diksha, Rajan Sharma, Kamal Gandhi, and Sonu K. received the Best Poster Presentation (1st prize) award for their work on *"Detection of Vegetable Oil Adulterants in Cow Ghee using Raman Spectroscopy in Combination with Multivariate Analysis"* at the 11th National Seminar on 'Indian Dairy & Food Industry in Viksit Bharat: Developments & Innovation' organized by ICAR-NDRI in association with NDRI Graduate Association (NGA) during September 27-28, 2024 at ICAR-NDRI, Karnal.
- Karra Madhavi Latha, Rajan Sharma, Richa Singh, and Kamal Gandhi received the 2nd prize for Best Poster Presentation on the topic *"Comparison of Different Extraction, Clean-Up, and Instrumentation Conditions for Identification of Multiclass Pesticides in Milk Using GC-MS/MS"* organized by ICAR-NDRI in association with NDRI Graduate Association (NGA) during September 27-28, 2024 at ICAR-NDRI, Karnal.
- Sanjit Maiti, Manjunath KV, Sanchita Garai, Goutam Mondal, Anjali Aggarwal, and Gopal Sankhala received the "Second Best Oral Presentation Award" for their paper entitled *"Building Climate Resilience: Impact of the NDRI Climate Service Model" at the*

International Conference on the Impact of Climate Change on Biodiversity—A Global Perspective", held at Madras Veterinary College, TANUVAS, Chennai, from July 11-13, 2024.

- Dr. Chitranayak, Principal Scientist, Dairy Engineering won 2nd prize in poster presentation in the 11th National Seminar on "Indian Dairy & Food Industry in Viksit Bharat: Developments & Innovation" organized by ICAR-NDRI in association with NDRI Graduate Association (NGA) during September 27-28, 2024 at ICAR-NDRI, Karnal.
- Dr. Hima John, Scientist, Dairy Engineering won 3rd prize in poster presentation in the 11th National Seminar on "Indian Dairy & Food Industry in Viksit Bharat: Developments & Innovation" organised by ICAR-NDRI in association with NDRI Graduate Association (NGA) during September 27-28, 2024 at ICAR-NDRI, Karnal.

PERSONALIA

Permission granted to the following Scientific/ Administrative Staff for attending Workshop/ Seminar/ Symposia/ Conference/ Training during the period July to September, 2024:

SN	Name & Designation	Period	Title of the Training/ seminar/ workshop	Venue
1.	Dr. Basavaprabhu H.N., Scientist	July 1-15, 2024	Carbon Quantum Dots and their applications in bio-medical and food safety area	IIT, BHU, Varanasi
2.	Dr. Shaik Abdul Hussain, Scientist	July 3-5, 2024	Building Successful Incubation Ecosystem	ICAR-NAARM Hyderabad
3.	Dr. Sonu K.S., Scientist	July 4 to August 2, 2024	Development of a paper-based µPAD device for creative assay	IIT Madras, Chennai
4.	Dr. Rashmi H.M., Sr. Scientist	July 4 to August 2, 2024	Computational biology & formulation genomics	NCBS, Tata Institute of Fundamental Research, GKVK, Bengaluru
5.	Dr. Goutam Mondal, Principal Scientist Dr. Sanjit Maiti, Sr. Scientist Dr. Sanjit Maiti, Sr. Scientist	July 11-13, 2024	Impact of climate change on biodiversity - A global perspective	Madras Veterinary College, TANUVAS, Chennai
6.	Dr. S. Subash, Sr. Scientist	July 16-17, 2024	Dairy Entrepreneurship Curriculum Workshop	Coimbatore
7.	Dr. Laxmana Naik N, Sr. Scientist Mr. Ramakrishna K. Prasad, STO	July 22, 2024	IGNOU Study centers Coordinators meet and Press meet	IGNOU Regional Centre, Bengaluru
8.	Dr. Udita Choudhary, Sr. Scientist Dr. Gunjan Bhandari, Scientist Dr. A. K. Dixit, PS	August 2-7, 2024	32nd International Conference of Agricultural Economists (ICAE)	NASC Complex, New Delhi
9.	Dr. D. N. Das, PS Dr. S. Jeyakumar, PS Dr. Mukund A.K., PS Dr P Barnwal PS Er Ankit Deep Scientist	August 2-8, 2024	Online training programme on 'Python'	ICAR-IASRI, New Delhi

10.	Dr. Sonu, Scientist	August 6-9, 2024	Laboratory Quality Management System and International Audit in accordance with IS/ISO/ IEC17025-2017	NITS, Noida UP
11.	Dr. (Mrs.) Bharati Pandey, Scientist	August 22-23, 2024	8th National Youth Convention	Banaras Hindu University (BHU), Varanasi, Uttar Pradesh
12.	Dr. Rajan Sharma, Joint Director (Research)	August 26-31, 2024	Leadership Excellence for RMPs of ICAR	ICAR-NAARM, Hyderabad
13.	Dr. Sachin, Scientist	August 26-30, 2024	Multivariate Analysis Using R	ICAR-NAARM, Hyderabad
14.	Dr. S. De, Principal Scientist	September 4-5, 2024	Annual Conference of the Society of one health Biochemist & Biochemistry of One Health	Nagpur Veterinary College, Nagpur
15.	Dr. Subhasis Mandal, Principal Scientist	September 18-20, 2024	Management of coastal salinity for transforming agri-food systems in Ganges delta-turning grassroots experiences into policy	NDDB, Anand
16.	Dr. A. Kumaresan, National Fellow Dr. A. Manimaran, Sr. Scientist	September 26-28, 2024	XXIX Annual Convention of ISVIB and National Conference	Madras Veterinary College, Chennai
17.	Dr. Manoj Kumar Singh, Sr. Scientist Dr. Naresh Lalaji Selokar, Sr. Scientist	September 27-28, 2024	11th National Seminar on "Indian Dairy & Food Industry in Viksit Bharat: Developments & Innovation"	ICAR-NDRI, Karnal

Joining/ Promotion/ Relieving/ Superannuation/ Additional Responsibilities

- Mr. Asgar Ali joined as Technician with effect from July 5, 2024 at SRS-NDRI, Bengaluru.
- Sh. P. Krishnaswamy, MTS retired from ICAR services on August 31, 2024 from SRS-NDRI, Bengaluru.
- Dr. Ashutosh, Principal Scientist, ICAR-NDRI, Karnal has retired/ VRS in the forenoon of September 6, 2024 vide office order F.No.13-537/2003/e-160183/E-I(S)-375-388 dated August 14, 2024.
- Sh. Sunil, LDC, University Office has assumed the Charge to the post of Assistant Finance & Accounts Officer in the pay level-7 at ICAR-NDRI, Karnal w.e.f. August 22, 2024 (FN).
- Sh. Dinesh Nagpal, CAO has been entrusted with the responsibilities of Officer Incharge (Security) with effect from September 4, 2024.
- Following Scientific Staff promoted to the next higher grade in PB-4 of Rs. 37,400-67,000+RGP of Rs. 9,000/- (Revised Research Pay Level-13A):

SN	Name of Scientist and Designation	Station	Promoted w.e.f.
1.	Dr. Devaraja H.C., Senior Scientist, Dairy Processing	SRS of NDRI, Bangalore	May 11, 2023
2.	Dr. Sathish Kumar M.H., Senior Scientist, Dairy Processing	-do-	May 11, 2023
3.	Dr. Sunita Meena, Senior Scientist, Animal Biochemistry	NDRI, Karnal	August 7, 2023
4.	Dr. Raghu H.V., Senior Scientist, Dairy Microbiology	-do-	December 15, 2023
5.	Dr. Pradip Vishnu Behare, Senior Scientist Dairy Microbiology	-do-	December 15, 2023
6.	Dr. Hardev Ram, Senior Scientist, Agronomy	-do-	December 15, 2023

- Dr. Vedamurthy G.V., Scientist (Animal Biochemistry), ICAR-SRS of NDRI, Bangalore promoted to the next higher grade in PB-3 of Rs. 15,600- 39,100+RGP of Rs. 8,000/- (Revised Research Pay level-12) and re-designation as Senior Scientist w.e.f. January 1, 2024.

राजभाषा एकक

संस्थान राजभाषा कार्यान्वयन समिति की बैठक

भाकृअनुप– राष्ट्रीय डेरी अनुसंधान संस्थान, करनाल की राजभाषा कार्यान्वयन समिति की दिनांक 08.08.2024 को संपन्न हुई 104वीं समीक्षा बैठक का कार्यवृत्त

डा. धीर सिंह, निदेशक, भाकृअनुप–राष्ट्रीय डेरी अनुसंधान संस्थान, करनाल की अध्यक्षता में संस्थान राजभाषा कार्यान्वयन समिति की दिनांक 01.07.2024 से दिनांक 30.09.2024 तक की तिमाही समीक्षा बैठक दिनांक 08.08.2024 को अपराह्न 03.30 बजे के साथ संस्थान के डा. एन. एन. दस्तूर सभागार में आयोजित की गयी। बैठक में संस्थान के 34 पदाधिकारी शामिल हुए।

बैठक के आरंभ में समिति के सदस्य– सचिव, श्री धीरज शर्मा, संयुक्त निदेशक (राजभाषा) ने सभा कक्ष में उपस्थिति समिति के अध्यक्ष तथा अन्य सदस्यों का स्वागत किया तथा कार्यसूची के 18 बिन्दुओं पर विस्तार से चर्चा की।

हिन्दी कार्यशाला का आयोजन

संस्थान के डा. एन. एन. दस्तूर सभागार में दिनांक 18.09.2024 को (राजभाषा हिंदी एवं उसका कार्यान्वयन, शब्द रचना एवं शब्दावली) हिन्दी कार्यशाला का आयोजन किया गया जिसमें संस्थान के 110 वैज्ञानिक, अधिकारी एवं कर्मचारी शामिल हुए।

हिंदी दिवस समारोह एवं हिंदी पखवाड़ा–2024

भाकृअनुप– राष्ट्रीय डेरी अनुसंधान संस्थान, करनाल ने दिनांक 18.09.2024 से हिंदी पखवाड़ा–2024 का आयोजन किया गया। इसका उद्घाटन दिनांक 18.09.2024 को डा. एन. एन. दस्तूर सभागार में पूर्वाह्न 11.30 किया गया। इस कार्यक्रम की अध्यक्षता संस्थान के निदेशक, डा. धीर सिंह द्वारा की गई। हिंदी पखवाड़ा–2024 के दौरान दिनांक 20.09.2024 को हिंदी निबंध प्रतियोगिता का आयोजन किया गया। इसके पश्चात् दिनांक 23.09.2024 को हिंदी शोध पत्र/ पोस्टर प्रदर्शन प्रतियोगिता, दिनांक 25.09.2024 को हिंदी श्रुतलेखन प्रतियोगिता, दिनांक 27.09.2024 को हिंदी टंकण प्रतियोगिता, दिनांक 30.09.2024 को भारत ज्ञान प्रतियोगिता तथा दिनांक 01.10.2024 को टिप्पण–आलेखन प्रतियोगिता का आयोजन किया गया जिनमें संस्थान के वैज्ञानिकों, अधिकारियों, कर्मचारियों एवं शोधकर्ता विद्यार्थियों ने बढ़–चढ़कर हिस्सा लिया।

हिंदी दिवस पखवाड़ा–2024 के दौरान दिनांक 20.09.2024 को हिंदी निबंध प्रतियोगिता की झलक

दिनांक 23.09.2024 को हिंदी शोध पत्र पोस्टर प्रतियोगिता के दौरान एक प्रतिभागी अपने पोस्टर की व्याख्या करते हुए

SOUTHERN CAMPUS, BENGALURU

Research

Nano-immobilization of β-galactosidase for the production of galactooligosaccharides from paneer whey

(Manoj Kumar, C.T., Deepak, Sathish Kumar, M.H., Jayaraj Rao, K., Priyanka Singh Rao, and Mamta Chauhan)

Beta-galactosidase is a glycoside hydrolase enzyme that hydrolyzes lactose into glucose and galactose, and it can also synthesize galactooligosaccharides (GOSs) from lactose through a transgalactosylation mechanism. GOS is a well-known prebiotic ingredient resembling the oligosaccharides naturally present in human milk. The β-galactosidase in its free/soluble state is neither recoverable nor reusable and is susceptible to extreme processing conditions; however, the enzyme immobilized on nanoparticles may exhibit better activity and stability compared to the native enzyme. Paneer whey, a major by-product of the dairy industry, contains a significant amount of lactose, making it useful for GOS production. In this context, the present research focused on immobilizing β-galactosidase on glutaraldehyde-functionalized clay nanoparticles and producing GOS from paneer whey. The nano-immobilized enzyme demonstrated significantly higher stability than the free enzyme under extreme pH conditions (4.0, 6.5, 7.0, and 8.0) and temperature conditions (30, 40, 50, and 60 °C). In a storage study, the immobilized enzyme retained 97.41% of its initial activity, significantly higher ($p<0.05$) than the free enzyme's 94.83% after being stored for 90 days at 4 °C. The nano-immobilized enzyme produced 1.41 times more GOS than the free enzyme in paneer whey, and in the reusability study, GOS production decreased by 71% after four cycles.

Ready-to-Reconstitute Foxtail Millet *Payasam* Mix

(Menon Rekha Ravindra., Monika Sharma and H.C. Devaraja)

Foxtail millet (*Setaria italica* L.) is used to prepare payasam in some southern states of India. However, due to its limited shelf life, there is a need to develop an instant payasam mix. The formulation of a ready-to-reconstitute dry-crystallized foxtail millet payasam mix was optimized using a mixture design approach. The processing conditions for the resulting formulation were then optimized for the mechanized production

of the dry mix in a dry-crystallization unit. The sample had a reconstitution time of 12-14 minutes. The product maintained its sensory acceptability, reconstitution, physico-chemical properties, and microbiological safety throughout 180 days of storage.

Events

- To commemorate the tenth anniversary of the Swachh Bharat Mission, the Swachhata Hi Seva 2024 (SHS 2024) initiative was launched under the theme "Swabhav Swachhata, Sanskar Swachhata." From September 17-30, 2024, SRS-NDRI engaged in various activities, starting with a Swachhata Pledge taking ceremony led by Dr. Arindam Dhali. This was followed by a plantation drive in the Students' Hostel and a mega cleanliness drive at the Livestock Research Centre, Experimental Dairy Plant, and residential areas, involving active participation from staff and students.
- Sponsored by DST-SERB, the VRITIKA training program on "Quality Attributes of Lactic Fermented Spray Dried Milk Prepared Using Paneer Whey" ran from June 26 to July 25, 2024. This month-long hands-on training aimed to enhance students' skills in value-added fermented dairy products using spray drying, homogenization, and gel formation techniques. Two participants, a Ph.D. student in Food and Nutritional Sciences and a final-year B.Tech. Dairy Technology student, gained experience with advanced instruments like HPLC and spray drying, concluding with certificate distribution.
- The Vritika training and skill internship program, sponsored by SERB DST, was conducted from June 26 to July 25, 2024. The theme of the program focused on the "Development of Nutri-Cereals Incorporated Probiotic Convenience Foods and Beverages." A total of five students from various dairy science colleges participated in the training program.
- Hindi Fortnight was celebrated from September 14-27, 2024, with great enthusiasm, featuring competitions like Poem Recitation, Slogan Writing, Singing, and Antakshari. A "Kanthasth 2.0" workshop on September 27, 2024 enhanced the skills of 22 participants. The celebrations culminated in a Valedictory Function attended by Dr. Arindam Dhali and Dr. Arthbandhu Sahoo, with 71 spectators. Winners received cash prizes, recognizing their exceptional performances and emphasizing the importance of Hindi in the community.

Kanthasth 2.0 workshop and prize distribution on September 27, 2024

Extension Activities/ Transfer of Technologies:

Advisory Services

Advisory services were provided to twenty-five clients through digital communication. The information requests included topics such as dairy farming business models, indigenous dairy cows, milk products for dairy businesses, improved fodder varieties, and training programs.

Visitors

The institute hosted a total of 455 visitors in 11 batches, including students and farmers from various districts in the state and neighboring states. The visitors were informed about ongoing research and extension activities and were given tours of the institute tailored to their needs.

Outreach Activities

On July 16, 2024, the Farmer First Collaborative Project by ICAR-Indian Institute of Horticulture Research and SRS-NDRI organized a Dairy Animal Health and Infertility Camp in Hosadurga and Vasappana Doddi, Ramnagara Taluk. The camp treated 50 crossbred HF dairy cattle and 35 sheep, benefiting 46 farm families, including 36 farmers and 10 farm women. Common issues addressed included mineral deficiency, mastitis, and anoestrus. Corrective measures involved mineral supplements, deworming, and curative medicines, alongside an interactive session to identify ongoing needs for targeted interventions.

On-Farm Training Program

An On-Farm Training Program was organized under TSP funds at Husenpura Village in Chintamani Taluk, Chikkaballapura District, Karnataka, in coordination with KOCHIMUL (Kolar-Chikkaballapura Milk Union) of the Karnataka Milk Federation. The training program on "Green Fodder Cultivation" and the Farmers' Interaction Meeting was well attended by 70 farmer beneficiaries.

EASTERN CAMPUS, KALYANI

Extension

- On September 3, 2024, 13 girl students from Jawahar Navodaya Vidyalaya, Murshidabad, visited ICAR-NDRI's Eastern Regional Station under the "Vigyan Jyoti" scheme, promoting science, technology, engineering, and mathematics (STEM) careers among young girls. Accompanied by two staff members, the students explored advancements in dairy science research, gaining insights into ERS's academic and research activities.

Visit of students to ERS-NDRI under Vigyan Jyoti scheme on September 3, 2024

- On September 23, 2024, 19 students and a faculty member from Tagore School of Rural Development visited ICAR-NDRI's Eastern Regional Station (ERS). They explored advanced research in dairy science, touring laboratories and experimental fields focused on dairy farming, animal nutrition, and livestock management. The visit ended with a machine-milking demonstration, fostering students' interest in agriculture and dairy science careers.

Visit of students to ERS-NDRI for knowledge enrichment about dairy science on September 23, 2024

Activities carried out for Scheduled Caste farmers:

On August 2, 2024, ICAR-NDRI ERS organized an SCSP program in Hingalganj, North 24 Parganas, West Bengal, benefiting 78 Scheduled Caste farmers in the Sunderbans. Farmers received 78 kg of mineral mixture, veterinary medicines, and educational materials to promote livestock health, boost productivity, and enhance sustainable farming knowledge, supporting socio-economic upliftment.

Distribution of mineral mixture among farmers from Sunderbans on August 2, 2024

- On August 3, 2024, ICAR-NDRI ERS conducted a targeted intervention in Gosaba, South 24 Parganas, West Bengal, benefiting 36 Scheduled Caste farmers. The program focused on livestock health by distributing mineral mixtures and veterinary medicines, providing educational materials, and organizing field visits to enhance knowledge and sustainable farming practices.

Farmers participating at livestock health camp at Gosaba on August 2, 2024

- On August 7, 2024, ICAR-NDRI ERS collaborated with the National Research Centre on Mithun to host a training program and input distribution camp for Scheduled Caste farmers in Nadia district. The event distributed 85 goats, animal feed, veterinary medicines, and vitamins, enhancing livestock productivity and supporting farmers' economic and food security. Dr. Girish Patil, Director, National Research Centre on Mithun emphasized the importance of these initiatives for marginalized communities.

Participation of farmers at training program at Nadia district on August 7, 2024

- Two successful training programs on "Scientific Animal Husbandry for Tribal Unemployed Youth" were held from July 2-5 and July 9-11, 2024, with 50 participants (43 females, 7 males). The sessions covered essential animal husbandry topics and provided inputs, empowering tribal youth to pursue sustainable livelihoods in this field.

Glimpse of training program organized for tribal farmers from July 2-5 and July 9-11, 2024

- On August 13, 2024, a Scientists-Farmers Interaction Session and Animal Health Care Camp were held at ShiberBandh, Sonamukhi, in collaboration with KVK Bankura. This event fostered knowledge exchange, addressing animal husbandry challenges for local tribal farmers. It included health check-ups for livestock and distribution of animal feed and husbandry utensils, enhancing nutrition and well-being.

Scientist-farmers interaction meeting at Bankura on August 13, 2024

- On August 23, 2024, ICAR-NDRI's Eastern Regional Station in Kalyani hosted an input distribution camp for 102 tribal farmers, providing seeds, fertilizers, and insecticides for sorghum fodder and black gram cultivation. A subsequent program on August 29, 2024 distributed 40 female goats, feed, and tumblers, promoting sustainable livestock management and integrated farming.
- On September 6, 2024, ICAR-NDRI, ERS Kalyani, organized a program to promote scientific backyard poultry among tribal farmers in Nadia district, West Bengal, under the NDRI-Tribal Support Plan Project. Total 225 beneficiaries received 2,700 chicks, 3,275 kg of feed, and additional support for goats, pigs, and cattle, enhancing integrated farming potential.

Glimpse of farmers participating in scientific backyard poultry program at Nadia district on September 6, 2024

- On September 12, 2024, the Eastern Regional Station of ICAR-NDRI held a scientist-farmer meeting and input distribution camp at KVK-Bankura, West Bengal, under the Tribal Sub Plan. The event promoted scientific duck husbandry, distributing 2,000 ducklings, 2,500 kg of feed, and essential equipment to 100 tribal farmers, empowering them with resources and knowledge.


Farmers attending the scientist-farmer interaction and input distribution at KVK- Bankura on September 12, 2024

Activities carried out under NEH project

- On September 6, 2024, a significant event at Krishi Vigyan Kendra (KVK), Morigaon, Assam, focused on promoting the indigenous Lakhimi cattle breed. Scientists from ICAR-NDRI's Eastern Regional Station emphasized conservation and sustainable practices. Fifty farmers received essential livestock inputs, enhancing dairy farming and strengthening ties between scientists and the local community.


Scientist-farmers interaction and distribution of inputs at KVK-Morigaon, Assam on September 6, 2024

- On September 26, 2024, the Eastern Regional Station, Kalyani of ICAR-NDRI, Karnal, hosted a Scientists' and Farmers interaction on scientific livestock rearing in Nagaland, collaborating with ICAR-RC-NEH. Twenty pig farmers and 51 poultry rearers attended. Beneficiaries received 35 piglets, 2,000 kg of pig feed, 3,000 chicks, and 4,000 kg of poultry starter feed. Scientists also visited local farms to advise on livestock health and rearing practices, emphasizing the importance of scientific animal husbandry for economic improvement.


Distribution of inputs at Nagaland on September 26, 2024

Editorial Board

Published by: **Dr. Dheer Singh,** Director, ICAR-NDRI, Karnal
Production: **Dr. Rajan Sharma,** Joint Director (Research)
Editor: **Dr. Sanjeev Kumar,** Sr. Scientist, Agronomy Section
Compilation: **Mr. Lakshman,** Technical Officer, PME Cell

Tel.: 0184-2252800 | **Fax:** 0184-2250042 | **e-mail:** director.ndri@icar.gov.in | **Gram:** DAIRYRESEARCH