NDRI News

Fulfilling Nation's Dairy Dreams

ICAR-NATIONAL DAIRY RESEARCH INSTITUTE, KARNAL

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From the Director's Desk

India continues to be a leader in milk production over the last two decades, accounting for 18.5% of the global output, with an annual output of 176 million metric tons. By 2050, the demand for milk in developing countries including India will increase by 62% (585 million metric tons). In order to provide safe and healthy dairy products to the consumers, the dairy industry will now have to focus on the use of antimicrobials in animal management. Antibiotics are used as prophylactic and metaphylactic agents to reduce the disease incidences, morbidity and mortality of dairy animals without affecting the productivity. Despite these benefits of antibiotics, there is considerable concern being raised globally about the use of antimicrobials in food-producing animals from public health, food safety and regulatory perspectives. Inappropriate use of antibiotics is a growing concern in the dairy industry, as it leads to antibiotic resistant bacteria as well as appearance of antibiotic residues in milk. Indiscriminate use of antibiotics poses the risk of human health hazards, interferes with the processing of the milk and milk products and also can spread from animal to human population, in turn complicating the therapeutic management of such infections.

The emergence of antimicrobial resistance (AMR) due to antibiotic abuse in the animal sector has emerged as an unmeasured problem in India. Mastitis is the most common disease in high yielding animals, leading to a loss of Rs. 7165.51 crore per annum in the country. As majority of the livestock sector in India is unorganized, it leads to vulnerability of human-animal interface to antibiotic resistance of mastitis-associated bacteria. Easy availability of different antibiotics in the market allows their indiscriminate use in infected animals. Several studies have reported isolation of antibiotic resistant bacteria from raw milk, mastitis milk, unpasteurized milk, human handlers as well as dairy environment. The major cause of prevalence of antibiotic resistant bacteria is the indiscriminate use of antibiotics as well as horizontal transfer of antibiotic resistant genes from animal to human beings or the environment. WHO has recently published a priority list of pathogens to identify the most resistant bacteria at global level and placed β-lactam resistant bacteria in their priority list as CRITICAL. Centers for Disease Control and Prevention (CDC) of the USA categorized carbapenem and cephalosporin resistant enterobacteriaceae (CRE) as an URGENT hazard level. Further, European Food Safety Authority (EFSA) in 2013 stated that the carbapenem-resistant bacteria are now seen as a new and potentially emerging problem in dairy animals, because of the specific use of cephalosporins and β-lactam antibiotics for mastitis treatment.

ICAR-NDRI, Karnal is taking a proactive role in developing mitigation strategies for antimicrobial use and AMR in the dairy sector. Diagnostics developed under outreach programmes for rapid detection of antibiotics on strip are in use for monitoring of residues in milk under ICAR-ILRI project funded by ICAR. The survey reports conclude that antimicrobial residues are present in milk samples. The most likely cause of their presence is the failure to follow the withdrawal times, treatment records

In this issue...

and improper disposal of infected milk samples. Recycling of biological sample (where the drug along with the drug resistant bacteria is excreted in feces/milk of treated animals) contaminates the feed and environment of unhealthy animals. Their presence is a serious concern in dairy supply chain with special reference to curd setting during preparation of fermented milks and development of drug resistance among gut micro-flora, especially pathogenic bacteria. Hence, there is a need to develop cost effective and rapid diagnostics for monitoring antimicrobial residues as well as AMR bacteria in dairy food chain system.

To tackle this problem under one health approach, DBT Indo-UK Collaborative Project 'Diagnostics for One health and User Driven Solutions for AMR (DOSA)' has been initiated, which brings together nine leading academic institutions, six from UK and five from India. Under this programme ICAR-NDRI, Karnal is involved in designing and developing enzyme strip(s) sensors for detection of infection, residues and resistance in dairy sector. Apart from research programmes, efforts are also needed to reduce the burden of AMR in animal husbandry sector in India through partial ban on use of some specific antimicrobials in feed, reduction in the type and amount of antimicrobial usage and adhering to WHO and/or country-related recommendations. There should be a ban on using antimicrobials considered critical to human health in all food and animal operations. Risk assessment approach should be conducted to investigate the exposure/risk pathways by which animals and human are exposed to antibiotic residues and antibiotic resistant bacteria in dairy settings.

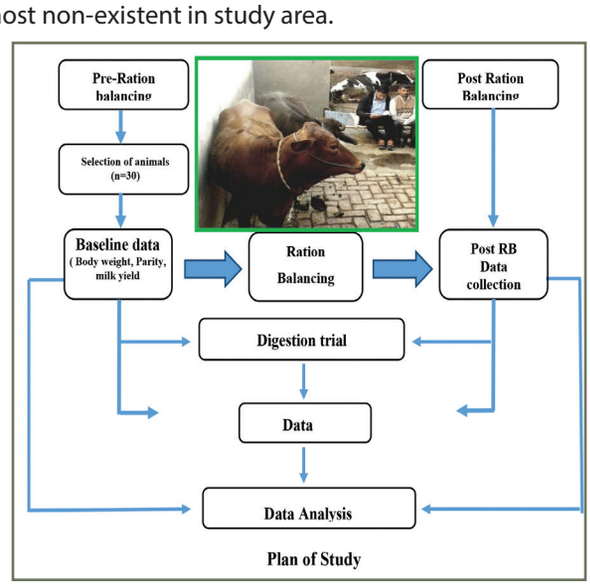
(R. R. B. Singh)

RESEARCH

Success Story of Ration Balancing

A K. Tyagi, Nitin Tyagi and Sachin Kumar

Judicious use of available feed resources is a major challenge to enhance milk productivity. It is well-documented that imbalanced nutrition is a major factor responsible for lowering livestock productivity. A study was conducted in two villages (Alipur and Lalukhedi) in Muzaffarnagar district of West U.P. to do in-depth scientific assessment of ration balancing as well as to motivate the dairy farmers. Baseline analysis revealed that there was both underfeeding and overfeeding of energy and protein whereas the use of mineral mixture in feed was almost non-existent in study area.



Plan of Study

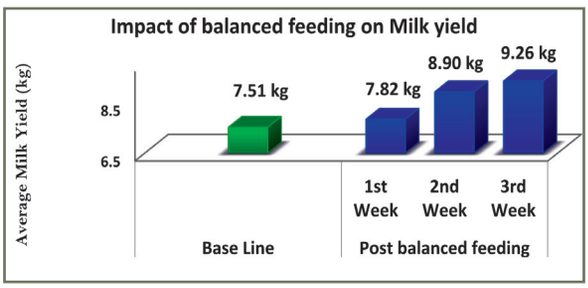
Observations

- Feeding balanced ration increased intake of dry matter (kg/d) and metabolized energy (Mcal/d) by 27.1% and 26.45%, respectively.
- The Intake of Calcium and Phosphorus improved by 51.35 and 56.41%, respectively.
- Feeding balanced ration had a significant ($P<0.05$) impact on the digestibility of nutrients.
- Milk yield recorded an improvement of 17.97% to the baseline value. It had improved at the rate of 64g/animal/day. 4% FCM (Fat Corrected Milk) yield improved by 24% (from 9.01 kg/day to 11.15 kg/day).

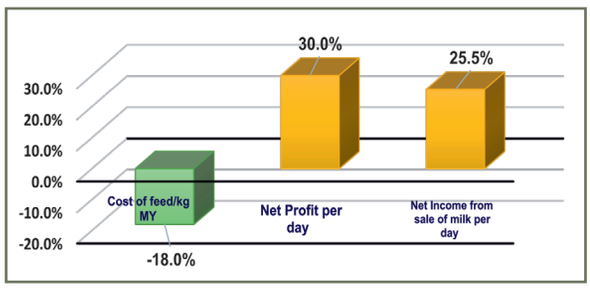
Team of NDRI scientists interacting with farmers

Conclusions

- Ration Balancing has significant effect on nutrient intake and digestibility.
- Milk yield was improved by 17.97% on balanced feeding intervention.
- Feed cost per kg of milk was reduced by 18% on ration balancing.
- Net income of sale of milk increased by 25.5%.



Impact of balanced feeding on milk yield in cattle in field condition



Effect of balanced feeding on economy of production

INSTITUTE TECHNOLOGY MANAGEMENT COMMITTEE (ITMC)

Technologies Commercialized

S No	Name of the technologies	Date of licensing	Name of the firm
1.	A New Rapid Test for Detection of Detergent In Milk (Patented)	17.07.2018	M/s The Punjab State Cooperative Milk Producers' Federation Ltd., Chandigarh - 160022
2.	A New Strip Based Test for Detection of Neutralizers in Milk (Patented)	17.07.2018	
3.	A New Strip Based Test for Detection of Urea in Milk (Patented)	17.07.2018	
4.	Strip Based Test for Detection of Hydrogen Peroxide in Milk	17.07.2018	
5.	Strip Based Test for Detection of Glucose in Milk	17.07.2018	
6.	A New Strip Based Test for Detection of Sucrose in Milk	17.07.2018	
7.	Sugar Tolerating Lactic Culture for Preparation of Misti Doi	01.08.2018	NIF Private Limited, Village-Baharampur, Tehsil Bilhaur, Kanpur, (UP)
8	Anionic Mineral Mixture for Reducing Post-Partum Problems in Cattle and Buffaloes	19.09.2018 through Agrinnovate	West Bengal Chemical Industries Limited, Kolkata

Transfer of technology of "Detection of Hydrogen Peroxide, Glucose and Sucrose in Milk" to "M/s The Punjab State Cooperative Milk Producers' Federation Ltd."

Patent Granted

S. No	Title of Patent	Inventors	Date of Filing	Patent Grant No.	Grant Date
1.	Estimation of Tannin Metabolites in Blood Serum and Cow Milk using HPLC (1831/DEL/2004)	Keshab Barman and S. N. Rai	27/09/2004	301155	19.09.2018

Patents Filed

S. No	Title of Patent	Inventors	Date of Filing	Application Number
1	An Indicator and the Indicator Impregnated Strip for Detection of Neutralizers in Milk	Rajan Sharma, Y. S. Rajput, G. P. Brath and Bimlesh Mann	10/08/2018	201811030055
2	A Process for Manufacture of Low-Fat Chakka and Shrikhand by Using Exopolysaccharides Producing Bacteria	Pradip V. Behare	05/09/2018	201811033236

EXTENSION

DAIRY EXTENSION DIVISION

Dairy Education at Farmers' Door

Dairy Extension Division organized the ongoing Extension Education Programme "Dairy Education at Farmers' Door" to strengthen the dissemination of dairy production and processing technologies among farming community. Under this programme, a team of NDRI scientists including subject matter specialists from production, processing and management group visited a cluster of villages viz. Shahpur, Subri and Pingli in Karnal district on 2nd Saturday of every month. Extension scientists obtained the feedback from the participating farmers. The key point of interactions were based on management of silent heat in animals, adulteration in milk, care of newly born calves and management of berseem and oats crops.

Farmers' Farm School

NDRI has started Farmers' Farm School with the aim of enhancing the productivity of agricultural practices. In this series, a fourth batch especially for resource poor, marginal and landless farmers was started in August, 2018 and 27 farmers were enrolled as students. One day exposure visit was organized at the Institute. Regular classes were organized on every Friday and Saturday for educating the farmers in dairy farming and its allied activities in village Deepo.

Field/Farm Technician (FFT) Activity

A total of 13 Kisan sangoshthies were organized at village level on various aspects of animal husbandry under filed/farm technician programme.

Empowerment of Farmwomen

Five women empowerment training and campaigns were organized with the objective to create awareness in the field of dairying and home science and also impart skills in these areas so that farm women could generate more income from dairying to cater to the needs of their respective families. A total of 53 farmwomen were trained.

Educational Visits and Tours

A total of 2111 visitors (students & Faculty) from 31 colleges/ Institutions/Universities visited the institute and they were sensitized about the different research, teaching and extension achievements and facilities available in the Institute.

KRISHI VIGYAN KENDRA

Extension Activities

- A total of 35 training programmes on different aspects of dairy production and processing, crop residue management, home science and fish farming were organized for 2386 farmers, women and rural youth from Haryana and other states of the country.
- KVK organized 12 training programmes on Dairy Production in which 347 farmers, farm women and rural youth from different districts of Bihar sponsored by Director, Directorate of Dairy Development, Bihar, Patna participated. Apart from this, two training programmes were also organized on integrated training in Dairy production and Processing for 41 farmers, farm women and rural youth from Himachal Pradesh and Jharkhand state. The programmes were sponsored by Project Director, ATMA, Kullu (HP) and Director, Directorate of Dairy Development Jharkhand, Ranchi.
- KVK also organized 33 exposures visits cum short training programmes for 1266 progressive farmers, farm women and rural youth from different districts of Gujarat, Uttar Pradesh, Rajsathan, Himachal Pradesh, Haryana, Madhya Pradesh, Uttarakhand, Chhatisgarh and Bihar.
- KVK organized four field days on sorghum and paddy crops in villages of Karnal district for 49 farmers.
- World Breast Feeding Day was celebrated in village Rindal on 7th August, 2018 by KVK to educate women about breast feeding and its effect on the health of infants. The programme was attended by 50 women.
- Web telecast of Prime Minister's Sawand was arranged with the members of Self Help Groups on 12th July, 2018 at NDRI. A total of 50 women participated.
- KVK in its training programmes arranged lectures sponsored by Ministry of Petroleum, Petroleum Conservation & Research Association (PCRA) to educate farmers, rural youth and farm women on methods and practices to be followed for saving of oil and petroleum. So far more than 610 such programmes have been organized.
- KVK organized three training programmes on crop residue management for 90 farmers of adopted villages namely Kulwehri, Dabri and Kunjpura.
- KVK organized seven awareness camps and two kisan sangoshthis on crop residue management. A total of 1230 farmers participated.

EVENTS

9th National Seminar on Entrepreneurship in Dairy and Food Industry: Concept to Commercialization

NDRI Graduates Association oraganised a Seminar on Entrepreneurship in Dairy and Food Industry: Concept to Commercialization from 14th to 15th September, 2018. Dr. Ramesh Jolly, CEO, Finial Capital, Ontario, Canada inaugurated the Seminar in presence of distinguished dignitaries. In his presidential address, Dr. R. R. B. Singh stressed upon to strengthen the academic and research activities of the Institute for developing new technologies required for the growth of dairy sector. The five technical sessions on various aspects of dairy sector were conducted and eminent speakers across the country participated in the seminar. The most interesting technical session on role of dairy sector in increasing farmers' income was conducted for farmers. A question-answer-session was also arranged for farmers. The subject matter specialists gave solutions to the problems faced by dairy personnel in their day to day life. During the valedictory session, Sh. Harsh Bhanwala, Chairman NABARD addressed the gathering as Chief Guest.

Alumni from the earlier batches of NDRI with the Chief Guest

Winter School on Nutritional Strategies to Enhance Livestock Productivity and Farm Economy

A compendium of lectures being released during inaugural function

NDRI organized a winter school on "Nutritional strategies to enhance livestock productivity and farm economy" from 5th - 25th September, 2018. A total of 24 participants from 17 states participated to learn and update the latest technologies, innovations and global scenario on livestock productivity and how farm economy could be improved under Indian scenario. In addition to NDRI faculty, external experts also delivered lectures and demonstrations to the participants during the training programme. Topics of the training were related to latest technologies in improving the efficiency of available feed resource utilization, utilization crop residues and agro-industrial by products, bypass nutrient technologies, ration balancing, web based ration formulation, feeding strategy to attain early puberty in both male and females, enriching milk with nutraceuticals, fortification of milk with micronutrients, role and functions of feed additives for better utilization of feed resources, entrepreneurship and start up programmes for educated youths to improve farm economy. Dr Vijay Paul Sharma, Chairman, CPAC, Ministry of Finance was the Chief Guest on 5th Sept during inaugural function while

Dr M S Chauhan, Director, CIRG, Makhdoom was the Chief Guest during the closing ceremony on 25th September, 2018.

Training Programme on Petroleum Conservation

NDRI organized a training programme on "Petroleum Conservation "with the officials from Petroleum Conservation Research Association (Ministry of Petroleum & Natural Gas, Govt. of India) on 13th July 2018. Experts from PCRA delivered useful lectures for maintenance of vehicles and Petroleum Conservation. Comptroller, NDRI, Sh. D. D. Verma graced the occasion as the Chief Guest.

Internship at Future Group, Mumbai

Five students of B. Tech. (Dairy Technology) from National Dairy Research Institute, Karnal have undergone an internship programme at Future Group for six weeks. The objective of the training was on- site understanding of the role of market research and consumer behaviour on product development. These students were given opportunities to meet and interact with senior leaders besides a prospect of gaining insights from on-field experience and understanding the work environment of the company. CEO of Future Group, Mr. Sadashiv Nayak met and interacted with the students during the internship.

23rd Meeting of the Institute Joint Staff Council was held on 10th August, 2018

CEO of Future Group with students of ICAR-NDRI, Karnal

HONOURS/AWARDS

Dr. Sonika Ahlawat (Guide: Dr. Sachinandan De, Principal Scientist, Animal Biotechnology Centre) received "**Jawaharlal Nehru Award"** for P.G. Outstanding Doctoral Thesis Research in Agricultural and Allied Sciences (2017) from Hon'ble Minister of Agriculture and Farmers' Welfare, Sh. Radha Mohan Singh on 90th Foundation Day & Award Ceremony of ICAR at NASC Complex, Pusa, New Delhi.

Dr. Sonika Ahlawat receiving award from Sh. Radha Mohan Singh Ji, Hon'ble Union Minister of Agriculture and Farmers' Welfare

Dr. Ravi Kant, Assistant Chief Technical Officer, Animal Biochemistry Division was awarded "**Best Employee Award"** under cash award scheme for technical category employee of ICAR on 16th July 2018 during 90th ICAR Foundation day at NASC Complex, Pusa, New Delhi.

Dr. Ravi Kant receiving award from Sh. Radha Mohan Singh Ji, Hon'ble Union Minister of Agriculture and Farmers' Welfare

Dr. Pradip V. Behare, Scientist (Sr. Scale), Dairy Microbiology Division, NDRI, Karnal was conferred **NADSI Associateship** on 9th September, 2018 during National **Conference on Challenges and Opportunities for the New Generation Dairy Foods in India and 5th Convocation of National Academy of Dairy Science** held at Dairy Technology College, SVVU, Tirupathi, A.P.

Dr. Pradip V. Behare, Scientist receiving NADSI Associateship

Ms. Parul, Final year M. Tech and **Mr. Akash Gill**, Final Year B. Tech student of ICAR-National Dairy Research Institute, Karnal secured the First Position in the National Dairy and Food Quiz Contest at Sheth M.C. College of Dairy Science, Anand Agricultural University (AAU), Anand, Gujarat on 7th September, 2018 amongst the 23 teams from various Dairy and Food Science Colleges and dairy industries throughout the country participated in this contest.

Dr. R. R. B. Singh, Director NDRI with the winning team

DINSTINGUISHED VISITORS & VISITS ABROAD

DISTINGUISHED VISITORS

25.7.2018 Dr. Santosh Kumar Singh, Agricultural Specialist of U.S. Embassy, New Delhi.

27.7.2018 Mr. Suresh Narayanan, Chairman and Managing Director, Nestle India.

28. 7. 2018 Director (Finance), ICAR, New Delhi.

VISITS ABROAD

Dr. R. R. B. Singh, Director NDRI, Karnal, **Dr. Latha Sabikhi**, Head and **Dr. Yogesh Khetra**, Scientist, Dairy Technology attended Indo Danish Collaborative Workshop on "Dairy, Food Ingredients and Water" at University of Copenhagen, Denmark from 6th -7th September, 2018.

Dr. (Mrs.) Smita Sirohi, Head, Dairy Economics Statistics and Management Division was deputed to attend "30th International Conference of Agricultural Economics" at Vancover, Canada during the period from 28th July to 2nd August, 2018.

Dr. P. Narender Raju, Scientist (Sr. Scale), Dairy Technology Division visited Yezin Agricultural University, Yezin, Nay Pyi Taw, Myanmar as a visiting faculty member to deliver a course to M.Tech. and Ph.D. (Food Engineering & Technology) students at Indo-Myanmar: Advanced Centre for Agricultural Research and Education (ACARE), sponsored by Ministry of External Affairs, Govt. of India during 27th June to 21st July, 2018.

Director ICAR-NDRI with scientists at University of Copenhagen, Denmark

Dr. P. Narender Raju at YAUYNPT, Myanmar as a visiting faculty member

PERSONALIA

Joining/Appointment

Dr. Asit Das, Principal Scientist (Animal Nutrition) discipline joined at ICAR-NDRI, Karnal w.e.f. 17.7.2018 after his transfer from ICAR-IVRI, Izatnagar.

Retirement/Relieving

Sh. H. R. Arya, Senior Admn. Officer retired from Council's service w.e.f. 30.9.2018.

Sh. S. C. Sharma, Sr. Fin. & Accounts Officer retired from Council's service w.e.f. 31.7.2018.

राजभाषा एकक

तिमाही हिन्दी बैठक का आयोजन

संस्थान के निदेशक एवं कुलपति महोदय की अध्यक्षता में संस्थान राजभाषा कार्यान्वयन समिति की तिमाही बैठक संस्थान में दिनांक 9.10.2018 को संपन्न हुई। समिति ने गृह मंत्रालय, राजभाषा विभाग द्वारा जारी चालू वित्तीय वर्ष 2018–19 के लिए केन्द्र सरकार के सभी कार्यालयों के लिए मदवार तय किए गए न्यूनतम वार्षिक लक्ष्यों के कार्यान्वयन के बारे में विस्तार से चर्चा करके कई महत्वपूर्ण निर्णय लिए। बैठक में सभी अधिकारियों एव कर्मचारियों से निर्धारित न्यूनतम लक्ष्य को प्राप्त करने की दिशा में सार्थक प्रयास करने की अपेक्षा की गई। बैठक में हिन्दी पत्रों पर हिन्दी में हस्ताक्षर करने के साथ–साथ अंग्रेजी पत्रों पर भी हिन्दी हस्ताक्षर करने एवं हिन्दी डाक को प्राप्त करते समय हिन्दी में हस्ताक्षर करके हिन्दी के प्रयोग को बढ़ाने के संबंध में निर्णय लिया गया।

राजभाषा हिन्दी उल्लास मास का आयोजन

परिषद मुख्यालय के निर्देशों के अनुसरण, संस्थान के निदेशक डा. आर. आर.बी. सिंह के मार्गदर्शन, संस्थान के सभी पदाधिकारियों, वैज्ञानिकों, तकनीशियनों व प्रशासनिक स्टाफ के सतत् सहयोग से संस्थान के द्वारा दिनाँक 14 सितंबर 2018 (हिन्दी दिवस) से प्रारंभ करके राजभाषा हिन्दी उल्लास मास का भव्य आयोजन किया गया। इस मास के दौरान संस्थान के द्वारा हिन्दी हस्ताक्षर अभियान, हिन्दी अनुभव लेखन प्रतियोगिता, हिन्दी खुला प्रश्न मंच प्रतियोगिता, हिन्दी गीत गायन प्रेतियोगिता, हिन्दी टिप्पण व आलेखन प्रतियोगिता, हिन्दी निबंध प्रतियोगिता, हिन्दी शोध पत्र पोस्टर प्रदर्शन प्रतियोगिता, हिन्दी ईमेल प्रोत्साहन प्रतियोगिता, उत्कृष्ट प्रभाग/अनुभाग(वैज्ञानिक) राजभाषा शील्ड प्रतियोगिता, उत्कृष्ट अनुभाग (प्रशासनिक) राजभाषा शील्ड प्रतियोगिता सहित 10 प्रतियोगिताओं का आयोजन किया गया। इन प्रतियोगिताओं के सभी विजेताओं व प्रतिभागियों को श्रीमती सीमा चोपड़ा, निदेशक (राजभाषा), भारतीय कृषि अनुसंधान परिषद, नई दिल्ली की अध्यक्षता में दि. 10.10.2018 को संस्थान में आयोजित भव्य समारोह में 99 विजेताओं को प्रमाण पत्रों से सम्मानित किया गया।

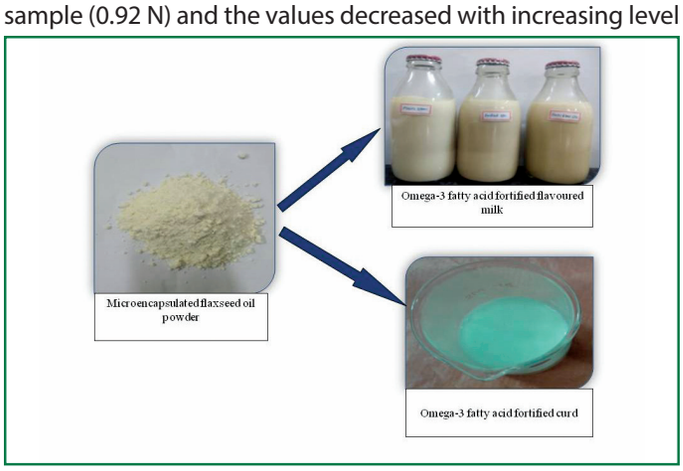
SOUTHERN CAMPUS, BENGALURU

RESEARCH

Omega-3 Fatty Acid Fortified Flavoured Milk and Curd Using Microencapsulated Flaxseed Oil Powder

Monika Sharma, Pramod Tambade, Devaraja HC and Ghosh BC

Milk is often referred as a complete food, but it lacks certain essential fatty acids like omega-3 fatty acid. Flaxseed oil, richest source of α-linoleic acid (ALA) was stabilized through microencapsulation before fortification in milk. The sensory scores of fortified milk were non-significantly ($p>0.05$) different from that of control milk. The fortified pasteurized and sterilized milk were evaluated for pH, acidity, viscosity and sensory characteristics during 6 and 28 days of storage, respectively. The moisture, fat, protein, ash and total carbohydrates for fortified sterilized milk and pasteurized milk were evaluated. One serving (240 ml) of fortified milk provides 0.612 g ALA meeting more than 35% RDA of ALA. The microencapsulated flaxseed oil powder was also used for curd preparation at 2, 3 and 4% level. The samples were evaluated for water holding capacity, pH, acidity, firmness, consistency index, and sensory parameters. The firmness values were more for the control sample (0.92 N) and the values decreased with increasing level



of microcapsules from 0.90 to 0.75N. Based on higher sensory acceptability score of more than 8.0 on 9-point Hedonic scale, sample having 3% level of flaxseed microcapsules was selected for storage study. With the selected level of microcapsule fortification, two servings (100 g each) of fortified curd would provide more than 50% RDA of alpha linoleic acid.

EVENTS

Winter School on Current Concepts and Frontier Technologies for Conservation and Improvement of Indigenous Dairy Bovine Genetic Resources

A winter school was organized at Southern Campus of ICAR-NDRI on 19th July, 2018. Dr. Suresh S Honnappagol, Animal Husbandry Commissioner, Govt. of India was the Chief Guest. He stressed upon the importance of application of frontier technologies at field conditions to improve upon the reproductive performance of dairy animals and for faster multiplication of superior germ plasm. The valedictory function of the winter school was conducted on 8th August, 2018. Dr. Sreenath Dixit, Principal Scientist & Theme Leader, ICRISAT Development Centre, Asia Program was the guest of Honour. After distribution of certificates to the participants, in his address, Dr. Dixit narrated the success stories of integrated farming system incorporating indigenous cattle.

International Training Programme on Ultrasonography and Reproductive Disorder Management in Dairy Animals

Southern Campus of ICAR-NDRI, Bengaluru organized an International Training Programme on "Ultrasonography and Reproductive Disorder Management in Dairy Animals" from 16th – 20th July, 2018 for Veterinary Officials of Nepal. The training programme was sponsored by the Department of Livestock and Nepal Agricultural Research Council, Nepal.

Hands on practical session on veterinary services in progress

A total of five Veterinary Officials from Nepal were trained on different aspects of reproductive disorders in dairy animals, reproductive technologies, basics of ultrasonography in dairy animals, advances in management of repeat breeding in dairy animals, male fertility prediction tools for selection of high fertile bulls, application of follicular wave dynamics in programmed breeding of dairy cattle and other related aspects including a thorough hands on training on ultrasonographic observation of bovine utero-ovarian structures and early pregnancy diagnosis in dairy cattle at the Livestock Research Centre of the campus. Two lectures from external experts were also arranged besides the interaction meeting followed by expert lecture from Dr. Suresh S. Honnappagol, Animal Husbandry Commissioner, Govt. of India. Dr. Honnappagol appraised the participants with the dairy development programmes being implemented by the Government of India and explained the importance of application of ultrasonography in dairy animal reproductive management.

The programme was concluded on 20th July, 2018. Dr. D. Kathiresan, Former-Dean of Veterinary College, Aizawl elaborated the recent developments and utility of reproductive biotechnological tools for downsizing reproductive disorders in dairy cattle. Dr. K. P. Ramesha, Head, Southern Campus urged participants to implement the techniques learnt from the training program at field conditions in Nepal besides propagating the acquired technical skills from the training programme to other veterinarians in Nepal so that the reproductive efficiency of dairy animals in Nepal is improved. Dr. K. P. Ramesha was the Programme Director while Dr. S. Jeyakumar and Dr. A. Kumaresan were the course coordinators of the training programme.

EXTENSION ACTIVITIES

- Advisory services were rendered to twenty-two clientele during personal visits and mail enquiries to the Institute. The information needs of the advisory comprised technical advice on training programme on scientific dairy farming and management of indigenous dairy animals, setting up of dairy farm, software programming for feed and fodder management, fodder production with improved fodder varieties and hydroponics fodder cultivation.
- Extension literature on 'Guidelines for Scientific Dairying Management" was prepared in regional language exclusively for the needy clientele groups and made available during outreach programmes, exhibitions, visitors and trainees during their visits to the Institute.
- An exposure-cum-training programme was organised for two batches of farmers, farmwomen and farm youth on Interstate exposure visit under ATMA programme for 34 progressive farmers from Namakkal and Thanjavur districts of Tamilnadu during July and August 2018, under 'Support to State Extension Programmes for Extension Reforms' (SSEPERS) under Agricultural Technology Management Agency (ATMA) scheme. The farmer trainees were briefed about ongoing activities and oriented about technical know-how of scientific dairy

farming aspects in breeding, feeding and healthcare aspects by lecture presentations, farm/dairy plant visits with special emphasis on clean milk production.

- Participated in Kisan Samridhi Mela 2018, organised by ICAR: SBI, Coimbatore, held during 24th to 26th 2018 at CODISSIA Trade Fair Complex, Coimbatore, Tamilnadu. NDRI stall depicted innovative and educative information on recommended scientific dairy farming practices, clean milk production, indigenous breeds of South India, and indigenous dairy products of the region for the benefit of the clientele groups.
- Participated in Dairy Tech India 2018, International Exhibition on Dairy Products & Technology held during 31st August, to 2nd September 2018 at Bengaluru International Exhibition Centre (BIEC), Bengaluru. NDRI Exhibition Stall depicted dairy processing technologies developed and standardized at the Institute alongwith information on Indigenous breeds of South India and recommended dairy management practices for the benefit of the clientele groups. The exhibition was well attended by multitude of small, medium and large scale dairy entrepreneurs, research scholars and industrialists from all parts of the country and abroad.
- A total of 290 visitors in eight batches comprising of farmers, farmwomen and farm youth from different parts of Karnataka and Tamil Nadu, field extension/veterinary officers and students from various educational institutes of Southern States visited the Institute.

ET DEV: The First Deoni Calf Born through Embryo Transfer Technology at Southern Campus of ICAR-NDRI, Bengaluru

Under "Rashtriya Gokul Mission-Mass Embryo Transfer Programme of Indigenous Breeds of Cattle" scheme of Department of Animal Husbandry Dairying and Fisheries, Ministry of Agricultural and Farmers Welfare, Government of India, Multiple Ovulation and Embryo transfer (MOET) in Deoni cattle was organised jointly by Southern Campus of ICAR-NDRI, Bengaluru and Central Frozen Semen Production and Training Institute, Hessarghata (DADF) on 2nd – 3rd October, 2018 with the support of ETT lab, DLF, Hosur. During the programme, five Deoni animals were super ovulated and a total of 23 embryos were collected and transferred to surrogate cows at the NDRI farm. A total of 14 embryos was produced from a single donor cow No 377 aged 13 years 6 month (7th lactation, with best lactation yield of 1595 kg). The embryos (Fresh/ frozen) were transferred to 12 HF crossbred and Deoni recipients; among them three animals conceived.

The first calf (male weighing 28 kg) was produced by the HF Crossbred surrogate mother on Friday, the 6th July 2018 while the second calf (female) was produced by an another HF Crossbred surrogate mother on 8th July 2018. The third calf (male) was born out of a Deoni surrogate mother on 11th July 2018. During the Visit, Dr. Suresh S. Honnappagol, Animal Husbandry Commissioner, Govt. of India named the first ET born Deoni calf as **ET DEV**. All the three calves are doing well. This initiation is a step towards application of MOET technology for genetic improvement and faster multiplication of elite Deoni cows.

Three ETT calves born out of a single Elite Deoni Cow and the team

Effect of Dried Meal of *Jussea repens* and *Enhydra fluctans* on Growth and Blood Parameters of Black Bengal Goats

S. Bidanta, A. Chatterjee, D. Satapathy, A. Mohammad, D. K. Mandal, C. Bhakat, M. Karunakatran, M. K. Ghosh and T. K. Dutta

In India, 7 million ha. area is covered by inland water bodies. Wetland vegetation/ aquatic macrophytes are widely available in these water bodies throughout India. Most of these wetland vegetation grow naturally in water bodies or in marshy areas and become weeds in many water bodies. Some of these aquatic plants are having good nutritional value and utilization of these plants as animal feed will not only be helpful to fulfil the gap between demand and supply of fodder to large extent but also will help to clean the water bodies. A study was carried out to study the effect of supplementation of two selected Aquatic Macrophytes namely, *Jussea repens* and *Enhydra fluctans* on intake, growth, blood parameters, feed conversion efficiency and economics of feeding in Black Bengal goats. A ninety days growth trial was conducted on eighteen growing black Bengal goats divided equally into three groups (T_0, T_1 and T_2). Concentrate mixture of T_1 and T_2 were prepared by

replacing 20% of wheat bran with dried *Jussea* and *Enhydra* meal, respectively. Average daily gain and feed conversion efficiency were significantly (P<0.01) higher in T_1 and T_2 than T_0 without affecting DMI, CPI, TDNI. Blood parameters (Glucose, BUN, total protein, albumin, globulin, AST and ALT) were within the normal range having no significant difference (P>0.05).

Utilization of *Enhydra fluctans* and *Jussea repens* as alternative feed resources improved average daily gain and also economized the goat ration without any adverse effect on Intake and blood parameters.

Profile of Seminal Proteins and their Correlation with *In Vitro* Sperm Characters in Black Bengal Buck Semen

(M. Karunakaran, Ajoy Mandal, Mohan Mondal, M. K. Ghosh and S. K. Das)

This experiment was carried out to study the electrophoretic properties of seminal plasma and sperm proteins of Black Bengal buck semen and their correlation with *in vitro* sperm characters and freezability. Ejaculates were evaluated for *in vitro* sperm characters and electrophoretic profile of seminal protein. *In vitro* sperm characters were evaluated immediately after collection, after completion of equilibration period and after freeze thawing. Seminal plasma proteins were precipitated by ice cold ethanol method and sperm proteins were extracted by Triton X detergent extraction method. Discontinuous sodium dodecyl sulphate polyacrylamide gel electrophoresis (SDS-PAGE) was performed to assess the molecular weight of seminal proteins. Correlation between *in vitro* sperm characters and protein bands was determined by Pearsons correlation coefficient and Two way ANOVA was applied to find the individual buck differences. Significant difference (P<0.01) among the bucks was noticed in the *in vitro* sperm characters evaluated at all the three stages of semen evaluation such as immediately after collection, after completion of equilibration period and post freeze thawing. Progressive loss of sperm motility, membrane integrity and other *in vitro* sperm characters were noticed during cryopreservation. A total of 10 protein bands in the molecular weight ranging from 17 to 180 kDa were found in the SDS-PAGE of seminal plasma proteins while nine bands of 17 to 134 kDa were observed in sperm proteins. Seminal plasma proteins of molecular weight 75, 62-49, 20, 17 kDa and sperm proteins of 75, 20, 17 kDa were present in all the nine bucks (100%) screened and variation among the bucks was noticed for presence of other proteins. Seminal plasma protein of 180 -134 kDa showed negative correlation with individual motility (-0.716) and functional membrane integrity of sperm cells (-0.724) in post freeze thaw analysis and 48 kDa protein had positive correlation with individual motility (0.649) and functional membrane integrity of sperm cells (0.664) in post thaw analysis. Sperm proteins of 63 kDa had negative correlation (-0.616) with sperm concentration in neat semen.

EXTENSION ACTIVITIES

Activities under Tribal Sub-Plan

Vaccination and health awareness programmes were organized at four different tribal villages of West Bengal viz. i) at Sarengasuli village in Jhargarm District on 10th July, 2018, ii) Bidyadharpur, Bolpur, Shantiniketan, Birbhum Dist., West Bengal on 24th July, 2018, iii) at Ajodhya Hills of Purulia district of West Bengal on 9th August, 2018, iv) and at Gangasagar of Sunderban region in South 24 Paraganas dist. of West Bengal on 17th August, 2018. Different dairy/animal production management systems were demonstrated to the livestock farmers. Animals were rendered health check up and treatment. Extension team demonstrated the use of various inputs like mineral mixture, calcium supplement and dewormers. A total of 252 tribal farmers were benefitted in these programmes. A total 186 goats, 15 qts animal feed, 348 kg of mineral mixture were distributed among tribal farm families to secure their livelihood. A total of 2937 animals were treated and vaccinated against FMD-HS-BQ/ Goat Pox / PPR.

Three training programmes were also organized during the period. The first training programme was organized during 11th – 13th September, 2018 on 'Scientific Goat Farming' in which 20 tribal farmers from Purulia district of West Bengal participated. The next training programme was organized on 'Scientific Dairy Farming' during 18th – 20th September, 2018 in which 18 female tribal farmers from Birbhum district participated. Another training programme on 'Scientific Dairy

Tribal trainees at Eastern Campus of NDRI, Kalyani

Farming' was organized during 25th – 27th September, 2018 in which 22 tribal trainees participated and got knowledge about the recent advances in scientific dairy farming.

A training programme on "Artificial Insemination and Veterinary First Aid" was organized during 5th – 6th June, 2018 in which 13 trainees from Bihar and West Bengal participated. They got the practical exposure about artificial insemination in dairy animals. They were also exposed to actual village situation where they got practical experience in real life situations. Several theory and practical sessions were organized followed by evaluation of the trainees.

Activities under NEH Programme

Scientists from Eastern Campus of ICAR-NDRI visited Namsai district of Arunachal Pradesh. A training programme on scientific management of pig was organized on 2nd August, 2018 at Namsai KVK in Momomg, Arunachal Pradesh in which 35 trainees participated. The training programme was followed by input distribution camp in which 42 piglets (14 male and 28 female), mineral mixture and pig feed was distributed among 14 farmers.

A veterinary health camp-cum-scientists-farmers interaction session was organized on 28th August, 2018 at Nkwareu, New Jalukie, Peren district of Nagaland in which 50 piglets were distributed among farmers. A total of 117 farmers were benefitted in the camp.

Swachhta Hi Sewa Campaign

Streets, drains and back alleys of the campus and KVK buildings was cleaned under 'Swachhta Hi Sewa Campaign' on 15th September, 2018. Staff and students, of the campus actively participated and cleaned office building, hostel premises, lawns of the campus and playground.

A team from Eastern Campus of ICAR-NDRI, Kalyani, visited Umapur, Iswaripur and Muratipur villages of Nadia district in West Bengal on 24th September, 2018. Team advised the villagers about the necessity of cleanliness and also distributed inputs for dairy farming. Cleaning of roads, drains and back alleys was done through awareness drive. Waste collection drive was organized the same day in those three villages. Door to door meeting was organized to manipulate positive behavioral changes towards sanitation, health and hygiene. During the occasion 'Shramdan' was done and the surrounding places of 'Dairy Vikas Kendra' in Muratipur village of Nadia district. One wall painting was made about "Swacchta" drive in the Muratipur village. Farmers of these villages were motivated to build compost pits so that good quality manure can be produced. Many farmers participated in these events and exchanged their ideas for making the surroundings clean and clear. Cleanliness drive was also organized on 1st October, 2018 in the ERS campus and one compost pit was dug to deposit bio-degradable wastes. Doctoral, Masters and Diploma students alongwith the staff members actively participated in the drive.

Freshers' Welcome Programme

Freshers'Welcome programme was organized at Eastern Campus of ICAR-NDRI, Kalyani on 29th September, 2018. On behalf of the faculty, Dr. T.K. Dutta, Head and Dr. A. Chatterjee, In Charge, Academic Cell welcomed all the freshers of DAHD, M.V.Sc. and Ph.D students. Cultural program was presented jointly by the old and fresher students. The senior faculty members shared their views and bestowed their good wishes on all the students.

Students performing cultural activities during Freshers' Day

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