

From the Director's Desk

CCOVID-19 continues to dominate the headlines all around the world for more than six months now. More or less, this pandemic has gripped all the sectors over the world including the dairy sector. Dairy farming, which is a major source of livelihood for millions of households in rural India, has been crippled by the inevitable nation-wide lockdown imposed since March 25, 2020 for controlling the pandemic. Though milk, being an essential commodity, was kept out of the ambit of lockdown, still there were disruptions in the dairy supply chain primarily due to initial confusions and slower pace of transportation, which not only affected the input supplies but also milk procurement and sales. Sales of milk and milk products also declined as a result of fall in demand due to closure of hotels and restaurants, which consume a major share of dairy products. This led to twin crisis- increased input prices and decreased revenue- for the dairy farmers.

Dairy farmers faced major problems in getting cattle feed and dry fodder. Due to limited supplies, their price went up by ₹10-15/ kg for cattle feed and ₹4-6/ kg for dry fodder, thereby increasing the daily feeding cost of cattle and buffalo. There was shortage of green fodder also in some areas. Farmers who were growing green fodder in their own fields or were using silage were affected less. Missed artificial insemination (AI) as a



result of supply glitches and unavailability of sufficient stock of frozen semen doses posed another difficulty. Commercial dairy farmers also suffered due to labour shortage as most of the labourers started moving back to their native places or were not able to commute to their workplace. Temporary residential facilities at some farms

for labour proved helpful in partially combating this issue. Alongwith these complications on the input side, serious crunches were observed on the output-side also. Milk production declined across all the categories of dairy farms. The fall in milk production ranged from 2.7 liters per day in small farms having 2-3 dairy animals to around 25 liters per day in commercial farms with 40-50 animals. In some farms, this reduction was due to decrease in the quantity of cattle feed fed to the animal and in others, it was because of poor animal health. Daily sales were also affected due to reduced procurement, which left the farmers with surplus milk. Private processors stopped procuring milk from the farmers as there was a sharp decline in demand of most of the dairy products. Demand for liquid milk was affected the least while ice-cream and sales of milk based beverages suffered the most. Dairy farmers who were supplying milk to cooperatives were able to dispose off their surplus milk but they suffered in terms of income. Still, many farmers provided milk directly to

FROM THE DIRECTOR'S DESK	RESEARCH	EXTENSION	EVENTS	INITIATIVES TOWARDS CORONAVIRUS PANDEMIC (COVID-19)	HONOURS AND AWARDS	PERSONALIA	राजभाषा एकक	SOUTHERN CAMPUS, BENGALURU	EASTERN CAMPUS, KALYANI
1	2	6	7	10	12	12	13	13	16

the consumer households at their door-steps and this was the segment which was comparatively less affected as fluctuations were not much in the household demand and also there was no change in the consumer price. In this category, farmers who were supplying milk to containment areas or whose products had to cross the inter-state boundaries faced problems. Prices of live animals also declined during the lockdown affecting the income of dairy farmers/ breeders.

Now, most of the supply issues have been resolved as the government has started phased re-opening of the economy but many unforeseen challenges are waiting for the post lock down period also. Most of the dairy farmers made ghee from the surplus milk left during lockdown. Similarly, processing plants also used the excess milk to prepare milk powder, ghee and white butter. If these huge inventory build-ups are not cleared timely then they can lead to bigger crisis in the dairy sector. Clearing of these stocks directly depends on the revival of domestic as well as global demand. In unlock phase, the government has allowed hotels and restaurants to operate but as there is still a constant spike in COVID-19 cases so people will continue to avoid the outside visits to minimize the risk of infection and the revival of demand is expected to be slow. Increased unemployment and recessionary forces will further keep a check on demand. Meanwhile, dairy cooperatives and producer organizations can obtain up to 4% interest subsidy on working capital from April, 2020 till March, 2021 under the new scheme-Interest Subvention on Working Capital Loans for Dairy sector, which will help them in making timely payments to the farmers. Long term measures announced by the

government like support for vaccination and Animal Husbandry Infrastructure Development Fund will help in improving the resilience of the sector in near future.

NDRI has prepared and circulated the advisory for ensuring safety of farm workers and preventing transmission of the disease while performing dairy activities. These advisories are available in the institute's website and should be followed by the dairy farmers and processors even in the post lockdown period. The Institute is also undertaking a comprehensive study on impact assessment of COVID-19 crisis on the dairy sector, which will help the government in taking more informed decisions in case of any such crisis in the future.

Indian Dairy Industry seems to be more resilient compared to other sectors despite all the problems. The pandemic has also created some new opportunities in the sector. It has changed the way people buy and eat. Consumers have come to realise that healthy diet is needed and there is a likelihood of shift from meat to dairy based products soon, which will bring prosperity to the dairy sector. A slow but clear shift of dairy consumers to packaged products and e-commerce is being observed. The pandemic experience can further boost the growth in these sectors. Similarly, migrant labourers who lost jobs and returned back amidst this pandemic can be motivated and incentivised to take up dairy farming and processing as a means of livelihood in under-developed rural areas.

(M.S. Chauhan)

RESEARCH

Development of Automatic Endo-exo Thermal Unit for Dahi

(Chitranayak Sinha, A. K. Singh, J. K. Dabas, P. S. Minz, Amita D. Vairat)

An endo-exo automated thermal unit for *dahi* was developed. There is no manual intervention in the whole process of *dahi* making. In the developed endo-exo cabinet, instead of two separate units, one for incubation and second for cooling storage, where higher initial cost, time and labour are involved (resulting in higher production cost), there is a single compact unit for the complete process of *dahi* making i.e. incubation in controlled condition and faster cooling thereafter. It consists of two automatic process control viz. Timer based and pH

level based. A 16-Channel Data Logger was attached to record and analyze the temperature data of the entire processing of incubation to cooling. The design is based on engineering calculations for fluid flow, heat transfer and refrigeration, the assembly of instrument panel and all the automation control system for providing controlled processing environment. This fully automatic and smart operation included loading the sealed cups filled with inoculated cups, switching on the machine and taking out good quality ready to consume cooled *Dahi* Cups. There is saving of time, energy and labour, hence the overall production cost. Developed technology could be applicable and adaptable for small to medium and medium to larger scale and useful to small dairy processors with the

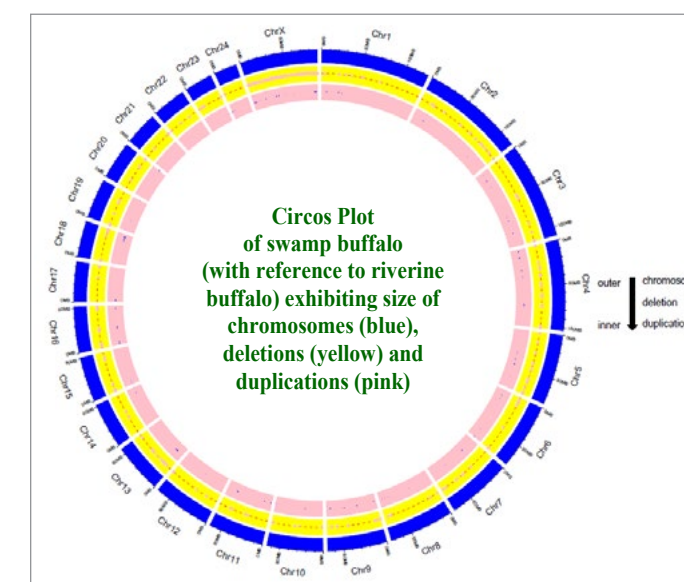


production capacity of 1000 cups (200 ml) of *Dahi* per day. It is approved for commercialization @ ₹4.00 Lakhs (+18% GST) with 2% royalty and Rs.6.00 Lakhs (+18% GST) without royalty for 10 years non-exclusive term by NDRI-ITMU Committee.

Copy Number Variations in Manipuri Swamp Buffalo

(Aishwarya Dash, Jayakumar, S and I. D. Gupta)

Genetic variation is the prime reason for phenotypic source of creating differences among individuals. Single nucleotide polymorphisms (SNPs) are considered as the most common form of genetic variants. Copy Number Variation (CNV) is a structural variation involving DNA segments varying from 50bp to several mega base pairs in length. CNVs involve a large fraction of genome. They alter gene regulation and expression by disrupting gene structure, modifying dosage and exposing recessive alleles. CNVs using whole genome resequencing method were identified in blood sample of Manipuri swamp buffalo. Total 1309 raw Copy Number Variations were called (detected) using Read Depth (RD) based method. There were

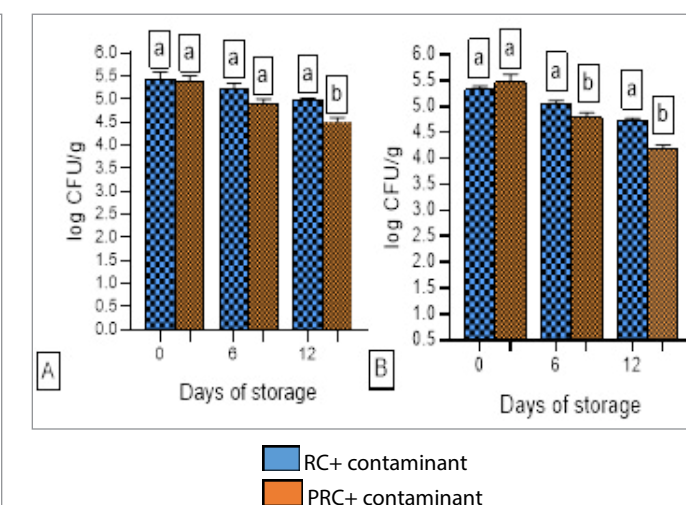


828 unfiltered CNVs after removing 481 variants overlapped with gap and unplaced chromosomes. Total 472 significant CNVs were obtained occupying 151.8 Mb in the swamp buffalo genome. The detected 472 CNVs were categorised into two types: 303 loss and 169 gain events. These genome-wide CNVs could be applied for Genome Wide Association Studies (GWAS), assessment of phenotypic variation and subsequently, could be used as an aid to selection.

In Situ Control of Spoilage Micro-organisms in Probiotic Ricotta Cheese Matrix

(Sameer Bhagwat, Sangita Ganguly, Yogesh Khetra and Latha Sabikhi)

Ricotta cheese was prepared from mixture of mozzarella cheese whey and buffalo milk (1% fat) followed by application of heat treatment and acidification by using citric acid. The probiotic organism *Lactobacillus acidophilus* La-05 (NCDC-291) was incorporated after adjusting total counts (~ 8 log CFU/ mL) with salt (1% w/w). Control cheese contained spoilage bacteria (*Escherichia coli* NCDC 135, *Staphylococcus aureus* NCDC 109) and the experimental cheese contained probiotic bacteria with spoilage organism. Inoculum of one ml of each spoilage and probiotic bacteria (*E. coli* and *S. aureus*) was added for each 25 g of cheese stored in sterile glass jars (250 ml), to provide a count of approximately 5.5 log CFU/g and 8 log CFU/g, respectively, for spoilage and probiotic bacteria. The inoculum of spoilage bacteria was fixed, considering the reported levels of contamination in fresh cheese samples. Inoculated cheese samples were mixed and kept at 7°C for 12 days. The viable cell count of contaminants in the cheese samples was enumerated at 0, 6 and 12 days intervals using the pour plate technique. In the presence of probiotic organism, the count of *E.coli* and *S. aureus* decreased significantly by 20% and 23.4%, respectively, at the end of 12 days of storage at 7°C.



Viable counts of spoilage organisms in control and probiotic Ricotta cheese during storage; A: *E. coli* (NCDC 135); B: *S. aureus* (NCDC 109)

Conjugated Linoleic Acid Producing Potential of *Lactobacillus* Spp. Isolated from Goat Rumen Fluid Samples

(Sachin Kumar, Nitin Tyagi and Amrish Kumar Tyagi)

Micro-organisms are major influential factors in the fatty acid biohydrogenation process in rumen and some pathways ultimately leading to the formation of conjugated linoleic acid (CLA). Attempts were made to explore the potential of *Lactobacillus* spp. for CLA production, isolated from rumen fluid samples of lactating goats. A total of 64 isolates of *Lactobacillus* were

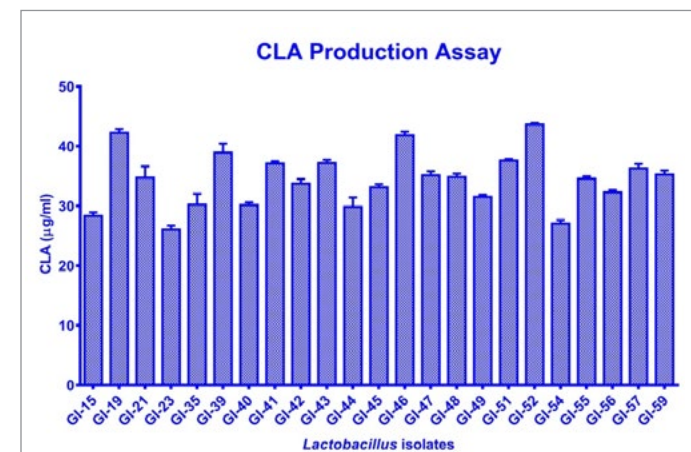


Fig: Comparative Conjugated Linoleic Acid production assay of the positive isolates after 24 h incubation (µg/ml)

isolated using MRS agar from rumen fluid content of goats. Out of 64 isolates, 23 isolates were observed positive for CLA production by linoleate isomerase (LAI) gene based amplification (968 bp) and quantitatively by spectrophotometric assay (Fig) for conversion

INSTITUTE TECHNOLOGY MANAGEMENT UNIT (ITMU)

Technologies Transferred

S. No.	Name of the Technology	Sale Price of the Technology	Date of Licensing	Name of the Firm
1.	A new strip-based test for detection of neutralizers in milk	1.50 Lakhs + 18% GST	01.03.2020 through Agrinnovate	J. K. Scientific Industries, Ambala Cant
2.	Strip based test for detection of hydrogen peroxide in milk	1.50 Lakhs + 18% GST	01.03.2020 through Agrinnovate	
3.	Strip based test for detection of maltodextrin in milk	2.25 Lakhs + 18% GST	01.03.2020 through Agrinnovate	
4.	A new rapid test for detection of detergent in milk	4.00 Lakhs + 18% GST	01.03.2020 through Agrinnovate	
Total		Total = Rs 9.25 Lakhs excluding Service Tax		

Patents Filed

S. No.	Title of Patent	Inventors	Date of Filing	Application Number
1.	Detection of A2 milk derived peptide (BCM9A2) by aptamers	A. K. Mohanty, Abhishek Parashar and Sudarshan Kumar	13.01.2020	202011001446
2.	Paper strip based sensor for detection of heavy metals in Milk	Naresh Kumar and Karanpriya	14.02.2020	202011006420
3.	Microfluidic device for enrichment of live and motile spermatozoa of cattle	Ashok Kumar Mohanty, Vinod Kumar Yata, Bhanu Prakash, Vibhav Katoch, Neeraj Yadav, Dharmendra Kumar Gangwar, Sudarshan Kumar and Tushar Kumar Mohanty	27.02.2020	202011008229

of linoleic acid to CLA as well as Gas chromatographic methods. All the positive isolates were identified by 16S rRNA based PCR amplification and sequencing. The isolates were identified as different species of *Lactobacillus ingluviei* (2), *Lactobacillus salivarius* (2) and *Lactobacillus curvatus* (19) group (Fig) further differentiated into *Lactobacillus curvatus* (15) and *Lactobacillus sakei* (4) based on biochemical tests. The study showed that lactic acid bacteria isolated from goat rumen fluid have the potential to produce CLA and may be applied as direct fed microbial to enhance the nutraceutical value of animal food products.

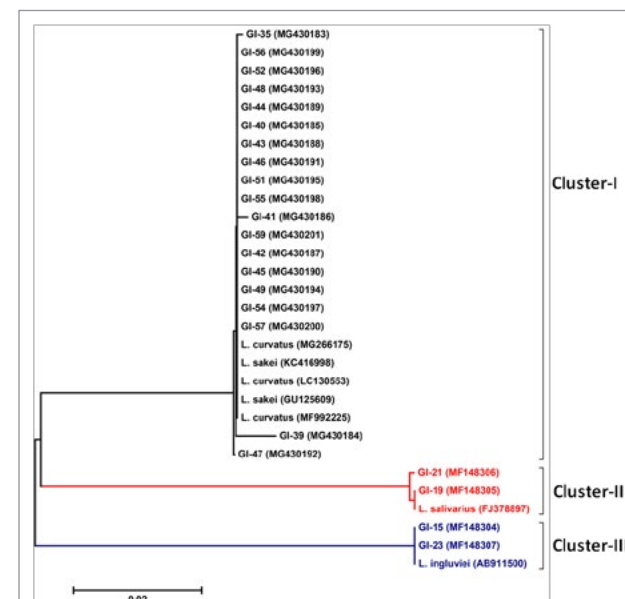


Fig: Evolutionary relationships of isolated CLA producing *Lactobacillus* spp. isolated from rumen samples of goat

S. No.	Title of Patent	Inventors	Date of Filing	Application Number
4.	Detection of BCM-7 peptide in urine sample by aptamers	A. K. Mohanty and Abhishek Parashar	08/06/2020	202011023895
5.	Novel peptide sequence and generation of polyclonal antibody against Pregnancy Associated Glycoprotein 7 (PAG-7) for pregnancy diagnosis in bovine	A. K. Mohanty, Munna Lal Yadav and Sudarshan Kumar	22/06/2020	202011023895

Patents Granted

S. No.	Title of Patent	Inventors	Date of Filing	Application Number	Date of Grant and Grant Number
1.	A process for bioethanol production by immobilized stress tolerant microorganisms.	Minakshi Dahiya and Shilpa Vij	19.12.2011	3710/DEL/2011	19.02.2020 (332454)

Request for Examination for Patent

Name of Institute	Application/Registration No.	Inventors of the Patent	Name of Innovation/Technology/ Product/ Variety	Date of Filing/ Registration
ICAR-NDRI	202011008229	Ashok Kumar Mohanty, Vinod Kumar Yata, Bhanu Prakash and Vibhav Katoch	Microfluidic device for enrichment of live and motile spermatozoa of cattle	27/02/2020 Request for examination filed in the patent office, New Delhi on 08.06.2020

Submission of NBA Application

Name of Institute	Application/Registration No.	NBA Reference Number	Inventors of the Patent	Name of Innovation/Technology/ Product/ Variety	Date of Filing/ Registration
ICAR-NDRI	1854/DEL/2015	INBA3202002019	Varij Nayan, Suneel Kumar Onteru and Dheer Singh	Novel peptide sequence and polyclonal antibodies for the detection of cow and buffalo luteinizing hormone.	25/06/2020 to National Biodiversity Authority filed

Filing of Reply of First Examination Reports (FERs) of Patents Filed

S. No.	Title of the application	Patent Application Number	Date of Filing	Date of Filing of Request for Examination	Date of Issue of First Examination Report	Date of Submission of Reply to FER
1.	A strip for detection of maltodextrin in milk and process for the same	2097/DEL/2014	24/07/2014	24/06/2016	24/09/2019	23/03/2020
2.	A strip for detection of added urea in milk and process for the same	3472/DEL/2013	29/11/2013	24/06/2016	26/09/2019	26/03/2020
3.	A PCR based method for detection of a field strain of <i>Ureaplasma diversum</i>	806/DEL/2015	24/03/2015	14/02/2017	18/10/2019	16/04/2020
4.	A strip-based test for detection of detergent in milk	750/DEL/2015	19/03/2015	22/12/2016	26/11/2019	30/04/2020
5.	Novel peptide sequence and polyclonal antibodies for the detection of cow and buffalo luteinizing hormone	1854/DEL/2015	23/06/2015	05/04/2017	22/11/2019	22/05/2020
6.	Oil in water curcumin nanoemulsion and method of preparation thereof	201611018434	30/05/2016	21/01/2019	25/11/2019	23/05/2020
7.	A peptide with and antiresorptive activity	2778/DEL/2013	20/09/2013	23/08/2016	09/12/2019	09/06/2020

EXTENSION

DAIRY EXTENSION DIVISION

Field/Farm Technician (FFT) Activity

The Field/Farm Technician (FFT) Laboratory of Dairy Extension Division provides a base for extension work in the adopted villages around Karnal and keeps the records of all extension activities of the division. The FFT Laboratory is operated through Stockman Centre. The Stockmen are the grass-root level workers through whom a live and regular contact between scientists and farmers is established.

Activity Conducted in Adopted Villages (April to June 2020)

S. No.	Activities Conducted	No. of Cases
1.	A.I. in Cows	23
2.	A.I. in Buffaloes	10
3.	Pregnancy Diagnosis	15
4.	Deworming Cases	80
5.	General Treatment	64

Dairy Education at Farmers' Door

Dairy Extension Division organized the ongoing Extension Education Programme "Dairy Education at Farmers' Door" to strengthen the effective 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 new cluster of villages viz. Deepo, Kulwaheri and Bhoji Khalsa in Karnal district on 2nd Saturday of every Month during the period under report. Extension scientists obtained the feedback from the participating farmers. The key points of interactions were: Management of dairy animals during lockdown due to COVID-19, Management of silent heat issue in animals, feed and fodder availability to the dairy farmers.

Kisan Sangoshthies on COVID-19

Eight Kisan Sangoshthies were organized at village level and discussed various topics comprising: Management of animals during lockdown due to COVID-19, Preparation of nutritious ration at Home, Care and management of pregnant animals, Immunity improvement in dairy animals, Clean India campaign, Preparation of milk products at home during lockdown period and tips for selling of milk to vendors/consumers, etc.

Farmers' Farm School

Farmers' Farm School (FFS) under educational approach (sixth batch) of NDRI was started in village Bhoji Khalsa, Karnal. A total of 20 farmers were enrolled as students. One day exposure visit & tour was organized at the institute. Regular classes are continuously organized on every Friday and Saturday for educating the farmers in dairy farming and its allied activities.

KRISHI VIGYAN KENDRA

Front Line Demonstrations (FLDs) on Oilseed Crop: Mustard

During the Rabi season 2019-20, a total of 50 FLDs on mustard crop using varieties CS-60 and CS-58 were laid in 20 ha area in different villages of Karnal district under irrigated conditions. In the demonstration plots, an average production of 16.55 q and 16.0 q/ha, respectively was observed in varieties. The overall performance of these varieties was found to be satisfactory. However, some of the demonstration plots were affected due to heavy rainfall in the month of March.

Front Line Demonstrations (FLDs) on Pulse: Gram

During the Rabi season 2019-20, a total of 50 FLDs on gram crop were laid in 20 ha area under irrigated conditions. The variety HC-5 was used for conducting FLDs. In the demonstration plots, an average production of the variety was observed to be 11.41 q/ha. However, some of the demonstration plots were affected due to heavy continuous rainfall.



On Farm Trial (OFT) on Wheat Varietal Evaluation

During the Rabi season, 2019-20, on farm trial on varietal evaluation of wheat late sown varieties DBW-173 and DBW-90 were used in 6 ha area at 15 locations under irrigated conditions. The average production of the varieties was observed 48.60 q/ha and 48.98 q/ha, respectively in late sown

conditions of Karnal district area. Farmers like these varieties under late sown conditions.

Promotion of Agriculture Mechanization for In-situ Crop Residue Management

Farmers used to burn paddy straw in different villages of Karnal in a run-up to wheat sowing leading to the degradation of soil health and environment pollution. During the Rabi season, 2019-20, KVK NDRI implemented the project 'Promotion of Agriculture Mechanization for *in-situ* crop residue management' in two adopted villages i.e. Bhainikhurd and Sultanpur of Karnal district. KVK organized sowing of wheat with the help of Happy Seeder and Zero Tillage Seed Drills in 144 acre and 237 acre areas of 43 farmer fields, respectively.



Extension Activities

- Field day on wheat in-situ crop residue management at village Bhainikhurd, Karnal was organized on April 24, 2020 in which 25 farmers participated.
- Field day on gram variety HC-5 was organized on June 25, 2020 in village Phurlak, Karnal in which 19 farmers participated.
- The farmwomen of Ghogharipur (8) and Dahajagir (10) were given vegetable seeds of lady finger, pumpkin, bottle gourd, sponge gourd and brinjal for the purpose of kitchen gardening.



- Dr. Rakesh Kumar (Head, KVK) delivered a webinar talk on Livestock Management Fodder Production and Conservation in association with *PhasalKranti* attended by 200 participants.

EVENTS

Dr. Verghese Kurien Memorial Lecture on World Milk Day

World Milk Day was celebrated at NDRI Karnal on June 1, 2020 by organising Dr. Verghese Kurien Memorial Webinar Lecture on "The Saga of Artificial Insemination in Indian Dairying" was delivered by Dr. (Prof.) A. K. Srivastava, Member, ASRB, DARE, Govt. of India and former Director of NDRI, Karnal. The event was chaired by Dr. B. N. Tripathi, D.D.G., Animal Sciences, DARE, ICAR-New Delhi and was attended by about 500 participants from all the Universities, Veterinary and Agricultural Universities of India.

Dr. A. K. Srivastava highlighted the work carried out by Dr. V. Kurien in milk production which made him the father of white revolution in India and helped India emerge as the largest milk producer in the world. As Founder Chairman of the National Dairy Development Board (NDDB), the Gujarat Cooperative Milk Marketing Federation Ltd. (GCMMF), and the

Institute of Rural Management (IRMA), Dr. Kurien dedicated his professional life to empowering the Indian farmers through cooperatives. The cooperative movement that he helped to create a model not only for India, but also for developing countries throughout the world. The Operation Flood Programme, of which Milk Producers' Cooperatives were the central unit, became India's largest rural employment programme.

Dr. Srivastava reiterated that there is an urgent need to expand AI coverage in all the rural and faraway places in India and regulation of upcoming private semen stations should be done. Policies for regulation of use of sexed semen have been made and Institutes like NDRI and IVRI should provide continuous training to inseminators.

Dr. M. S. Chauhan, Director NDRI informed that NDRI has made significant contribution to improve the milk production in cattle (indigenous and crossbred) and buffaloes in India.

Many innovative, less expensive and rapid methods have been developed to improve the reproduction and milk production of our dairy animals. While mentioning the transfer of technology, he said that in the last 5 years, NDRI has transferred 96 technologies to various dairy industries and entrepreneurs across the country earning around ₹261 lakhs revenue.

Interaction Meeting with Women Groups in Manglora Village

A group meeting was organized under DST project at Manglora village on May 27, 2020 in order to have first hand information about work progress of women groups and to advise them on safeguards during ongoing Covid-19 crisis. Dr. K. Ponnusamy and Ms. Priya of NDRI interacted with group members. It revealed that groups were prepared and they sold paneer, khoa and gulab jamun on order basis in the Manglora and nearby villages with good profits margins amid Covid-19 crisis with restrictions on movement of people. The group (Sri Ram SHG) members also informed that they had prepared cloth face mask and distributed not only in village but also handed over 2000 such masks to Deputy Commissioner, Karnal. Since the frequency of visit by milk vendors to the village for procuring milk from farmers had come down, families had to consume extra milk and milk products or gift to neighbours and sometimes they sold milk in their own village. They were also sensitized about the importance of maintaining personal and family hygiene. The importance of home-made dairy products was explained based on the principles of self-reliance and vocal for local as being emphasised by Hon'ble Prime Minister due to more trust and genuineness of products from villages. Women informed that wheat harvesting was done by villagers themselves due to non availability of labourers.



Extension scientists interacting with farmwomen

Impact of COVID-19 Lockdown of Indian Dairy Sector

A study revealed that the sizeable reduction in demand of milk and milk products (MMP) in the event of COVID-19 lockdown had adversely impacted the milk producers and processors.

The consequent decrease in prices of MMP was instrumental in welfare losses of stakeholders. The estimates from economic surplus model put economic welfare losses of milk producers at ₹112.3 crores per day which were highly concentrated in nine states out of which two states namely Uttar Pradesh and Rajasthan alone were accounting for more than one fourth of these losses. The improvement in the welfare of consumers on account of decline in prices of milk was not sufficient enough to compensate the producers leaving ₹66.7 crores per day of economic losses uncovered. The shadow of lockdown is going to last long with reduction in milk production to the extent of 5 to 6% and the profitability of dairy industry by 10% depending upon the mitigation strategies adopted during and after the effect of pandemic is over.

Impact Assessment of Rapid Detection of Adulterant in Milk Kits Developed by ICAR-NDRI

ICAR-NDRI in association with ICAR-NIAP, New Delhi assessed the impact of technology for Rapid Detection of Adulterants—especially that of maltodextrin and detergent in milk. The technologies of these tests were developed during 2012-14 and transferred to nine commercial houses. The major dairy industries using these test are: Mother Dairy, Sanchi Milk Industry, Punjab State Cooperative Milk Producers' Federation Limited, Haryana Dairy Development Cooperative Federation Limited, Rajasthan Cooperative Dairy Federation Limited, etc., which are located in the major milk producing states and accounts for about 73.4% of total milk production in the country in 2018. Around 10 lakh milk testing kits were marketed and nearly 33.53% of milk in the organized sector was tested for the adulterants in 2019. The economic benefits to the society from the reduction in the adulterants (maltodextrin and detergents) accrued through the saving of the cost of milk testing and ensuring the quality of milk. The cost-saving to the dairy industry was estimated as ₹3.8 crore annually. The annual benefits from the technology were estimated at ₹174.44 crore in 2018-19. In due course, the large proportion of these benefits would get translated to milk producers (farmers). At the same time, it was also found that the consumers were willing to pay a higher price (15%) for the quality tested milk. Thus, the technology resulted in furthering the overall economic welfare of both milk producers and consumers in the society. The study was included in the Coffee Book published recently by ICAR-NIAP on 'Economic Impact of ICAR Research'.

Holstein Friesian Cross Cow Produced Record Milk Yield (76.61) kg in a Day

Dr. M. S. Chauhan, Director, NDRI, Karnal felicitated Shri Baldev Singh from Galib Khedi village whose crossbred cow yielded

a record milk production of 76.61 kg milk in 24 hours, which is a record production by a crossbred cow. This cow was evaluated by an evaluation Committee of NDRI. Dr. Chauhan informed that Mr. Baldev Singh and his brother Mr. Amandeep Singh took training on management of dairy animals from National Dairy Research Institute, Karnal in the year 2010 and 2011, from where they learnt about scientific breeding and feeding of animals. This training and continuous technical knowhow from NDRI inspired them to take up dairying with small dairy farm. Dr. Chauhan further urged all dairy farmers and rural youth to take up dairying as an entrepreneurship and skill development programme, and welcomed them at KVK, NDRI, Karnal, where the Institute is routinely engaged to help the farmers in dairy development and trainings. He further told that NDRI has many ongoing capacity building programs in dairy and persons like Shri Baldev Singh can serve as role model for the youngsters through his success story. Shri Baldev Singh on receiving the Award from NDRI informed that his cow no. 106232/112 is a champion performer born by using Pannymaker ABS USA Imported semen; cow first calved on 02.01.2014 and produced 42 kg in a day. In her second and third lactation produced 54 kg and 62 kg, respectively. This is her 4th lactation and has earlier produced 66.20 kg milk in National Livestock Championship & Agri Expo-2020, Batala Punjab. The same cow has also won 10th PDFA International Dairy & Agri Expo-2015 held at Ludhiana, Punjab, and National Dairy Mela at NDRI, Karnal.



Dr. M. S. Chauhan, Director, NDRI, Karnal felicitating Shri Baldev Singh from Galib Khedi village whose crossbred cow yielded a record milk production of 76.61 kg milk in 24 hours

6th International Yoga Day

6th International Yoga Day was celebrated at ICAR- NDRI, Karnal during June 17 - 21, 2020. A team of yoga experts from Patanjali Yoga Samiti, Karnal and Bharat Swabhimani Trust Haridwar taught yoga tips to the participants. The programme was organized as per the protocol of Ayush Mantralaya and advisories issued by the Government from time to time. The basic objective of this event was to improve the immunity of



the participants through yoga asanas. All Heads of Divisions, Section in-charges and employees participated in this event by wearing masks and maintaining social distancing. Dr. M. S. Chauhan, Director, NDRI, Karnal said that organization of such events played an important role for maintaining physical and mental health of people.



Alumni-Institute Engagement

The first Webinar under the theme "Alumni-Institute Engagement", an activity initiated under the Institutional Development Plan of the NAHEP was organized on June 18, 2020 at ICAR-NDRI, Karnal. Mr Atul Jain, Managing Director for Indian Subcontinent & Middle East, DZ Card and of the B.Sc. (Dairy Technology) batch of 1984-88 addressed students and faculty on 'Soft Skills Gained during My Journey with NDRI'. The speaker described one incident from each of the four years of his undergraduate days at NDRI and what life lesson he learnt from each of them. The address was followed by a Question and Answer Session, when the students interacted with the speaker through the moderator.

A Webinar on Decoding Secrets of Agri-Dairy Sector: Towards Self Employment

A webinar on "Decoding Secrets of Agri-Dairy Sector: Towards Self Employment" was organized on June 9, 2020. More than 1000 participants including 150 students attended this webinar. Two eminent speakers viz. 1) Mr. N. Raghuraman, Editor, Writer, Columnist & Engagement Specialist; 2) Mr. Srijan Pal Singh, Former Advisor to Dr. APJ Abdul Kalam and TEDx Speaker delivered their lectures on personality development traits.

A Webinar on Fundamentals of Goal Setting and World and Business after COVID 19

A webinar on the topics "How to design your life in 5 years", 'Fundamentals of Goal Setting' and 'World and Business after COVID 19' was organized on June 10, 2020. More than 200 participants attended this webinar. Three Speakers 1) Mr. N. Raghuraman, Editor, Writer, Columnist & Engagement Specialist; 2) Mr. Rajesh Aggarwal, Author and Motivational Speaker; 3) Nirmal Bhatnagar, Educational Consultant and Career Counsellor delivered their talks.

A Webinar on Bridging the Gap between the Education and Industry

A webinar on the topic "Bridging the gap between the education and industry" was organized on June 11, 2020. Mr. Ratnakar C. Choudhary, MD, CRASHOLA delivered the talk.

A Webinar on Skill Sets for Hybrid Teaching and Learning in Post COVID Era

A webinar for NDRI faculty and students on "Skill sets for hybrid teaching and learning in the post COVID era" was conducted

on June 18, 2020 as a part of IDP (NAHEP) activities. A total of 82 faculty members attended the webinar. Dr. Pratima Khandelwal, Pedagogue & National Level Educator was the speaker

IRC meetings of the Institute

The Institute Research Committee (IRC) Meetings were conducted through Video Conferencing during May 26-30, 2020 for research projects of ICAR-NDRI Karnal; June 10, 2020 for research projects of Southern Regional Station, Bengaluru; and June 12 and July 13, 2020 for research projects of Eastern Regional Station, Kalyani. The IRC Meetings were held to evaluate the outcome of the completed research projects and to consider new research project proposals under the seven broad research programmes identified within the mandate of the Institute. The new project proposals were discussed at length in presence of invited subject matter experts. The valuable suggestions were given by the house and experts to fine tune the objectives and technical programmes of the new projects.

INITIATIVES TOWARDS CORONAVIRUS PANDEMIC (COVID-19)

Novel Coronavirus disease (COVID-19) has affected around 213 countries including India. The pandemic has wreaked havoc across Nations. Govt. of India has taken timely measures including lockdown to prevent the risk of COVID-19 and issued several advisories to save the lives of people. ICAR-NDRI also has taken proactive steps for containing the spread of corona virus and also rendered support to District Administration in terms of providing equipments for testing COVID19 patients and quarantine facilities.

ICAR-NDRI supported the Kalpana Chawla Govt. Medical College (KCGMC), Karnal by providing Real Time PCR Machine (Roche) and two Microcentrifuges. The Real Time PCR machine is being extensively used for testing around 300 to 400 samples daily. The scientists of the Institute remain in touch to provide advice as and when required. Earlier samples were being sent outside district Karnal for testing which took two to three days for getting results. With this support from NDRI, results are available on the same day and cost is also cut down.

ICAR-NDRI has offered its facilities viz. the Kalki Bhawan and Scientist Home to district administration to create quarantine facility for Doctors of Kalpana Chawla Hospital, Karnal. A total of 30 doctors at present are availing this facility.

KVK of NDRI issues advisories twice a week to farmers to follow the social distancing and use of masks in view of the risk of

infection of coronavirus (COVID-19) during harvesting. They are also advised to safeguard themselves by downloading Aarogya Setu app. Advisory has also been issued for livestock during this crisis period.

Entries of visitors have been restricted and thermal scanners have been used at entry points. Milk Parlour, Cafeteria, Gym and Creche have been closed.



Stay arrangements have been made for field staff. The labourers (around 130) coming from outside for rendering their services at LRC, ABRC, Security, Animal Nutrition etc. have been provided free accommodation at Kisan Hostel, KVK and Community Centre. They are provided free food, masks, gloves and hand sanitizers.

A monitoring committee comprising of four staff members to ensure campus wide safety has been constituted by Director, who visits all the departments and sections on regular basis and issues advisory wherever required to contain the spread of COVID-19.

Institute's Estate section has provided masks and sanitizers to all the staff members of the Institute and ensures that

disinfection of corridors, doors and bolts is being done on regular basis.

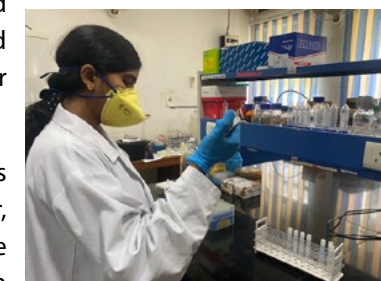
Hand sanitizers have been kept at the entry points in all laboratories, offices and sections.



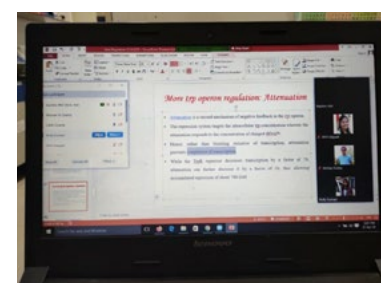
All the activities at NDRI are running at normal pace by maintaining social distancing. Meetings too are convened by maintaining social distancing and wearing masks etc. Scientists and students have also started working in labs on their projects.



Since academic activities were suspended, Director, NDRI instructed Vehicle Maintenance section to drop all the students leaving for their homes at Railway Stations and Air Ports by Institute vehicles when lock down was announced.



NDRI faculty is conducting on-line classes and meetings are also being conducted through Video Conferencing.



Awareness was spread for prevention of COVID-19 by displaying of posters and sharing pamphlets and study material through e-mails.



Indigenous low cost Sprinkle tunnels have been designed by NDRI scientists for sanitizing inanimate materials coming from

outside in the campus. As per the directives of Govt. of India, staff of NDRI has downloaded Aarogya Setu App also.



The Staff of the institute including ERS and SRS has contributed one day salary amounting to ₹21,80,522. Besides, individual contributions have been also made by Hon'ble Director and Staff members in Karnal Corona Relief Fund and PM Cares fund that includes ₹21000 donated by Director, Dr. M. S. Chauhan and ₹20000 by Dr. Sunita Grover, Head, DM Division. Even the Ladies Club at NDRI has contributed an amount of ₹45,000 towards Karnal Coronavirus Relief Fund. Model Dairy Plant at NDRI contributed ₹50,000 to Karnal Corona Relief Fund. Employees Welfare fund contribution to PM Cares Fund is ₹11 lakhs. The Institute also handed over 2000 kg wheat flour to District Administration as community help. Director, NDRI applauded the efforts of workers in LRC who were feeding 2500 animals since the lockdown and honoured them by inviting on lunch. Hon'ble Director and his wife also joined to boost their morale.

A felicitation ceremony was organized for the Contractual staff working in hostels of ICAR-National Dairy Research



Institute, Karnal on April 29, 2020. These staff contributed in house keeping and maintenance of seven hostels of the institute during the lockdown period. They stayed inside the campus during the lockdown and worked day and night for ensuring the cleanliness and hygiene of the hostel premises. Their contribution during the epidemic phase is appreciated by the authorities and students. Dr. M. S. Chauhan, Director, ICAR-NDRI, Karnal lauded the efforts of hostel staff and as token of appreciation distributed honorarium amounting to ₹14500/- among the contractual staff. Sweet boxes were offered to permanent staff members. Dr. J. K. Kaushik, Principal Scientist and Former Chief Hostel Warden had taken initiative for honoring the hostel staff. Director has announced that appreciation certificates will be provided to all staff who have assisted institute authorities during the lockdown.

HONOURS AND AWARDS

- **Dr. Neelam Upadhyay**, Scientist, Dairy Technology Division was conferred **"Young Woman Scientist Award-2020"** during the International Web-Conference on 'New Trends in Agriculture, Environmental and Biological Sciences for Inclusive Development (NTAEBSID-2020)', organized during June 21-22, 2020 by Agro Environmental Development Society (AEDS) and co-organized by National Agriculture Development Co-operative Ltd., Baramulla and Babasaheb Bhimrao Ambedkar University, (A Central University), Lucknow.
- **Dr. Gunjan Bhandari**, Scientist, DESM Division received **"Best Paper Presentation Award"** for her paper "Alternatives for Accelerating Agricultural Growth in Uttar Pradesh: A Zone Wise Analysis" presented during 6th National Seminar (Webinar) on 'Sustainable Development: Socio-Economic Concerns' conducted by the Department of Economics, Punjabi University, Patiala and the Society of Economics and Development, Ludhiana on June 22, 2020.
- **Ms. Soumya Mohapatra** and **Dr. R Sendhil**, Senior Scientist, IIWBR received **"Best Paper Presentation Award"** for their paper "Role of Milk Market Infrastructure for Sustainable Dairy Development" presented during 6th National Seminar (Webinar) on 'Sustainable Development: Socio-Economic Concerns' conducted by the Department of Economics, Punjabi University, Patiala and the Society of Economics and Development, Ludhiana on June 22, 2020.
- **Ms Babita Kathayat, Ms Priyanka Lal** and **Dr. A. K. Dixit**, Principal Scientist, DESM Division received

"Best Paper Presentation Award" for their paper, "Has the Consumption Pattern Changed?" An Overview of Livestock Products" presented during 6th National Seminar (Webinar) on 'Sustainable Development: Socio-Economic Concerns' conducted by the Department of Economics, Punjabi University, Patiala and the Society of Economics and Development, Ludhiana on June 22, 2020.

- **Mr. Amit Thakur, Dr. Anil Kumar Dixit**, Principal Scientist, **Mr Kamlesh Kumar Acharya, Mr. A. G. Adeeth Cariappa and Ms Tulika Kumari**, DESM Division received **"Best Paper Presentation Award"** for their paper "Local Dairy Supply Chains: A Profitability Analysis in Haryana" presented during 6th National Seminar (Webinar) on 'Sustainable Development: Socio-Economic Concerns' conducted by the Department of Economics, Punjabi University, Patiala and the Society of Economics and Development, Ludhiana on June 22, 2020.
- **Dr. Pooja Devi**, Ph.D. scholar received **"Smt. Kamala Madan Memorial Young Scientist Award-2020"** for her best thesis research work presentation entitled "Effect of Chlorophytum Borivilianum Supplementation on Biochemical Profile, Hormones and Productive Performance of Cattle" by the SAPI in XXVIII Annual Conference of Society of Animal Physiologists of India held at CSWRI, Avikanagar from February 18-19, 2020.
- **Mr. Harshal**, B.Tech. (Dairy Technology) 1st year student **"Secured 2nd Position"** in the International On-line Declamation Competition on the topic 'Coronavirus pandemic: Challenges and Opportunities' organized by Guru Nanak Khalsa College, Karnal from June 10-15, 2020.

संस्थान राजभाषा कार्यान्वयन समिति की बैठक का आयोजन

डा. एम. एस. चौहान निदेशक, भाकृअनुप-राडेअनुसं, करनाल की अध्यक्षता में संस्थान राजभाषा कार्यान्वयन समिति की तिमाही बैठक दिनांक 21.4.2020 को संपन्न हुई। समिति के पदाधिकारियों द्वारा सभी मुद्दों एवं सुझावों पर महत्वपूर्ण निर्णय भी लिए गए। निदेशक डा. एम. एस. चौहान ने इस बात पर जोर दिया कि संस्थान "क" क्षेत्र के अन्तर्गत हिन्दीभाषी हरियाणा राज्य में स्थित है, अतः हमें अपना अधिकाधिक प्रशासनिक सरकारी कामकाज हिन्दी में ही निपटाना चाहिए। उन्होंने सभी प्रभागाध्यक्षों, वैज्ञानिकों व कर्मचारियों से यह आग्रह किया कि वे अपने सरकारी कामकाज और अनुसंधान के कार्यों में राजभाषा को प्राथमिकता दे।

हिन्दी नोटिंग लेखन प्रोत्साहन अभियान संपन्न

संस्थान के करनाल मुख्यालय एवं बेंगलूरु व कल्याणी क्षेत्रीय केन्द्रों के प्रशासनिक कार्यों में हिन्दी नोटिंग को बढ़ाने के लिए दिनांक 1.6.2020 से 15.6.2020 तक 15 दिवसीय हिन्दी नोटिंग अभियान का सफलतापूर्वक आयोजन किया गया। इससे हिन्दी नोटिंग में आशातीत वृद्धि दर्ज की गई।

वर्चुअल राजभाषा गतिविधियों का आयोजन

भारत सरकार के द्वारा कोविड-19 की रोकथाम के लिए जारी किए गए निर्देशों को ध्यान में रखते हुए रिपोर्टाधीन अवधि में

राजभाषा एकक

संस्थान के द्वारा हिन्दी संगोष्ठियों एवं हिन्दी कार्यशालाओं का वेबिनार के माध्यम से वर्चुअल आयोजन करने पर जोर दिया गया। संस्थान के द्वारा नगर राजभाषा कार्यान्वयन समिति के तत्वावधान में दिनांक 17.6.2020 को राजभाषा प्रबंधन : समस्याएं एवं समाधान के विषय पर आयोजित की गई वर्चुअल हिन्दी संगोष्ठी में 46 प्रतिभागी शामिल हुए। इसी प्रकार 18 जून 2020 को "हिन्दी टिप्पणियां व हिन्दी पत्राचार कैसे बढ़ाएं" विषय पर नगरस्तरीय हिन्दी कार्यशाला का आयोजन किया गया जिसमें 32 प्रतिभागी ऑनलाइन माध्यम से शामिल हुए। इन दोनों आयोजनों में करनाल मुख्यालय व बेंगलूरु व कल्याणी क्षेत्रीय केन्द्रों के वैज्ञानिक व अधिकारियों ने भी बढ़-चढ़ कर भाग लिया।

नगरस्तरीय राजभाषा गतिविधियां

संस्थान नगर राजभाषा कार्यान्वयन समिति, करनाल के अध्यक्षीय कार्यालय के रूप में करनाल नगर में स्थित 51 सदस्य कार्यालयों को राजभाषा हिन्दी के प्रचार, प्रसार व कार्यान्वयन की दिशा में मार्गदर्शन प्रदान कर रहा है। रिपोर्टाधीन अवधि में राडेअनुसं, करनाल द्वारा 19.6.2020 को "अनुभव साझा करो प्रतियोगिता" के लिए लिखित प्रविष्टियां आमंत्रित की गई। इसी प्रकार संस्थान के द्वारा 17.6.2020 व 18.6.2020 को संपन्न वर्चुअल आयोजन में न.रा.का.स. के सदस्य कार्यालयों के इच्छुक प्रतिभागियों को भी शामिल कराया गया।

PERSONALIA

Joining/Appointment/Promotion

- Dr. Priyanka, joined as Scientist (AS&PE) at ICAR-NDRI, Karnal w.e.f. 04.04.2020.
- Dr. Hima John, joined as Scientist (AS&PE) at ICAR-NDRI, Karnal w.e.f. 04.04.2020.
- Mr. B. C. Katoch, joined as Administrative Officer at ICAR-NDRI, Karnal w.e.f. 06.06.2020.

Transfer/Retirement/Relieving

- Dr. P. K. Dixit, Principal Scientist (Agricultural Economics) SRS of ICAR-NDRI, Bengaluru retired from Council's service w.e.f. 31.05.2020.
- Smt. Krishna Devi Azad, AAO, ICAR-NDRI, Karnal retired from Council's service w.e.f. 30.06.2020.

SOUTHERN CAMPUS, BENGALURU

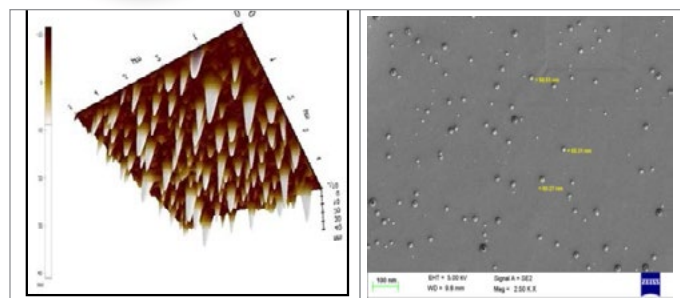
RESEARCH NEWS

Catechin Loaded Niosomes: Preparation, Characterization and Fortification of Milk

(G. Swarnalatha, B. Surendra Nath, Laxmana Naik N., Heartwin P. Amaladhas and F. Magdalene Emerald Eljeeva Emerald)

Catechins, belonging to the class of flavonoids, have promising therapeutic benefits, but have limited efficacy mostly due to poor absorption and bioavailability. Niosomes (nonionic surfactant vesicles) are promising nano-carriers in providing

targeted and controlled release of bioactives. Catechin loaded niosomes were prepared using food-grade surfactants and different stabilizers by thin film hydration technique and high shear homogenization. The niosomal suspensions were evaluated for structural, morphological characteristics, release behaviour, antioxidant properties, solubility and photostability. Catechin loaded niosomes prepared with Tween 60 and Tween 80 using lauryl alcohol exhibited small z- mean diameter of about ~60 nm and high entrapment efficiency when compared to those prepared with cetyl



alcohol and cholesterol. DLS, SEM, AFM images confirmed that the particle size is less than 60 nm. FTIR results showed interaction among surfactant, stabilizer and catechins, thereby confirming the successful encapsulation of catechins. Controlled and sustain release of catechins was observed for niosomal form under simulated GI conditions; 66.2% in 24 h when compared to >85% for free catechin in 2 h. The solubility and photostability of catechins in the niosomal form improved when compared with free catechins. Fortification of milk with catechin niosomes did not show any significant ($p < 0.05$) difference in sensory parameters. The developed niosomes could serve as promising delivery vehicles for improved bioavailability and functionality of catechins.

Bioactive Casein Peptides from Deoni Cow Milk: Preparation, Characterization and Elucidation of Functional Properties

(Brunda S. Murthy, B. Surendra Nath and Laxmana Naik N.)

A method for the production of cow (Deoni) milk casein peptides was optimized with different enzymes to substrate ratio (E:S), duration and combinations of enzymes. Among the different enzymes tested, the rate of hydrolysis decreased in the order of: flavourzyme > protease K > trypsin > pepsin. E:S ratio of 1:25 was observed to be optimal for trypsin, pepsin and protease K, while it was 1:100 for flavourzyme. Duration for optimal hydrolysis was 8 h for trypsin, pepsin and flavourzyme and 6 h for protease K. Electrophoresis of casein hydrolysates showed that the number of bands increased with increased hydrolysis. The hydrolysates were analyzed for antioxidant (ABTS and DPPH), antidiabetic (alpha amylase and alpha glucosidase inhibition) and antihypertensive (ACE inhibition) activity. Casein hydrolysates obtained using protease K showed the highest activity for antioxidant and antidiabetic

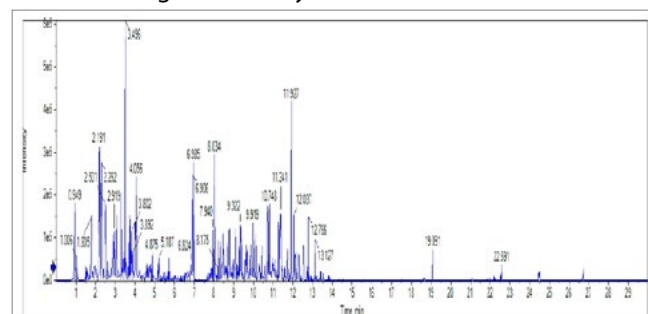


Fig. Bioactive peptide chromatogram RP-HPLC 3kDa Casein Fraction

properties, whereas those produced by trypsin showed highest ACE inhibition. Casein was also hydrolysed using select combinations of the enzymes. Hydrolysates obtained using combination of protease K and flavourzyme had the highest antioxidant and alpha amylase inhibition property, while those produced by protease K and trypsin showed highest alpha glucosidase inhibition and the ones obtained using trypsin and pepsin showed maximum ACE inhibition.

The fractions obtained by ultrafiltration were subjected to electrophoresis and analysed for functional properties. As the 3 kDa permeates of the hydrolysates obtained using protease K, flavourzyme, protease K + flavourzyme, protease K + trypsin and trypsin + pepsin showed better functional properties, they were subjected to preparative RP-HPLC for fractionation and the peak fractions were collected and analyzed for functional properties. The fractions with the highest activity were subjected to LC-MS/MS for amino acid sequencing, source of casein and m/z ratio. It was observed that each HPLC fraction had about 5-11 peptides and the number of amino acids in the peptides ranged from 6-14. The data was compared with the peptide library and previous literature and it was observed that almost all the identified peptides matched well with the reported ones with respect to amino acid sequence and functional property; a few new peptide sequences with functional properties were also observed. Antidiabetic properties with respect to alpha amylase and alpha glucosidase inhibition of casein biopeptides were shown for the first time through this study.

SUCCESS STORY

Vermicomposting Technology using Cow Dung as a Self-employment Venture for a Youth: A Success Story of Mr. Bharath Hemanth, M.Tech. Professional from Karnataka

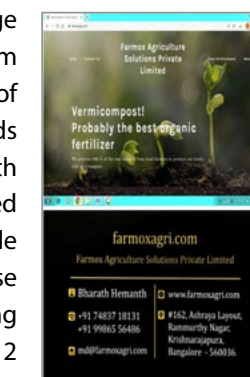
(S. Jeyakumar and K. P. Ramesha)

"Vermicompost" is organic manure prepared by using earthworms, dung and organic wastes. Vermicomposting technology has long been recognized as a source of creating self-employment, revenue generation vis-à-vis a source of organic fertilizer and Govt. of India is promoting organic manure production through various schemes for making "wealth from waste". Keeping in view the above facts and benefits of vermicompost technology, a youth, Mr. Bharath Hemanth, a M.Tech professional in Aircraft Design from Kolar district of Karnataka got interest in vermicompost production technology as a suitable method of producing organic manure as a source of self-employment and promote the technology to increase farmer's income. He learnt



the knowledge of vermicompost production from SRS of ICAR-NDRI, Bengaluru. He purchased two species of earth worms viz. *Eisenia foetida* (red worm) and *Eudrilus eugeniaei* (African Nightcrawler) from our Station. An interesting fact that, he does not own any dairy farm and he was concerned, how to get cow dung for vermicomposting and initially he was hesitant to start. Upon discussion with Scientists of SRS, he was suggested to collect cow dung at a regular interval from dairy farmers in and around his village. Based on our suggestion, he adopted the procedure and formed a network among dairy farmers for regularly obtaining cow dung for vermicomposting.

He used 4.5 acre of grand-parent's land under mango orchard for vermicompost production at his village Vokkalari which is about 12 km from Kolar. He established two types of vermihouse consisting of 6 vermibeds of size 10 feet in length, 3 feet in width and 2 feet in depth of pre-fabricated ones which are commercially available in market. Another type of vermihouse consisting of 4 vermibeds measuring 40 feet in length, 3 feet in width and 2 feet in depth were also made by him using factory rejected silk fabric spread between sticks fixed to the ground and stiffened to shape by using GI wire. Shade net was held by wooden poles fixed to ground. He is now able to produce every month around one ton of vermicompost made purely out of cow dung. As in any product, here too 'demand' is one of major deciding factors for success of commercial vermicomposting. He felt there was less demand among the agriculture farmers for vermicompost in and around his village. He was suggested to explore the marketing opportunities in the urban Bengaluru area where there is a huge demand for use in nurseries, kitchen garden, and roof garden. In addition, to have an identity for his product, he was given guidance to register a trade name and good packaging system with nutritional quality and benefits of vermicompost printed on the pack. He further ventured into e-trading by creating his own website www.farmoxagri.com. With his start-up venture, he is selling about 1 ton every month at a cost ₹10/kg. He is able to get a net income of ₹6000 every month through sale of vermicompost. Mr. Bharath shared his path of success by quoting that "Charity is not sustainable, there has to be a



business model" as stated by Shri. Devi Prasad Shetty, founder of Narayana Health and he decided to make the venture profitable. He also registered a private limited company by the name "Farmox Agriculture Solutions" and started selling vermicompost at a profitable price in packages of 1, 5 and 25 kgs to nurseries and other customers in the name of 'Farmox'. He further states that, vermicomposting is not only less capital intensive, but it has many advantages like faster capital recovery, ease of maintenance, less operational cost.

Mr. Bharath remembers and concludes by saying that, "the entrepreneurial opportunities of vermicompost technology, and the dire need to enrich our agricultural lands made possible by SRS of ICAR-NDRI, Bengaluru which, of course made my dream come true".

EVENT

Institute Webinar World Milk Day

Southern Campus of ICAR-NDRI organized an Institute Webinar for the faculty and students on the occasion of World Milk Day on June 1, 2020. In the webinar, talks were delivered on role of dairy products in immunity boosting and the corona virus infection & reproduction by the scientists of the Institute. The focus of the talks was on the impact of corona virus infection on the reproductive health of humans and cattle. Further, the Head of the Southern Campus, Dr. K. P. Ramesha also enlightened the participants about the significance of dairy sector and highlighted the need of innovative approaches to be followed in the dairy sector under the COVID-19 pandemic.

EXTENSION ACTIVITIES

Mera Gaon Mera Gaurav (MGMG) Activities

Under MGMG programme, two teams of scientists adopted 10 villages nearby Hosur in Krishnagiri District of Tamil Nadu. Members of both the team along with local veterinarian interacted small holder- and progressive- dairy farmers and discussed about good dairy farming practices on January 25, 2020 and followed up during the quarter April-June 2020. A meeting was arranged with Mr. Sivaraj, a progressive dairy farmer who underwent hands on training on artificial insemination (AI) and other farming practices during 1985. Through the skills, he acquired during his training, he is running a dairy farm for the last three decades and currently maintaining about 25 cows and heifers and produce about 500 kg of marketable milk per day which is being sold to local private dairy co-operative company. Dharwad Hybrid Napier-6 fodder variety cultivation by beneficiaries at adopted villages nearby Hosur Tamil Nadu under MGMG programme was monitored by field visits.



EASTERN CAMPUS, KALYANI

RESEARCH NEWS

Lutekhanew (*Ficus clavata*) Leaf as Herbal Feed Additive to Reduce Rumen Protozoal Population in Growing Crossbred Cattle

(A. Santra, S. K. Das, T. K. Dutta and M. K. Ghosh)

Rumen protozoa possess strong proteolytic activity and are contributed to intraruminal recycling of microbial nitrogen which should be avoided or minimized for efficient utilization of dietary protein. Elimination of protozoa from the rumen (defaunation) results in an increased growth rate and feed conversion efficiency in young ruminants due to better dietary protein and energy utilization. Recently, there is increasing interest in the use of tree leaves/plant secondary metabolites to reduce rumen protozoal population for efficient utilization of dietary protein and energy. Lutekhanew (*Ficus clavata*) tree leaves were collected from Gangtok, Sikkim and sun dried grounded (2 mm size) leaf meals were used as feed additive for conducting the experiment. Fifteen numbers of growing Jersey male cross-bred calves (about four months of age) were randomly divided in to three equal groups (G1, G2 and G3) and were fed individually under stall feeding on a mixed ration containing 50 % paddy straw and 50 % concentrate mixture for 140 days. Three types of iso-nitrogenous concentrate mixtures (C1, C2 and C3) were prepared. Wheat bran in concentrate mixture (C2 and C3) of test group (G2 and G3) was partially replaced (4 and 8 parts w/w) with Lutekhanew leaf meal.



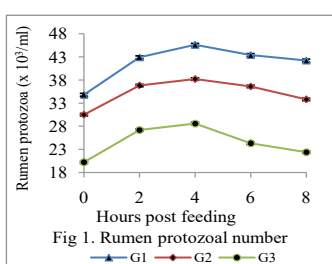
Dietary supplementation of Lutekhanew leaf meal as herbal feed additive did not have any effect on voluntary feed intake. On an average the calves of G1, G2 and G3 group consumed 3.2, 3.3 and 3.3 kg DM per 100 kg body weight per day, respectively. The rumen protozoal population present in the rumen of the experimental calves in all the experimental groups were B type due to presence of *Epidinium* sp, and the absence of

Polyplastron multivesiculatum. Numerically spirotrich protozoa comprised more than 90 % of total protozoal population in the calves of all the three experimental groups. The lowest number of rumen protozoal count was observed just before feeding (0 h) with increased in total protozoal number at 4 h (peak value) followed by a gradual decrease at 6 to 8 h post-feeding in the calves of all the experimental groups. Rumen protozoal number reduced ($P < 0.01$) drastically due to feeding of Lutekhanew tree leaves as herbal feed additive to the experimental calves (G2 and G3 group). Rumen protozoal number in the calves of G1, G2 and G3 groups was 42.2 , 35.5 and 26.5×10^3 per ml rumen liquor, respectively. The result of the study showed that Lutekhanew (*Ficus clavata*) leaf meal may be used as herbal feed additive to manipulate rumen fermentation to reduce rumen protozoal population for efficient utilization of dietary protein and energy in growing crossbred calves.

Improvement of Developmental Competence of Immature Oocytes Supplementing with Fibroblast Growth Factor as a Media Supplement and *In Vitro* Cattle Embryo Development

(Sonia B. Umdor, M. Karunakaran, A. Santra and Subrata K. Das)

The study was conducted to improve the production of *in vitro* cattle embryos using fibroblast growth factor as a maturation media supplement. Fresh ovaries and oviducts were collected from local abattoir in 0.9% saline solution (30-35°C) supplemented with antibiotics (400 IU /ml penicillin and 50 mg /ml streptomycin) transported to the laboratory within 2-3 h of animal slaughter. Total 524 cumulus oocyte complexes were collected by aspiration method, washed 5-6 times and cultured in maturation media (TCM-199 + 10% FBS + 5µg /ml FSH-P + 0.33 mM sodium pyruvate + 5% Follicular fluid + 50 µg/ml gentamicin sulfate) with supplementation of FGF (1, 5, 10 ng/ml) in treatment group for 24 h. in 5% CO₂ incubator at 38.5°C with maximum humidity. After 24 h of culture, matured oocytes were co-incubated with *in vitro* capacitated sperms for fertilization in Fertilization Bracket Oliphant media for 15-18 h. After co-incubation presumptive zygotes were co-cultured with oviductal cells for 7-9 days. In this study, the percentage of cleavage, 4-cell stage, 8-cell stage, 16-cell stage and morula stage were 36.88%, 51.92%, 34.61%, 19.23% and 11.54%, respectively in control group. It was concluded that fibroblast growth factor with 1 ng /ml supplementation enhanced cleavage rate as well as blastocyst formation rate for *in vitro* embryo development in cattle.



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