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

www.ndri.res.in

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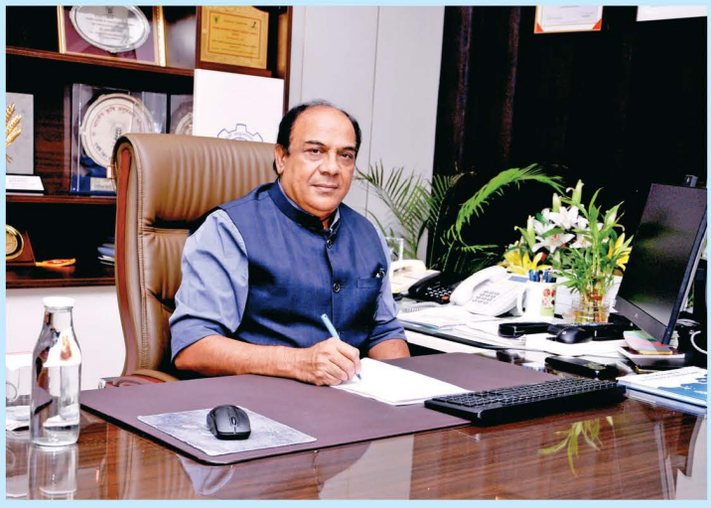
From the Director's Desk



Nestled in the Indian Himalayas, Ladakh is characterized by its extreme environmental conditions, featuring high-altitude terrain with harsh winters and arid summers. Surrounded by the Karakoram and Greater Himalayas ranges, Ladakh has a unique cold-arid climate with very low annual precipitation. The high altitude and harsh climate make it a challenging geographical location for both humans and animals. The extreme cold and dry-arid conditions restrict the growth and productivity of livestock populations, including dairy cattle. Beyond physiological challenges, livestock farming in Ladakh faces socio-economic and geopolitical challenges.

The primary livestock rearing system in Ladakh is pastoralism, which is undergoing rapid changes due to livelihood diversification, increased dependence on external food production systems, and the development of tourism. Climate change in the region is contributing to a decline in pasture growth and quality, a reduction of grazing areas, and the drying of vital water sources. Consequently, herders are compelled to initiate early migrations, encountering challenges such as ice-covered terrain, lack of suitable pasture, and extreme weather events. Overgrazing and the progressive shrinkage of rangelands have catalyzed the transition from extensive grazing systems to semi-intensive stall-feeding methods.

NDRI accepted the challenges of Ladakh and initiated research work on the *"Development of Climate-Resilient and Sustainable Agri-Based Systems for Better Food, Feed, Nutritional, and Livelihood Security Options for the Farming Community of the Cold Arid Region-Ladakh"* with the support of Department of Science & Technology, Govt. of India. Multi-dimensional efforts concentrated on the assessment of climate change and its impact on existing production systems, mitigation of climate change impacts, enhancing livestock productivity, exploring the techno- and bio-functional potential of milk from locally available livestock species, developing technologies for extended shelf-life, value-added dairy products, and capacity building among farmers and other stakeholders for climate-resilient agriculture.

Analyses of different climate change indices indicate a consistent decline in the number of frost days over the years in Ladakh. By 2040, it is projected that there will be an average decrease of 10 frost days compared to 2010. The average daily minimum temperature trend shows a consistent upward trajectory and is likely to persist. By 2040, the average daily minimum temperature is estimated to increase by 1°C, reaching 2.2°C by 2070, and 2.6°C by 2100 compared to 2010, based on the RCP 4.5 scenario. The Mann-Kendall trend and Sen's slope indicate a significant rise in growing degree days (GDD) over the years.

In this issue...

Local indigenous breeds are well adapted to the changing climatic scenario due to their compact body posture with long hair, which is suitable for the harsh cold climate and steep terrain. Despite their higher adaptability to the cold-arid climate, these breeds often face feed deficits as the region does not produce feed of high quantity and quality. Grasslands used for grazing and other non-conventional feed sources such as the straws of wheat, barley, buckwheat, and alfalfa hay are common during the winter season due to their higher availability and easy storage. To bridge the feed gap, there is a notable opportunity arising from the observed climatic changes in Ladakh, particularly the increasing temperature trends leading to a rise in growing degree days, a crucial factor for agricultural phenology. These trends hold the potential to enhance the cultivation of forage crops like maize in the region. The NDRI team successfully cultivated maize and prepared good quality maize silage in Ladakh. This intervention may provide a significant avenue for reducing feed shortages in the region.

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

RESEARCH

Title: Conservation of fodder resources for lean season in Ladakh region

(Anurag Saxena, A.K. Mishra, Hardev Ram and Tsewang Youdol)

The Ladakh region faces a significant shortage of food, fresh vegetables, and fodder, particularly during the harsh winter months, impacting livestock rearing, which is crucial for the livelihoods, economy, and nutritional security of the tribal population. To address this, efforts have been made to conserve fodder and conduct feeding trials. Various fodder plants, such as *Cicer microphyllum* and *Fagopyrum esculentum*, have been identified, and crops like maize, sorghum, and Chinese cabbage introduced, with maize, especially the African Tall variety, showing the best performance. Although sorghum struggled in Leh, it might become viable in the future due to rising growing degree-days. High-quality silage from maize (27.6% dry matter, 10.2% crude protein, 27.4% crude fiber) and sorghum (28.2% dry matter, 8.2% crude protein, 26.8% crude fiber) provides essential nutritional data for livestock feeding and winter fodder management. Additionally, feeding trials with seabuckthorn leaves for local milch animals have begun, aiming to enhance nutritional intake and livestock productivity during the lean season.

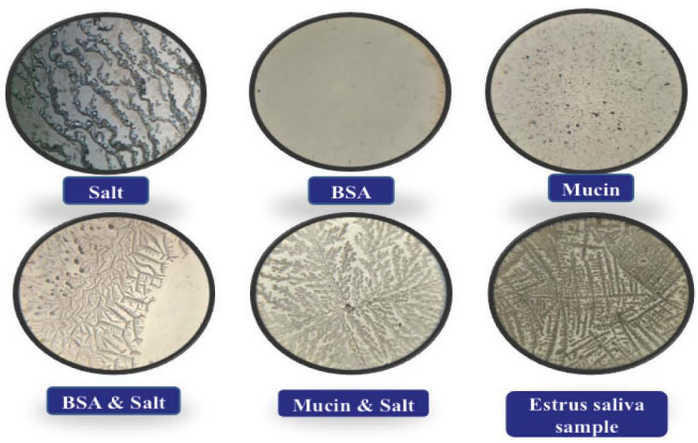
Glimpse of activities performed during silage preparation

Simulating Typical Fern-Like Patterns of Buffalo Saliva at Estrus with Mucin and salt combination

(Varun Kumar, Dheer Singh, and Suneel Kumar Onteru)

Estrus detection, a crucial aspect of buffalo husbandry, poses unique challenges, particularly during the summer months when traditional behavioral and physiological signs become less prominent. An approach emerges

through the observation of fern-like crystallization patterns in buffalo saliva, similar to that in bactrian camels, beagle bitches, and cows. This method offers a promising avenue for estrus detection. In the pursuit of understanding these mechanisms, a hypothesis is proposed, suggesting a correlation between estrus-specific mucins and salts in facilitating the formation of fern-like patterns. To test this hypothesis, experiments were conducted, combining different concentrations of mucin types (MUC2 and MUC3) with sodium chloride (NaCl). Microscopic examinations confirmed the synergistic effect of MUC3 and NaCl in producing realistic fern-like patterns, offering insights into the underlying biological processes. Further exploration involved computational analysis, leveraging image analysis tools to predict natural fern-like patterns in buffalo saliva during estrus. Through this analysis, a guide tree was constructed, revealing 12 distinct clusters of artificially generated patterns. Notably, cluster 2 emerges as a focal point, characterized by the presence of MUC3 in combination with specific salt concentrations (100, 150, and 250 mM), closely mirroring natural fern-like patterns observed during buffalo estrus. Conclusively, the predictive model suggests that buffalo saliva at estrus is typified by the presence of gel-forming heavily glycosylated proteins, such as mucins, alongside a minimum concentration of 100 mM NaCl.

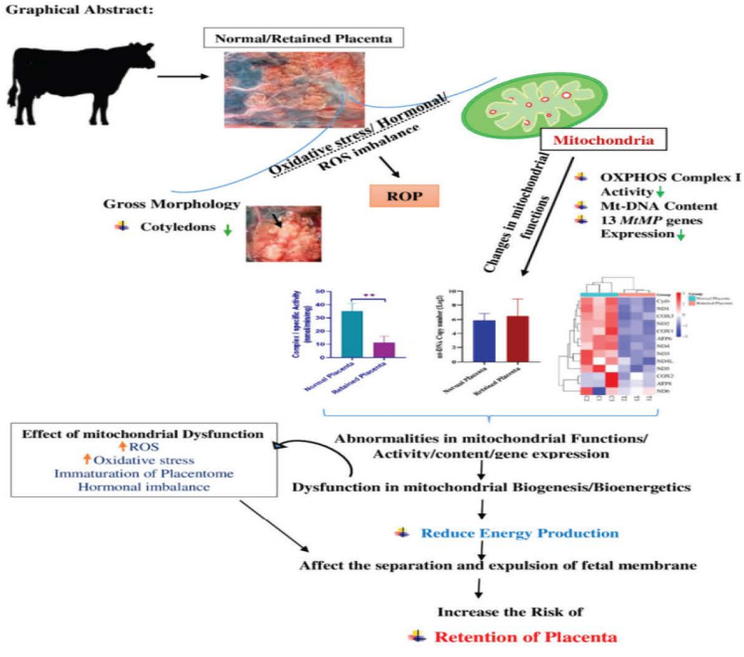


Comparison between different combinations of salt and glycoproteins and natural buffalo saliva at estrus

Deciphering the association between mitochondrial alterations and retained placenta in crossbred cattle

(Madhuri S. Lahamge and Sadeesh E.M.)

The placenta is a metabolically active organ that meets its bioenergetic needs through Oxidative Phosphorylation (OXPHOS) and supports both its growth and that of the fetus. Metabolic dysfunction in the placenta commonly occurs in cases of Retained Placenta (RP), yet its exact connection with mitochondria remains unclear. In this study, we examine the link between mitochondrial dysfunction and RP in crossbred cattle, suggesting that altered mitochondrial functions could contribute to RP. Morphological observations revealed distinct cotyledon structures in RP. Further investigation revealed a notable decrease in OXPHOS complex I activity and pronounced reductions in transcript levels of nine mitochondrial protein-coding genes (ND1, ND2, ND3, ND4L, ND4, CYTB, COX1, COX3, and ATP6), accompanied by an upregulation observed in ND6. Subsequently, the mitochondrial DNA copy number varied among animals without significant differences between groups. These changes in mitochondrial gene expression and complex activities imply altered energy requirements or mitochondrial deficiencies in cases of RP, affecting placental expulsion, hormonal balance, and oxidative stress. In conclusion, our findings emphasize the link between mitochondrial irregularities and RP.



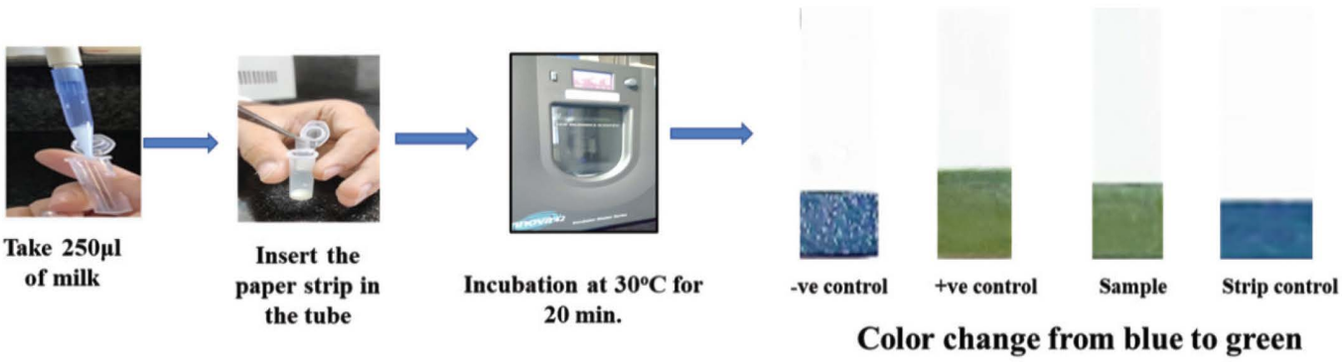
Role of mitochondria in retention of placenta in cross-bred cattle

This study highlights the pivotal role of mitochondrial function in maintaining placental health and its significant implications for pregnancy outcomes.

Colorimetric Paper Strip Sensor for the Detection of Microbial Quality of Raw Milk

(Shreya Saha and Raghu H.V.)

Ensuring food safety by rapidly detecting microbial contamination in milk is crucial. Monitoring aerobic plate count (APC) in milk can indicate hygienic conditions and freshness, as well as identify cold chain lapses. Traditional methods like methylene blue reduction test, direct microscopic count, and plate counts are time-consuming and labor-intensive, often affected by external factors. To address these challenges, a colorimetric paper strip sensor has been developed. This sensor detects changes in pH and conductivity in an optimized medium due to bacterial metabolites, altering the color of a conducting polymer immobilized on the strip from blue to green. The sensor is dipped in 250 µL of raw milk, incubated at 30°C for 20 minutes, and the resulting color shades indicate milk quality: very good (blue), good (bluish green), fair (greenish blue), and poor (green), correlating with microbial loads ≤ 10^5, 10^5 – 10^6, 10^7 – 10^8, ≥10^8 cfu/ml, respectively. This sensor offers a sensitive, cost-effective, and user-friendly method for qualitative assessment of raw milk quality upon reception. It presents a viable alternative to traditional tests like the methylene blue reduction test, facilitating routine and real-time monitoring of milk microbiological quality.



Paper strip sensor for detection of microbial quality of milk

	Grading	APC (cfu/ml)
Blue →	Very good	≤ 10^5
Bluish green →	Good	10^5 – 10^6
Greenish blue →	Fair	10^7 – 10^8
Green →	Poor	≥ 10^8

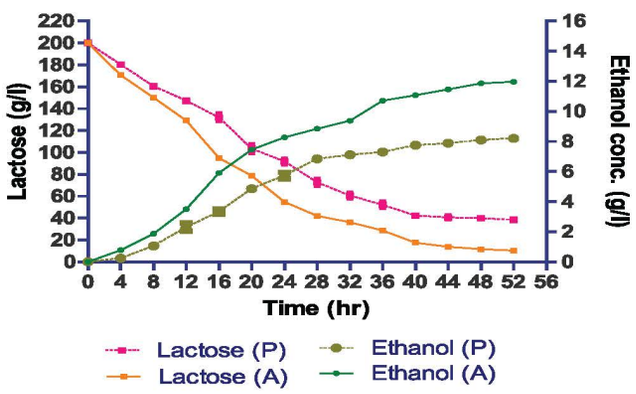
Interpretation based on color change on strips

Adaptive evolutionary engineering of *Kluyveromyces marxianus* for high ethanol tolerance

(Upma and Shilpa Vij)

Kluyveromyces marxianus has several benefits over *Saccharomyces cerevisiae* with respect to thermo tolerance and the capacity to convert lactose to ethanol and several sugars. Currently, *K. marxianus'* weak ethanol tolerance makes it unsuitable for industrial use. To date, very less studies has been done to improve its ethanol tolerance. Therefore, the present project has been conceptualised to exploit the adaptive evolutionary engineering to increase ethanol tolerance and evaluation of factor involved in stress tolerance. Firstly, strain was adapted to 20% lactose and it was able to produce 78.33 ± 0.88 g/L in 46 h of fermentation with residual lactose 41± 0.28 g/L, its ethanol tolerance was 8% (v/v). Adaptive evolution, a sequential transfer with increase in stress, was done. It took 110 days and 55 generations

to improved ethanol tolerance to 12% (v/v). Ethanol production 110.51 ± 0.87 g/L in 46 h which was 42.9 % higher from parent strain. Specific growth rate was also enhanced from 0.043 h^{-1}, 0.049 h^{-1} in adapted strain. In serial re-pitching of strain there was no significant reduction of ethanol production up-to 5 cycles. The stability of strain was checked and was found stable up-to 10 cycles of sub culturing in low sugar medium. So, it can be concluded that adaptation to high ethanol tolerance of *K. marxianus* 6C17 enhanced its ethanol tolerance to 12% (v/v) that yielded 42.9 % higher ethanol than lactose adapted strain.

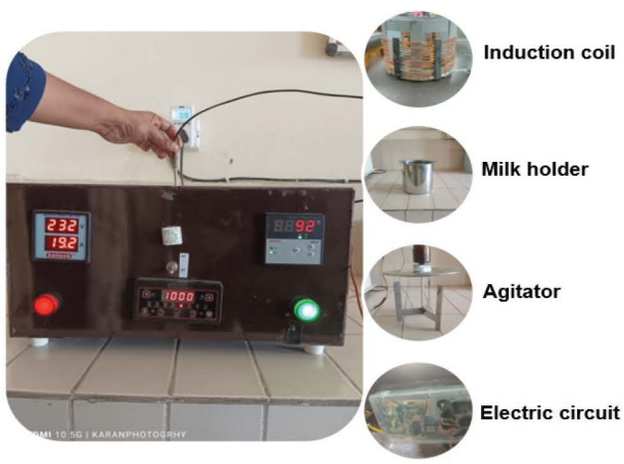


Comparison of ethanol production and sugar utilization without external nutrient supplement by parent strain and its adapted strain of *Kluyveromyces marxianus* 6C17. The values are mean ±sd

Magnetic induction-based milk heating unit

(Hima John, P Barnwal, Khushbu Kumari and A.K. Puniya)

A laboratory-scale, magnetic induction-based milk heating unit with a 5 L capacity was developed in the Dairy Engineering division. The sample holder, made of AISI 304 stainless steel, was placed inside an induction coil (Litz copper coil with 16 wires, 5 meters long, 15 turns, 10.5 cm in height, and 15 cm in inner diameter). An agitator was included in the sample holder to ensure uniform temperature distribution. This innovative thermal technique demonstrated the lowest energy requirement (0.25 kWh) to heat 2.5 L of milk compared to other heating methods, such as an LPG stove (0.34 kWh) and an electric coil heater (0.52 kWh). Approximately 25% energy savings were observed compared to the LPG stove. The total time to heat the milk was also significantly reduced, taking only 9 minutes in the developed unit, whereas the electric coil heater took 26 minutes to heat the same quantity of milk. Additionally, there was almost zero milk deposit observed in the unit after heating the milk to 90°C. Moreover, no steam or water is required as a heating source in the developed unit, as electrical energy is converted to heat energy by eddy currents. Thus, the developed unit aligns with technologies aimed at achieving net-zero water usage, which is essential in this era.



Magnetic induction based milk heating unit

NDRI Climate Service: an effective climate-led extension service delivery model for building climate resilient dairy production system

(Sanjit Maiti, Manjunath KV, Sanchita Garai, Goutam Mondal, Anjali Aggarwal, Mukesh Bhakat, Raj Kumar, S K Jha and Gopal Sankhala)

The Indian dairy production system is highly vulnerable to climate change. To mitigate its adverse effects on smallholder dairy farming, the ICAR-National Dairy Research Institute (NDRI), Karnal, developed a Temperature Humidity Index (THI)-based climate services delivery model. This model provides weekly, district-specific THI-based climate advisories every Wednesday or Thursday through an Android-based mobile application, an SMS portal, and social media (WhatsApp groups) to aid smallholder dairy farmers' operational decisions during thermal stress seasons. Significant improvements were observed in animal feeding management due to these climate services. The use of oilcake increased to 0.39, 0.45, and 0.51 kg/animal/day for the Text SMS, WhatsApp, and MobileApp groups, respectively. Similarly, concentrate usage

increased during summer (0.48, 0.56, and 0.59 kg/animal/day) and winter (0.35, 0.40, and 0.42 kg/animal/day). Mineral mixture supplementation also rose as part of the climate-resilient strategies to minimize thermal stress. The average treatment effect of these services on economic outcomes was significant, improving milk yield by 0.38, 0.44, and 0.50 liters for the Text SMS, WhatsApp, and MobileApp groups, respectively, during summer. The climate services enabled dairy farmers to promptly adapt their daily operational decisions, significantly enhancing their adaptive capacity. Proactive acceptance of this model by farmers will ensure greater climate resilience in India's dairy production system.

Institutional Technology Management Unit

Patent Filed:

One Patent has been filed on May 2, 2024 for the innovation entitled "**A process of producing *khoa* powder substitute using sweet cream butter milk and ghee-residue**" (Application No. 202411034793 by **Dr. G. S. Meena**).

Patent Granted:

Two (02) Indian patents have been granted:

S. No.	Title of patent	Inventors	Application No.	Grant No. & Date
1.	A crosslinked membrane with flow-line capable of arresting free-flowing gold nanoparticles and the process for the same	Y. S. Rajput, Nanda Dhiraj Kumar and Rajan Sharma	201711036404	#533338 dated 16.04.2024
2.	Label for indicating freshness of Indian dairy products and preparation method thereof") by a team of scientists comprising	Narender Raju Panjagari, Rakesh Kumar Raman, Karpurapu Uma, Ashish Kumar Singh and Sangita Ganguly	202111004590	#534389 dated 23.04.2024

पेटेंट कार्यालय,भारत सरकार The Patent Office, Government Of India
पेटेंट प्रमाण पत्र | Patent Certificate
(पेटेंट नियमावली का नियम 74) | (Rule 74 of The Patents Rules)

पेटेंट सं. / Patent No. : 533338
आवेदन सं. / Application No. : 201711036404
फाइल करने की तारीख / Date of Filing : 13/10/2017
पेटेंटी / Patentee : INDIAN COUNCIL OF AGRICULTURAL RESEARCH
आविष्कारकों का नाम /Name of Inventor(s) : 1.RAJPUT YUDHISHTHIR SINGH 2.NANDA DHIRAJ KUMAR 3.SHARMA RAJAN

प्रमाणित किया जाता है कि पेटेंटी को, उपरोक्त आवेदन में यथाप्रकटित "A CROSSLINKED MEMBRANE WITH FLOW-LINE CAPABLE OF ARRESTING FREE-FLOWING GOLD NANOPARTICLES AND THE PROCESS FOR THE SAME" नामक आविष्कार के लिए, पेटेंट अधिनियम, 1970 के उपबंधों के अनुसार आज तारीख अक्टूबर 2017 के तेरहवें दिन से बीस वर्ष की अवधि के लिए पेटेंट अनुदत्त किया गया है।

It is hereby certified that a patent has been granted to the patentee for an invention entitled "A CROSSLINKED MEMBRANE WITH FLOW-LINE CAPABLE OF ARRESTING FREE-FLOWING GOLD NANOPARTICLES AND THE PROCESS FOR THE SAME" as disclosed in the above mentioned application for the term of 20 years from the 13th day of October 2017 in accordance with the provisions of the Patents Act, 1970.

अनुदान की तारीख : 16/04/2024
Date of Grant : 16/04/2024
पेटेंट नियंत्रक
Controller of Patents

टिप्पणी - इस पेटेंट के चालीसवें के लिए फीस, यदि इसे अगस्त रद्द नहीं है, अगस्त 2019 के तेरहवें दिन को और उसके पश्चात प्रत्येक वर्ष में उसी दिन देय होगी।
Note. - The fees for renewal of this patent, if it is to be maintained, will fall / has fallen due on 13th day of October 2019 and on the same day in every year thereafter.

Patent Granted: A crosslinked membrane with flow-line capable of arresting free-flowing gold nanoparticles and the process for the same

पेटेंट कार्यालय,भारत सरकार The Patent Office, Government Of India
पेटेंट प्रमाण पत्र | Patent Certificate
(पेटेंट नियमावली का नियम 74) | (Rule 74 of The Patents Rules)

पेटेंट सं. / Patent No. : 534389
आवेदन सं. / Application No. : 202111004590
फाइल करने की तारीख / Date of Filing : 03/02/2021
पेटेंटी / Patentee : INDIAN COUNCIL OF AGRICULTURAL RESEARCH
आविष्कारकों का नाम /Name of Inventor(s) : 1.NARENDER RAJU PANJAGARI 2.RAKESH KUMAR RAMAN 3.KARPURAPU UMA 4.ASHISH KUMAR SINGH 5.SANGITA GUNGULY

प्रमाणित किया जाता है कि पेटेंटी को, उपरोक्त आवेदन में यथाप्रकटित LABEL FOR INDICATING FRESHNESS OF INDIAN DAIRY PRODUCTS AND PREPARATION METHOD THEREOF नामक आविष्कार के लिए, पेटेंट अधिनियम, 1970 के उपबंधों के अनुसार आज तारीख फरवरी 2021 के तीसरे दिन से बीस वर्ष की अवधि के लिए पेटेंट अनुदत्त किया गया है।

It is hereby certified that a patent has been granted to the patentee for an invention entitled LABEL FOR INDICATING FRESHNESS OF INDIAN DAIRY PRODUCTS AND PREPARATION METHOD THEREOF as disclosed in the above mentioned application for the term of 20 years from the 3rd day of February 2021 in accordance with the provisions of the Patents Act, 1970.

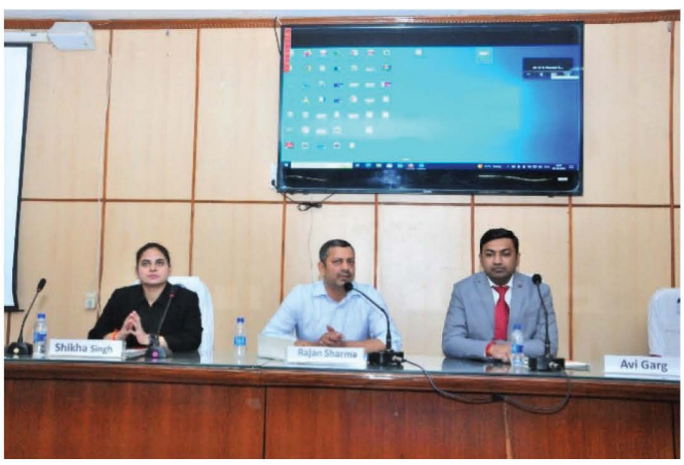
अनुदान की तारीख : 23/04/2024
Date of Grant : 23/04/2024
पेटेंट नियंत्रक
Controller of Patents

टिप्पणी - इस पेटेंट के चालीसवें के लिए फीस, यदि इसे अगस्त रद्द नहीं है, फरवरी 2023 के तीसरे दिन को और उसके पश्चात प्रत्येक वर्ष में उसी दिन देय होगी।
Note. - The fees for renewal of this patent, if it is to be maintained, will fall / has fallen due on 3rd day of February 2023 and on the same day in every year thereafter.

Patent Granted: Label for indicating freshness of Indian dairy products and preparation method thereof

Capacity Building in IP Management:

- A Patent Workshop titled *"Pre-requisites for Sustainable Innovations in Dairy and Animal Science"* was organized on the occasion of World Intellectual Property Day on April 26, 2024. At this workshop, Ms. Shikha Singh and Mr. Avi Garg, Managing Associates at M/S LexOrbis conducted sessions on the drafting procedures of patents, copyrights, and industrial designs.



Glimpse of the workshop on the occasion of World Intellectual Property Day

- The Dairy Engineering Division, ICAR-NDRI, Karnal, conducted a "Hands-on Training Programme in Dairy Engineering" for seven B.Tech. students. The program started on June 3, 2024, and lasted for one month.

EVENTS

- Institute Research Committee (IRC) meetings were held during April 22-24 & 29, 2024 and May 1, 2024 at NDRI, Karnal, for evaluation of completed research projects and discussion of new research project proposals (in-house projects as well as externally funded projects) under the Chairmanship of Dr. Dheer Singh, Director of the Institute in presence of invited outside experts. The scientists of Regional Stations located at Bangaluru and Kalyani also joined these IRC meetings online.

Institute Research Committee (IRC) Meetings

- Dairy Microbiology Division, ICAR-NDRI, Karnal organized a 'High-End Workshop (*Karyashala*) on Advanced Biosafety Practices for Handling and Detection of Foodborne Pathogens' from May 08-17, 2024 sponsored by Anusandhan National Research Foundation under the Accelerate Vigyan Scheme.

A group photograph of the participants with Director ICAR-NDRI, Karnal in the High-End Workshop

- Dairy Engineering Division conducted a "Brainstorming Session on Restructuring the Academic & Research Agenda" on May 18, 2024, at ICAR-NDRI, Karnal, under the chairmanship of Dr. Dheer Singh, Director of the Institute. A prolonged discussion was held to revamp not only the academic curriculum of UG and PG programs for improving the analytical skills of the students but also the futuristic research programs of dairy engineering at the Institute. The session included invited outside eminent experts such as Dr. K. Narsaiah, ADG (Engineering), ICAR, Krishi Bhawan, New Delhi; Dr. Nachiket Kotwaliwale, Director, ICAR-CIPHET, Ludhiana; Sh. R. P. Singh, Director, Food & Biotech Engineering Pvt. Ltd., Faridabad; Sh. A.K. Khosla, Vice-President, IDA; Sh. Ravindra Mahajan, Director, Neologic Engineering Pvt. Ltd., Bengaluru; Dr. Rajendra Kumar, Independent Dairy and Food Consultant, Dean (Retd.), College of Dairy Science and Technology, Kerala Veterinary and Animal Sciences University (KVASU), Kunnathidavaka, Kerala; and Sh. R.K. Malik, Executive Director, Indian Dairy Machinery Company Ltd., Anand. A total of 40 participants attended this program.

Brainstorming Session on Restructuring the Academic & Research Agenda

- On May 28, 2024 Dr. R. B. Singh Former Chairman, ASRB; former Director & Vice-Chancellor - Indian Agricultural Research Institute, New Delhi; former Chancellor, Central Agricultural University, Imphal visited ICAR-NDRI. Dr. Singh has interacted with Heads of Department and provided his views on the research and innovations. Dr. Dheer Singh, Director, ICAR-NDRI presided over the function.

Visit of Dr. R. B. Singh Former Chairman, ASRB

- ICAR-NDRI celebrated World Milk Day 2024 on June 1 by organizing a seminar on "Bovine and Non-Bovine Milk and Human Health" to highlight the significance of milk and dairy products for human health. This year's theme was "The vital role dairy plays in delivering quality nutrition to nourish the world." Dr. Manish Kumar Chatli, Director of ICAR-CIRG, and Dr. Artabandhu Sahoo, Director of ICAR-NRC on Camel, were Guests of Honour and delivered lectures emphasizing the health benefits of non-bovine milk. Dr. Dheer Singh, Director and Vice Chancellor of ICAR-NDRI, delivered the presidential address, highlighting the critical role of dairy in the Indian economy and stressing the need to explore the health benefits of non-bovine milk from animals such as goats, camels, donkeys, yaks, etc., which possess numerous therapeutic properties. The event was organized by the Dairy Technology Division.

Launch of new milk products by the Model Dairy, ICAR-NDRI, Karnal on the occasion of World Milk Day celebration on June 1, 2024

- Officials of French Embassy in India visited ICAR-NDRI on June 3, 2024. The purpose of the visit was to explore potential collaboration between India and France in dairy research. The meeting featured Dr. Didier Raboisson, Attaché for Scientific and Academic Cooperation; Dr. Meenakshi Singh, Scientific Coordinator; and Mr. Aymmeric Voquang, Project Manager, all from the French Embassy in Delhi. Dr. Dheer Singh, Director, ICAR-NDRI presided over the event and all Heads of Division participation in the discussion.

Visit of French Embassy in India

- On June 3, 2024, a creche was inaugurated at the premises of ICAR-NDRI, Karnal by Director, ICAR-NDRI, Karnal. The creche centre is designed to provide stimulating environment for the holistic development of staff children, who needs care, guidance and supervision during the day. The event was attended by many ICAR-NDRI staff members, faculty, and community representatives, including parents and children. The creche highlights ICAR-NDRI's commitment to the well-being of its staff and their families.

Creche Inauguration

- On June 10, 2024, a World Bank Delegation comprising of Dr. Bekzod Shamsiev, Task Team Leader (TTL), NAHEP and Dr. Gerry Boyle, World Bank Consultant (NAHEP) visited ICAR-NDRI. The team had a discussion with NDRI fauclty working in the area of Climate Adoption of Dairy Animals and Mitigation Strategies of changing climate on Dairy Animals.

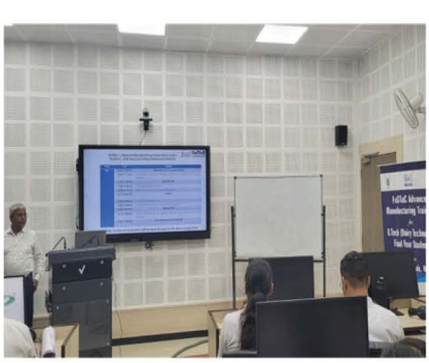
Visit of World Bank Delegation

- A training programme was organized on the topic titled "Cheese: Production & Quality Evaluation" during June 17-21, 2024 under ABI Project. A total of 3 trainees attended the programme.
- On June 18, 2024, the Hon'ble Prime Minister Shri Narendra Modi released the 17th installment of PM Kisan by transferring ₹20,000 crore directly into the accounts of 9.25 crore beneficiaries under the PM Kisan Samman Nidhi Yojana from Varanasi. The event was telecasted live at ICAR-NDRI and was attended by Haryana Chief Minister Shri Nayab Singh Saini as the Chief Guest. The event was organized by Krishi Vigyan Kendra Karnal under the chairmanship of Dr. Dheer Singh, Director, ICAR-NDRI. Dr. Dheer Singh formally welcomed the Chief Guest and briefed him about the program.
- Approximately 1,050 farmers including women farmers from various blocks and villages such as Indri, Ghoranda, Asand, Nising, Kunjpura, and Nilokheri participated in the event. In his address,

Prime Minister Narendra Modi emphasized his government's commitment to strengthening and empowering farmers. The Prime Minister also distributed certificates to Krishi Sakhis, while Chief Guest Shri Nayab Singh Saini distributed certificates to 10 Krishi Sakhis who received training from the Haryana State Rural Livelihood Mission. In his speech, the Chief Guest highlighted the importance of women in agriculture and the Krishi Sakhi Certification Program, which aims to enhance the skills of rural women and empower them as "Agriculture Para-Extension Assistants."

Hon'ble Chief Minister viewing the live telecast and distributing the certificates

- The Dairy Technology Division organized FoSTaC Training on "Advanced Manufacturing & Covid" on June 26, 2024. Final year B. Tech. (Dairy Technology) students (2020-24 batch) completed this comprehensive course, organized by the Placement Cell, ICAR-NDRI, Karnal, in collaboration with Nestlé Research & Development Centre India Ltd. Mr. Amal Kumar Kar, an esteemed alumni and certified national resource person for FSSAI, led the training. The training enhanced students' professional skills, preparing them to apply advanced manufacturing processes and stringent food safety standards in their future careers.



Glimpse of FosSTaC Training program

EXTENSION

- Under the Farmer FIRST project, the Dairy Extension Division implemented 193 demonstrations of paddy varieties PB-1692 and PB-1885 across seven adopted villages to promote seed multiplication. To ensure successful cultivation, three training sessions were conducted, providing farmers with comprehensive guidance on best practices for growing these paddy varieties. The training covered critical aspects of cultivation, including soil preparation, sowing techniques, irrigation, pest management, and harvesting, with the aim of enhancing productivity and ensuring high-quality seed production.

Farmers interacting with scientific staff to enrich their knowledge

- An animal health camp was organized in the village of Dabkoli Kalan on May 22, 2024, under the FFP Project to address animal health issues faced by SC households. The camp emphasized the importance of mineral supplementation and deworming for calves. Over 40 farmers attended the program. Additionally, the Slivascope technology, developed by NDRI, was successfully demonstrated. This technology helps identify buffaloes in silent heat, thereby improving reproductive efficiency and overall herd health.

Glimpse of animal health camp

Krishi Vigyan Kendra

- A workshop on Directly Seeded Rice (DSR) was organized by KVK, ICAR-NDRI, in collaboration with Bayer India at the N.N. Dastur Mini Auditorium on April 30, 2024. This program was also broadcasted virtually. The event was organized under the guidance and leadership of Dr. Dheer Singh, Director, ICAR-NDRI, Karnal. Dr. U.S. Gautam,

Glimpses from the workshop organized on Directly Seeded Rice (DSR) technology

DDG (Agriculture Extension), was the chief guest of the event. Eminent dignitaries from Bayer India also participated in the program.

- Harvest Day for Cluster Frontline Demonstration (CFLD) summer moong, variety MH-1142, was organized in the village of Kalron on June 27, 2024. Twenty-five participants, including rural women and farmers, attended the event.

Glimpses from the Harvest Day program organized at Kalron

HONOURS/ AWARDS/ RECOGNITIONS

- Dr. Manjunath K.V. under the supervision of Dr. Sanjit Maiti, Sr. Scientist, Dairy Extension Division, has been awarded the prestigious MANAGE Best Ph.D. Thesis Award. This award was presented on June 29, 2024 during the 37th Foundation Day celebration of the National Institute of Agricultural Extension Management (MANAGE), Hyderabad, an autonomous institute under the Ministry of Agriculture and Farmers' Welfare, Govt. of India.
- Sanjit Maiti, Sanchita Garai, Shravani Sahani, Siddhesh Zade, Amitava Panja, and Gopal Sankhala received the "Best Oral Presentation Award" for their paper entitled "Risk Characterization of the Dairy Production System of the Saline Coastal Districts of India to Climate Change" at the International Soil Salinity Conference on "Rejuvenating Salt Affected Ecologies for Land Degradation Neutrality under Changing Climate" organized by the Indian Society of Soil Salinity and Water Quality, Karnal, Haryana, India, and ICAR-Central Soil Salinity Research Institute, Karnal, on February 14-16, 2024.
- Amitava Panja, Sanchita Garai, Sanjit Maiti, Shravani Sahani, Siddhesh Zade, and Apoorva Veldandi received the "Best Poster Award" for their paper entitled "Exploring the Viability of Land Shaping Technology as an Adaptive Mechanism in Saline Coastal Regions of West Bengal" at the International Soil Salinity Conference on "Rejuvenating Salt Affected Ecologies for Land Degradation Neutrality under Changing Climate" organized by the Indian Society of Soil Salinity and Water Quality, Karnal, Haryana, India, and ICAR-Central Soil Salinity Research Institute, Karnal, on February 14-16, 2024.
- Dr. Laxmana Naik N, Senior Scientist, Dairy Chemistry, SRS of ICAR-NDRI, Bengaluru, received the Associate Fellowship Award from the National Academy of Dairy Science, India (NADSI), during the 8th Convocation of NADSI, held on April 9, 2024, at Pt. Deen Dayal Upadhyaya Pashu Chikitsa Vigyan Vishwavidyalaya Evam Go-Anusandhan Sansthan (DUVASU), Mathura, U.P.

- Dr. Richa Singh, Senior Scientist, Dairy Chemistry Division, ICAR-NDRI, Karnal received the Associate Fellowship Award from the National Academy of Dairy Science, India (NADSI), during the 8th Convocation of NADSI, held on April 9, 2024, at Pt. Deen Dayal Upadhyaya Pashu Chikitsa Vigyan Vishwavidyalaya Evam Go-Anusandhan Sansthan (DUVASU), Mathura, U.P.
- Dr. Priyanka Singh Rao, Senior Scientist, Dairy Chemistry Division, ICAR-NDRI, Karnal received the Associate Fellowship Award from the National Academy of Dairy Science, India (NADSI), during the 8th Convocation of NADSI, held on April 9, 2024, at Pt. Deen Dayal Upadhyaya Pashu Chikitsa Vigyan Vishwavidyalaya Evam Go-Anusandhan Sansthan (DUVASU), Mathura, U.P.
- Ms. Helna Pious, Ph.D., Dairy Chemistry scholar from SRS of ICAR-NDRI, Bengaluru, received an appreciation and a cash award in a competition conducted by the Bureau of Indian Standards (BIS) on "Standardization Contest-Shaping Tomorrow's Sustainability Standards".

PERSONALIA

Permission granted to the following Scientific/ Administrative Staff for attending Workshop/ Seminar/ Symposia/ Conference/ Training

Name, Designation & Decipline	Title of the Workshop/ Seminar/ Symposia/ Conference/ Training	Period
Dr. Sumit Arora, Principal Scientist, Dairy Chemistry	Delivered lecture in the one-day workshop entitled "Recent Advances in tools and techniques for food quality and safety". University of Horticultural Sciences, Bagalkot (Online)	April 16, 2024
Dr. P. Barnwal, Principal Scientist & Head, Dairy Engineering	Attended second meeting of Dairy Equipment Sectional Committee, FAD 33, held at Anushilan (Copper Room), Manak Bhawan, New Delhi	May 29, 2024
Mr. Biswajit Sen, Scientist, Dairy Economics	Attended the National Training programme under IDP-NAHEP Project (excluding journey period) at International Food Policy Research Institute (IFPRI), New Delhi	June 19, 2024 to July 16, 2024
Dr. Dheer Singh, Director Dr. Rajan Sharma, Joint Director (Research) Dr. Kaushik Khamrui, Principal Scientist, Dairy Technology Dr. Raghu H.V., Senior Scientist, Dairy Microbiology	Attended the conference entitled "The FIRST IDF Regional Dairy Conference Asia Pacific 2024" Kochi, Kerala	June 26-28, 2024

Joining/ Promotion/ Relieving/ Superannuation/ Additional Responsibilities

- Dr. Gopal Ramdasji Gowane, Senior Scientist has been promoted to the post of Principal Scientist in Lavel-14 vide Council Office Order No. Personel-2/ Misc./ASRB/2023/Assessment Unit dated 5th April, 2024 and endorsement by Establishment-I(S) ICAR-NDRI vide endorsement No. 6-35/2022/ DPCES/E-191646/E-I(S)/ Vol. XVII-497-504 dated 12th April, 2024.
- Sh. Deepak, FAO has joined dated 22nd April, 2024 (FN) for the post of FAO, ICAR-NDRI, Karnal vide Council's Office Order No. Admn. 33-21/2017-Estt-I dated 15th April, 2024 and Office Order No. 13-807/2024/e-311432/E-I(S)/555-567 dated 25th April, 2024.

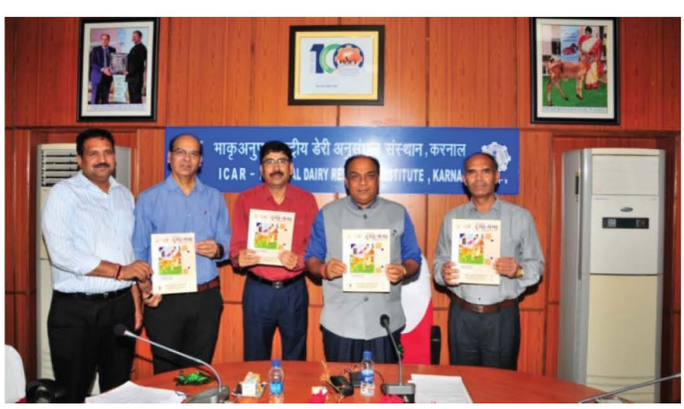
- Er. Sneh (Technical Assistant (W/S, Level-5) has been promoted to Senior Technical Assistant with effective from April 26, 2024.
- Er. Sachin (Technical Assistant (W/S, Level-5) has been promoted to Senior Technical Assistant with effective from April 30, 2024.
- Er. Ravi Kumar, Senior Technical Officer (T6) joined in Dairy Engineering Division, ICAR-NDRI, Karnal on June 14, 2024 (FN).
- Dr. Soniya Ashok Ranveer, Senior Technical Officer joined at ICAR-NDRI, Karnal on June 14, 2024.

राजभाषा एकक

संस्थान राजभाषा कार्यान्वयन समिति की बैठक

भाकृअनुप–राष्ट्रीय डेरी अनुसंधान संस्थान, करनाल की राजभाषा कार्यान्वयन समिति की दिनांक 6 मई, 2024 को संपन्न हुई 103वीं समीक्षा बैठक का कार्यवृत्त

डा. धीर सिंह, निदेशक, भा.कृ.अनु.प.–राष्ट्रीय डेरी अनुसंधान संस्थान, करनाल की अध्यक्षता में संस्थान राजभाषा कार्यान्वयन समिति की 1 अप्रैल, 2024 से 30 जून, 2024 तक की 103वीं तिमाही समीक्षा बैठक दिनांक 6 मई, 2024 को अपराह्न 3.30 बजे के साथ संस्थान के पिनाकी में आयोजित की गयी। बैठक में संस्थान के 33 वरिष्ठ पदाधिकारी शामिल हुए।



संस्थान राजभाषा कार्यान्वयन समिति की तिमाही बैठक (6 मई, 2024) की झलक

बैठक के आरंभ में सदस्य–सचिव, श्री धीरज शर्मा ने सभा कक्ष में उपस्थिति समिति के अध्यक्ष तथा अन्य सदस्यों किया तथा सभा को अवगत कराया एवं साथ ही बैठक की कार्यसूची के 24 बिन्दुओं जिस पर परिषद कार्यालय द्वारा जोर देने के लिए कहा गया पर विस्तार से चर्चा की।

हिन्दी कार्यशाला का आयोजन

संस्थान के डा. एन. एन. दस्तूर सभागार में दिनांक 27 जून, 2024 को (राजभाषा हिन्दी का सरलता से कार्यालय में प्रयोग) हिन्दी कार्यशाला का आयोजन किया गया जिसमें संस्थान के 49 वैज्ञानिक, अधिकारी एवं कर्मचारी शामिल हुए।

संस्थान राजभाषा कार्यान्वयन समिति की तिमाही कार्यशाला (27 जून, 2024) की झलक

नगरस्तरीय राजभाषा गतिविधियां

नगर राजभाषा कार्यान्वयन समिति, करनाल के अध्यक्षीय कार्यालय भाकृअनुप–राष्ट्रीय डेरी अनुसंधान संस्थान, करनाल में दिनांक 27 जून, 2024 को 79वीं नगरस्तरीय छमाही समीक्षा बैठक का डा. धीर सिंह, निदेशक की अध्यक्षता में संस्थान के डा. एन. एन. दस्तूर सभागार में आयोजन किया गया। इस बैठक में समिति के करनाल नगर के केन्द्रीय कार्यालयों के प्रशासनिक प्रमुखों एवं प्राधिकृत अधिकारियों ने भाग लिया।

नगर राजभाषा कार्यान्वयन समिति की छमाही बैठक (12 जून, 2024) की झलक

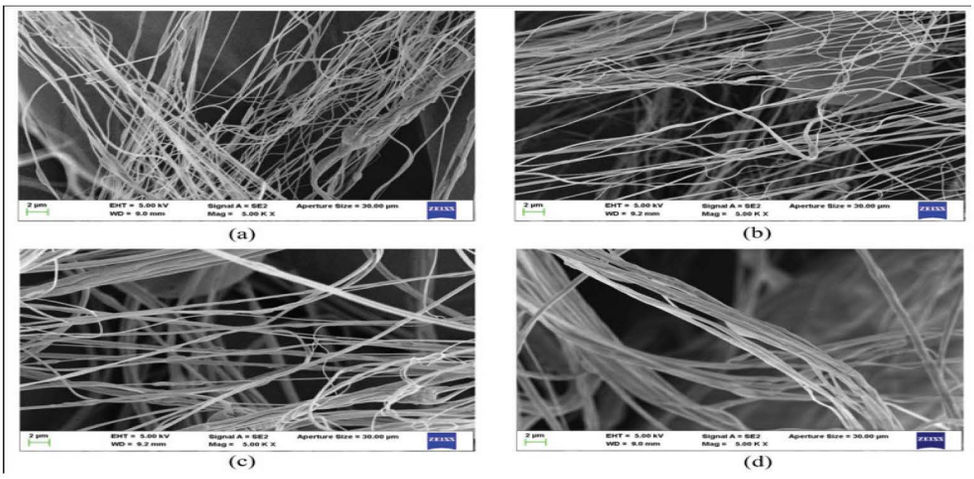
SOUTHERN CAMPUS, BENGALURU

Research

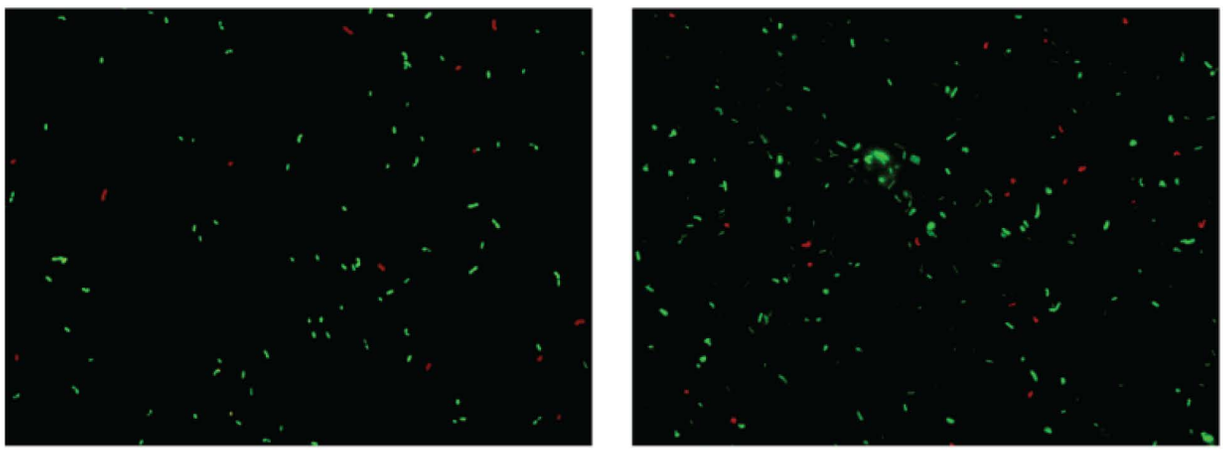
Encapsulation of *Lactiplantibacillus plantarum* CRD7 in sub-micron pullulan fibres by spray drying

(Abhisek Ohja, Seethu B.G., Heartwin A. Pushpadass, Magdaline Eljeeva Emerald Franklin, Chand Ram Grover, Sachin Kumar, and Arindam Dhali)

Pullulan was used as wall material for microencapsulation of *L. plantarum* CRD7 by spray drying with isomalto-oligosaccharides (IMO) as prebiotic. IMO at 30 % (*w*/w) along with WPI at 20% concentration provided the highest viability of 94.21% after microencapsulation, and the highest storage stability and the lowest rate of cell death of L. *plantarum*. FESEM images revealed that the spray-dried encapsulates were fibrous and similar to those produce by electrospinning, while fluorescence microscopy ascertained that most of the probiotic cells were alive and intact after microencapsulation. The probiotic bacteria were encapsulated by the wall materials unlike embedded in the case of freeze drying. The adsorption-desorption isotherm was of Type II and the encapsulate had specific surface area of 1.92 m^2/g and mean pore diameter of 15.12 nm. FTIR spectra and DSC thermogram revealed the interactions between the probiotic and wall materials. Acid and bile salt tolerance results confirmed that microencapsulated L. *plantarum* could sustain the harsh GI conditions with >7.5 log CFU/g viability.



Encapsulation of Lactiplantibacillus plantarum by spray drying



Fresh *L. plantarum* Encapsulated *L. plantarum*

Fluorescent microscopy of fresh and encapsulated Lactiplantibacillus plantarum

New Initiatives:

Foundation Stone Laying for a New Facility "Dairy Entrepreneurship and Skill Development Center" under RKVY Project at SRS of ICAR, Bengaluru

The foundation stone laying ceremony for the new facility, 'Dairy Entrepreneurship and Skill Development Center,' funded by the 'National Agriculture Development Programme' (RKVY) project, was held on June 14, 2024, at the SRS, NDRI Campus. Dr. Dheer Singh, Director & Vice Chancellor, ICAR-NDRI, laid the foundation stone in the esteemed presence of Dr. A. Sahoo, Director, ICAR-NIANP; Dr. Arindam Dhali, Head, SRS, NDRI; Shri N. K. Arora, Comptroller, ICAR-NDRI; Dr. S. Subash, Senior Scientist, SRS, NDRI & PI of the RKVY project; along with faculty, staff, and students of SRS-ICAR, NDRI. The Director appreciated the efforts of the project team for adding a new facility at the SRS-NDRI campus and expressed his confidence that the new facility would serve as an ICT-enabled skill development center for the benefit of farmers across the country.

Glimpse of the Foundation stone laying event for "Dairy Entrepreneurship and Skill Development Center"at SRS-NDRI, Bangaluru

Outreach Activities:

Under Tribal Sub-Plan (TSP), various technical inputs were distributed to around 100 beneficiary Scheduled Tribe farmers in the adopted villages of Chintamani Taluk, Chikkaballapur district, Karnataka State. Farmers were provided with critical inputs such as improved hybrid fodder crop seeds (e.g., Sorghum CoFs-31) to increase the area under fodder crops, thereby improving animal productivity. Teat dip cups and solutions were also distributed to promote clean milk production practices at the farm level. Additionally, extension literature related to improved dairy farming practices was distributed for the benefit of the farmers. On-farm

training and demonstrations on 'improved fodder production practices' were conducted in farmers' fields, followed by a farmers' interaction meeting on May 12, 2024, at Pingyanahally village, Chikkaballapur district.

On farm training on improved fodder production practices and demonstration of clean milk production at Pingyanahally village of Chikkaballapur district

World Milk Day-2024 - National Seminar on 'Quality Compliance'

On June 3, 2024, SRS, ICAR-NDRI, Bengaluru organized a National Seminar on 'Quality Compliance' in collaboration with Indian Dairy Association-South Zone (IDA-SZ), Bengaluru, Bureau of Indian Standards and FSSAI, Bangalore. The event featured expert presentations on nutrition, microbiological analysis, food regulations, and quality compliance, attracting 108 participants from various sectors of the dairy industry.

Glimpse of the World Milk Day 2024- National Seminar on 'Quality Compliance' organized at SRS, ICAR-NDRI, Bengaluru

Workshop on 'Impact of a Dietary ISO-Peptide: Modulating Taste Sensations and Alleviating Vascular Inflammation'

SRS, ICAR-NDRI, Bengaluru organized a Workshop on 'Impact of a Dietary ISO-Peptide: Modulating Taste Sensations and Alleviating Vascular Inflammation' sponored by IDP-NAHEP. Dr. Kaustav Majumder, Associate Professor at the University of Nebraska, Lincoln, USA delivered a lecture on "Impact of a Dietary ISO-Peptide: Modulating Taste Sensations and Alleviating Vascular Inflammation". The event was attended by 47 participants, including faculty and students of the station. The Head of SRS, ICAR-NDRI, welcomed the speaker and introduced the theme to the participants. During the presentation, Dr. Majumder discussed how ISO-Peptides form in foods, their resistance to gastric digestion, and their bio-functional roles, supported by in vitro and in vivo experiments. Dr. Jayaraj Rao, Incharge of the Dairy Processing Section, provided concluding remarks, and the program ended with a vote of thanks from Dr. Sathish Kumar M.H.

Dr. Kaustav Majumder delivered the lecture and honored at ICAR-NDRI workshop on ISO-Peptides.

EASTERN CAMPUS, KALYANI

Research

Effect of heat stress on milk production and composition in Jersey crossbred cows using test day records

Indrajit Gayari, Mokidur Rahman, M. Karunakaran, Sylvia Lalhmingmawii and Ajoy Mandal

The study was undertaken to determine the effect of heat stress on milk production (test day milk yield) and compositional traits (fat%, protein%, fat yield, protein yield) as well as to observe the pattern of response to increasing heat load on these traits in Jersey crossbred cows. The daily relative humidity (RH, %) and ambient temperature (AT, °C) was used to calculate the Temperature Humidity Index (THI) using the formula: THI=(1.8×T+32)-[(0.55-0.0055×RH)×(1.8×T-26)]. To analyze the data, a linear model was fitted to the milk production and compositional records, which were adjusted for additive genetic effect of animal, permanent environmental effect of animals and known environmental sources of variations. Subsequently, a segmented polynomial regression model was fitted to obtain the break-point (BP). The BP is obtained at a THI value at which the production traits began to increase or decrease at a different rate, the least squares estimates of production and composition traits in different classes of THI were used as the dependent variable. Two THI break-points (BP) for milk yield and one THI BP for fat yield, protein %, and protein yield were found. The first and second BP for milk yield was at THI 59 and 77, respectively, with a significant decline in milk yield of -0.04kg/ unit of THI at second BP. The BP for fat and protein yield was at THI 76, with a decline rate of -1.18 and -0.61g/ unit of THI increase, respectively. The findings revealed the significant adverse effects of THI on milk production and composition traits in Jersey crossbred cattle.

Extension activities

- On May 6, 2024, a farmer-scientist interaction meeting was held in Haringhata Block, Nadia district, West Bengal. Organized with NABARD's support and involving the local FPO, the event included 10 farmers discussing agricultural challenges with experts. A follow-up meeting on June 3, 2024, expanded the dialogue, including NABARD officials and field veterinary workers. The discussions focused on improving livestock management, veterinary care, and dairy production, highlighting a commitment to enhancing collaboration and agricultural sustainability.

Glimpse of farmer -scientist interaction meeting Haringhata Block, Nadia district

- On June 26, 2024, a veterinary health camp in Shikaripara village treated and vaccinated 47 cattle, 110 goats, and 135 poultry birds. The camp served 50 farmers, addressing health issues and preventing disease spread. This effort enhanced animal health, productivity, and sustainability, highlighting the importance of veterinary care in farming.

Activities undertaken under Tribal Sub-Plan (TSP) project

On June 27, 2024, a Livelihood Improvement program for tribal farmers was held in Ruppur village, Bolpur, West Bengal, under the NDRI-TSP Project. Scientists from ERS-NDRI led a training session attended by 100 tribal women farmers, covering topics like breeding, feeding, and management. They distributed 5,000 kg of feed and 100 kg of mineral mixture, aiming to enhance nutritional and economic security for the farmers.

Glimpse of farmer -scientist interaction meeting at Ruppur village

Activities undertaken under Scheduled Caste Sub Plan (SCSP) project

On June 28, 2024, a one-day program on Livelihood Improvement for SC farmers was held in Raipur village, West Bengal, under the NDRI-SCSP Project. Scientists from ERS-NDRI conducted a training session for 100 farmers, covering integrated farming and livestock management. The event included distributing 5,000 kg of feed and 100 kg of mineral mixture to enhance farmers' economic and nutritional security.

Glimpse of farmer -scientist interaction meeting at Raipur village

Organization of animal health camp under Scheduled Caste Sub Plan Project

On June 25, 2024, ICAR-NDRI organized a veterinary camp in Muratipur, treating 53 cattle, 27 calves, 61 goats, and 211 poultry, benefiting 39 Scheduled Caste farmers. Another camp on June 28, 2024, in Raipur, vaccinated and treated 226 goats and 24 cows, aiding 100 SC farmers.

Glimpse of animal health camp organized at Muratipur and Raipur village

Activities undertaken by the KVK (Addl), ICAR-NDRI, Kalyani

In Nadia district, key agricultural programs included: Jute management across 108 ha with 800 farmers; sesame demonstration on 30 ha and a field day; promotion of high-yielding rice (MTU 1156) to 112 farmers; hybrid bajra demo with 42 farmers; green gram (Pusa 1431) on 5 ha for 30 farmers; and nutritional gardening for 400 women across 8 villages.

Field day of sesame crop

Training programme for promotion of nutritional gardening at Banagram and Bhaluka

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