



NDRI News

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From The Director's Desk



Nutraceuticals are becoming the integral part of self-care movement across the globe. Significance of nutraceuticals assumes altogether different dimensions in our country where rapid rise in malnutrition and incidence of non-communicable diseases is posing newer challenges. It is costing not only 1% to National GDP but adversely affecting the human resource as well. In India 20% of the total population and 44% of children (below 5 years of age) are undernourished, which is even higher than poorer nations of Sub-Sahara region. In spite of introduction of iodized salt long back, about 10% people are still suffering with goitre, which is twice the cut-off level of WHO. Widespread Iron deficiency has affected the 79% children and 56% women and every 1/5th maternal death is attributed to anaemia. Another side of the story is related to imbalanced nutrition that has enhanced the burden of diabetes and cardiovascular diseases (CVDs) with estimation of 30 and 32 million patients, respectively. Designing of suitable

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Independence
Day
Celebrations
at NDRI :
Hoisting
of the tricolor
by the
Hon'ble
Director NDRI



diet with desired nutrients and pharmacologically-active components to meet the diverse needs of consumers is quite a daunting task. The healing power of milk nutrients is known for centuries and recent scientific investigations have proved the disease preventing or alleviating properties of milk nutrients. Whey proteins, lactose derivatives, casein derived bioactive peptides and milk lipids have been targeted by the food formulators and health professionals for the manufacture of novel foods. Likewise, probiotics have already captured a significant proportion of global nutraceutical market. Several species of Lactic acid bacteria (LAB) assist in maintenance and improvement of gut health besides providing several other health benefits. It has been exploited all over the world for the development of probiotic dairy foods. Now the time has come when characterized indigenous probiotic microflora with proven technological and therapeutic attributes should be made available for the manufacture of novel probiotic dairy products. Although, probiotics have already started cementing their place in global dairy market, yet many mysteries and health claims associated with probiotics need to be addressed carefully.

Further, milk mining for the isolation of such bioactive molecules through appropriate technological interventions has gathered momentum in the recent past. Traditional dairy products (TDP), which comprise the largest segment of processed dairy products, also need a face-lift through innovations in formulations and processes to reduce the fat and sugar levels without affecting their consumer acceptability. Newer ingredients and processes like membrane processing, high pressure processing (HPP) and supercritical fluid extraction (SCE), offer newer opportunities in delivering "wholesome" dairy products. Consumer acceptability of functional dairy foods will largely depend on their excellent sensory profile, validated health benefits and also their cost effectiveness. National Dairy Research Institute has given a lot of impetus on developing functional foods and nutraceuticals through interdisciplinary scientific investigations for fulfilling the diverse dietary needs of Indian consumers. The R&D efforts in these areas will help the Indian food industry to deliver nutritional and therapeutic products to consumers and also diversify their product profile to sustain in this competitive world.

A.K. Srivastava

(A.K. Srivastava)



RESEARCH NEWS

Pregnancy Established Using Ovum-Pick-up-IVF in Sahiwal Cattle

(M. S. Chauhan, R. S. Manik, S. K. Singla, P. Palta, M. K. Singh and Shiv Prasad)

Oocytes were collected from the ovaries of Sahiwal cattle by follicular aspiration using an ultrasound machine with a transvaginal convex transducer with a needle guide, single lumen 18-gauge 55 cm long sterile needle with an ultrasound echo tip. Oocytes were then subjected to *in vitro* maturation, fertilization and culture for development of embryos to the blastocyst stage. An embryo was transferred to the recipient i.e. surrogate mother resulting into establishment of pregnancy in cattle for the first time. This procedure allows carrying out research in cattle oocytes since cow slaughter is banned in the country. Further, this technology will also be useful for infertile, aged/tired and problematic yet valuable dairy cattle, and for those which do not respond to conventional embryo transfer program.

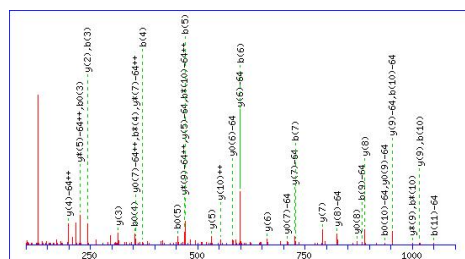
Identification of Antioxidative Peptides from Casein Hydrolysed with Crude Proteinase Preparation from *L. Helveticus* NCDC 288

(V. Ramesh, Rajesh Kumar, R. R. B. Singh, J. K. Kaushik and Bimlesh Mann)

Casein was hydrolysed with crude proteinase preparation from *L. Helveticus* NCDC288 to produce hydrolysate with antioxidant activity. The hydrolysis conditions such as hydrolysis

temperature, pH and enzyme to substrate (E/S) ratio for optimum production of antioxidative peptides were evaluated using response surface methodology. A central composite rotatable design (CCRD) was applied to study the effect of experimental variables on the antioxidant activity determined by ABTS⁺ radical scavenging capacity. It was shown that antioxidant activity of the casein hydrolysate could be controlled by regulation of three hydrolysis conditions including temperature, pH and enzyme to substrate (E/S) ratio. The parameters of the model were estimated by multiple linear regression and highest radical scavenging activity (1.80 TEAC Mg⁻¹ peptide corresponding to 12.30 %DH) was obtained under the hydrolysis conditions with E/S ratio 0.50, pH 9.10 and temperature 42.0°C. In order to identify the antioxidative peptides from hydrolysate, the peptides were separated on RP-HPLC C₁₈ column. Nine different fractions were collected and analysed for antioxidant activity. Fraction 4 exhibiting highest antioxidant activity was further separated and sequenced by LCMS.

Following the sequence interpretation, the first peptide GVSKEAMAPK matched with sequence β -Casein (94-105) and the second peptide RPKHPKHQGLPQ matched with sequence α ₁-CN (1 – 13). These peptides find application in functional foods as well as could be used in food systems as a natural additive with antioxidant properties preventing lipid oxidation via radical scavenging activity.





ACADEMIC AFFAIRS /DEEMED UNIVERSITY NEWS

Scholars Qualified for the Award of Ph.D. Degree

		<i>Lactobacillus</i>
	(Animal Biochemistry)	Nutraceutical Aattributes against Colorectal Cancer and Cardiovascular Disease.
	Dr. R. K. Mehla (Livestock Production Management)	Effect of Herbal Feed Supplementation Shatavari (Asparagus Racemosus) on Productive Performance of & Murrah Buffaloes.
	Dr. A. K. Dang	Alteration in the Immune Activity of Milk Somatic Cells of Elite Crossbred Cows during Lactation Cycle.
		Comparative Proteome Analysis of Bovine Mammary Epithelial Cells at Different Stages of Lactation.
		Development of Defined Starter for Preparation of a Cereal Based Functional Fermented Milk Product.
		Conjugated Linoleic Acid (CLA) Producing Potential and Genetic Heterogeneity of Rumen-Fungi.

ADMISSIONS (2011-12)

Course	No. of Students
B. Tech.(DT)	44
Master Programme	140
Ph.D. Programm	108



Director NDRI being presented the first copy of the Students' Magazine Endeavour -2011 by the Editorial Committee



Scintillating performances of the new entrants on Freshers' Day celebrated at NDRI on September 12, 2011



TRANSFER OF TECHNOLOGY

Krishi Vigyan Kendra (KVK)/Dairy Training Center (DTC)

Training Programmes

During the period under report, in all 37 training programmes (On-campus and Off-campus & training-cum-visits) on different aspects of dairy production and processing, vermi-culture, fisheries and home science were organized in which 1166 farmers, women, rural youth and extension functionaries were imparted training. Out of the total courses, KVK organized 12 sponsored training programmes on Scientific Dairy Farming for 368 practicing farmers, rural youth and extension functionaries. In these training programmes, 213 trainees were from Bihar, 96 from Jharkhand, 35 from Rajasthan and 24 from Orissa.



Exposure Study Visits Organized

During the period, KVK also organized 18 exposure and study visits for 601 farmers and farm women from different districts of Uttar Pradesh, Jharkhand, Assam, Rajasthan, Haryana & Himachal Pradesh states.

Animal Health Management Activities

Various Animal Health Management activities were organized through Stockman centers in adopted villages of KVK. At these centers, 475 cattle and 213 buffaloes were artificially inseminated and as a result 419 calves were born. Besides these, 41 animals were treated, 25 calves were dehorned and 31 animals were given infertility treatment.

Revenue Generated by KVK

Source	
Training Fee from KVK courses	9,000
Training Fee from sponsored courses	2,18,832
Tuition fee from visits conducted	8,000
Room Rent from Farmers' Hostel	79,620
Vermicompost Unit	300
Bee-keeping Unit	5,580
Fisheries Unit	3,900
Dairy Vikas Kendras	17,245
Horticulture	4,400
Crop production	2,50,007
Total	5,96,884

Dairy Extension Division

Dairy Education at Farmers' Door

Dairy Extension Division organized the 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 groups visited villages viz. Khrijpur and Wazidpur Karnal district on 2nd Saturday of each month during the period under report. The scientists educated the farmers on recommended Breeding and feeding practices so that this problem could be resolved. Tick Control treatment was also administered on the animals.

Field/Farm Activities Conducted in Adopted Villages from April to June 2011

Activities Conducted	Nos. of Cases
A.I. in Cows	506
Conception Rate	38%
A.I. in Buffaloes	200
Conception Rate	21%
No. of Crossbred Calves Born	68
No. of Buffalo Calves Born	33
General Treatment	137

During the 15 Campaigns, 1680 cases were treated for reproductive disorders and various ailments. Deworming and tick control programmes were conducted for endo & ecto parasites. Special attention was given to improve the productive & reproductive cases of diagnosis and proper treatment.

Kisan Sangosthies

Eight Kisan Sangosthies were organized on Prevention and control of infertility of dairy animals; Clean milk production practices in rural areas; Role of reducing inter-calving period in lactating animals; Endo and ecto-parasite control of dairy animals; Importance of animal vaccination against contagious diseases; Role of mineral mixture in animal diet; Heat stress management in buffaloes and Balance diet of lactating animals.

Empowerment of Women and Mainstreaming of Gender Issues

The 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 and maintain healthy atmosphere in their respective families. Ten such programmes were organised in the adopted villages of Dairy Extension Division in which 155 Farm Women from villages Surbi, Shahpur, Kulwetiri and Vazidpur participated.

Consultancy Services

(April to September, 2011)

1. Contract Research

I) Contract Research Project entitled "Use of Rice Bran Lecithin and Phosphatidyls in Dairy Cattle Feeding" sponsored by A. P. Organics Pvt. Ltd. Dhuri



(PB) under (Dr. A. K. Tyagi, Principal Scientist, DCN Division) (total project cost Rs. 6,92,960/- including S. Tax); Received final installment of Rs. 2,18,664/- including S. Tax 20,419 = Rs. 1,98,245/-

Rs. 1,98,245/-

ii) Contract Research Project entitled "Evaluation of the effect of Keenan Mech Fiber System on the Lactation Performance of Buffaloes" sponsored by Keventer Agro. Ltd. Kolkatta under (Dr. S. S. Thakur, Principal Scientist, DCN Division) (Total project cost Rs. 8,95,636/- including S. Tax); Received first installment of Rs. 6,04,554/- including S. Tax Rs. 56,454 = Rs. 5,48,100/-

Rs. 5,48,100/-

iii) Balance fee pertaining to Certification of Nestle, Nesvita Probiotic Dahi (Dr. V. K. Batish, Head, DM); Received Rs. 99,270/- including S. Tax. Rs. 9,270/- = Rs. 90,000/-

Rs. 90,000

Sub Total (1) Rs. 8,36,345

2. Contract Services

- | | |
|----------------|--------------|
| a. Analyses | Rs. 45,178/- |
| b. Sale of Kit | Rs. 32,100/- |
| c. Sale of CD | Rs. 6,00/- |

Sub Total (2) Rs. 77,778/-

3. Student Training Charges Rs. 1,79,000/-

4. NonStudent Training Course

- | | |
|---|--|
| a) Training on Dairy Processing for Employees of Nestle India Ltd. In Dairy Technology (Rs. 1,97,359/- after S. Tax) | |
| b) Training on Testing Kit for antibiotic (DM) for Neugen Diagnostics India Pvt. Ltd., Hyderabad and Delhi Milk Scheme, Delhi (Rs. 4,624/- + 39,300 after S. Tax) | |

5. Consultancy

(Individual/General)	Rs. 2,80,472/-
Grand Total	Rs. 16,14,878/-

RECENT HAPPENINGS

Silver Jubilee (25th Course) National Training Program on Technological Developments in Cheese and Fermented Dairy Foods

National Training Programme on "Technological Developments in Cheese and Fermented Dairy Foods" was organized under the aegis of Centre of Advanced Faculty Training in Dairy processing at NDRI, Karnal from 5th – 25th July, 2011. This training programme was planned for strengthening the scientific and teaching faculty of State Agricultural/Veterinary and Animal Sciences Universities, ICAR Research Institutes and other developmental organizations engaged in research, teaching, training and developmental activities.



Dr. A. K. Srivastava, Director, NDRI releasing lecture compendium during inaugural session of the training programme

During the training programme, several theory lectures, practical demonstrations and hands on practical training on various aspects related to dairy processing such as cheeses, fermented products and functional dairy foods and their evaluation were organized.

National Training Programme on Basic & Applied Approaches in Designing of Dairy Based Nutraceuticals and Functional Foods

NDRI organised National Training Programme on Basic & Applied Approaches in Designing of Dairy Based Nutraceuticals and Functional Foods from 18th – 27th July, 2011. The Training Programme was inaugurated by Dr A. K. Srivastava, Director NDRI. Resource persons for the programme included prominent experts Dr Hannu J. Korhonen, Head & Professor, Bio-molecule Research, MTT Agrifood Research, Finland; Dr Ritu Trivedi, Scientist Endocrinology from Lucknow and Dr Arpana Kuna, Asstt Prof. ANGRAU, Hyderabad besides senior faculty drawn from Dairy Technology, Dairy Chemistry and Animal Biochemistry Divisions NDRI. Dr. Panjab Singh, Former Director General, ICAR gave away the certificates to the 14 participants during the valedictory function organized on 27th July 2011.



Dr Panjab Singh, Former DG ICAR and Secretary DARE addressing the farmers on his visit to village Amritpur Kalan

Short Course on Basic and Technological Aspects of Milk and Milk Products

NDRI organized a Short Course for Professionals of Tetra Pak India, Ltd., from 5th - 9th September, 2011. During the training, various basic and technological aspects such as chemistry and microbiology of milk and milk products, fluid milk processing, manufacture of fermented milks, cheese, concentrated milks, Indian traditional milk products, ice-cream and frozen desserts, fat rich products, dairy by-products and packaging of dairy products, also safety aspects were discussed.

Data Analysis using SAS

A 6-day training programme was organized at NDRI under the aegis of NAIP Sub-project entitled "Strengthening Statistical Computing for NARS" during 12th -17th September, 2011. A group of 20 participants including scientists, teachers and technical officers drawn from different Nodal Centres associated with NDRI Consortium (Statistical Computing Hub-II) attended the training programme. The training programme covered theory lectures and practical hands on SAS Programming Essentials, Descriptive Statistics, Regression and Correlation Analysis, ANOVA, Multiple Regression, Design of Experiments, SAS Graphics, JMP, etc.

Short Course on Technological and Safety Aspects of Dairy Processing for Professionals of Nestle India

A Short training Course was organized for professionals of Nestle India from 13th – 17th June, 2011. In this training programme 18 theory lectures were delivered and 5 practicals were conducted. On successful completion of training programme, Dr. S. L. Goswami, Joint Director (Research) & Chief Guest distributed the certificates to all trainees at valedictory function on 17th June 2011.

National Workshop on Visioning and Strategic Planning for Dairy Sector in India

NDRI organized two day National Workshop on "Visioning and Strategic Planning for Dairy Sector in India" during 2nd - 3rd September, 2011 in association with National Centre for Agricultural Economics & Policy Research (NCAP), New Delhi.

The workshop was inaugurated by HE Sh. Surjeet Singh Barnala, former Governor of Tamil Nadu on 2nd September, 2011. Dr Ramesh Chand, Director, NCAP was the Guest of Honour in the function. Dr Ramesh Chand highlighted the importance of visioning and strategic planning for development in the context of fast changing environment.

Sixty four experts from different organizations and dairy industry in the country participated in the workshop. The workshop concluded on 3rd September, 2011 and Dr Raj Vir Singh, Member, CACP, New Delhi was the Chief Guest. Prof. A. K. Srivastava, Director & VC, NDRI Deemed University presided over the valedictory function and emphasized to increase primary lending to the dairy sector and to plug the gaps in inputs availability and the vaccination supply to control dreaded diseases among dairy animals like FMD.



National Seminar on Integration of Indian Dairy and Food Industry for Future Sustenance

NDRI Graduate Association organised a National Seminar on 23rd-24th Sept, 2011 at NDRI Karnal. The seminar was held under the banner of Ministry of Food Processing Govt. of India, New Delhi

Dr. R. S. Sodhi, Managing Director Gujrat Co-operative Milk Marketing Federation (Amul) was the Chief Guest for Inaugural function while Dr. M. M. Pandey DDG (Eng.) ICAR presided over the valedictory function. Dr. A. K. Srivastava Director, NDRI delivered the key note address. More than 400 scientists, CEO's and Managers from Dairy & Food Industry participated in the seminar. Mostly all the speakers focused on the present situation of Dairy & Food Industry and how both could integrate with each other to be more successful and profitable for future growth.



Dr. R. S. Sodhi, Managing Director GCCMF (Amul) inaugurating the exhibition during the seminar



Signing of MoU of NDRI with ILRI: Seen in picture are Mr Iain Wright, ILRI Regional Representative for Asia and Dr A. K. Srivastava, Director, NDRI

Institute Research Committee Meetings

The midterm Institute Research Committee (IRC) Meetings were held on 8th, 9th, 10th, 12th August, 2011 at NDRI, Karnal; 25th August, 2011 at SRS, Bangalore and 30th August, 2011 at ERS, Kalyani, respectively under the Chairmanship of Dr. A. K. Srivastava, Director, NDRI, Karnal. Dr. Srivastava emphasized on the development of farmer friendly technologies to address the core issues in present scenario. Dr. S. L. Goswami, Joint Director (Res.) encouraged the scientists to achieve their set targets/objectives with some useful research findings. All the ongoing research projects were critically evaluated and discussed thoroughly.

Technology Business Incubator

M/s. Agati Healthcare Pvt. Ltd., an Incubatee Company has started operating under SINED (TBI) on the project relating to manufacture Colostrum powder under the technical guidance of TBI.

Technology Business Incubator conducted the following programmes.

- Training Program on 'Commercial Dairy Farming' for 22 participants from 12th - 17th September 2011.
- Training Program on 'Breeding and Reproductive Health Management in Dairy Animals' for 20 veterinary doctors of the state of Orissa from 27th September to 1st October 2011.



Experts from USAID being apprised of the extension activities of NDRI at Village Amritpur Kalan on 12.08.2011



DISTINGUISHED VISITORS

19.07.2011 Six member delegation from Korea (Kangwon National University, Kangwon, Korea.

19.08.2011 **Sh. Giri Raj Singh**, State Animal Husbandry & Fisheries Minister, Bihar state

13.09.2011 **Mr. Antoine PFISTER** and **Ms. Juliette DRION**, French Trade Commission, French Embassy in India.

20.09.2011 **Mr. Francisco Mayorga**, Minister of Agriculture, Livestock Rural Development, Fisheries and Food of Mexico and accompanied 7 member delegates.



Director NDRI interacting with Mr Francisco Mayorga

27.09.2011 **Mrs. Imelda Quibranza-Dimaporo**, Member of Parliament, Republic of the Phillippines accompanied by **Mr. Abdullah D. Dimapora**, a former Congressman

VISITS ABROAD

- **Dr. M. K. Singh** Scientist, Animal Biotechnology Centre was deputed to undertake training in the area of "Stem Cell Research (Animal Sciences)" under NAIP project of Component-I from 20th June to 19th September, 2011 in USA.
- **Dr. S. L. Goswami** Joint Director (Res.) and **Dr. Sachinandan De** Sr. Scientist, Animal Biotechnology Centre participated in Workshop on Comparative Genomics under NAIP project of Component-4 from 10th – 23rd July, 2011 in USA.

- **Dr. P. Palta** Principal Scientist Animal Biotechnology Centre participated in "44th Annual Meeting of the Society for the Study of Reproduction" under NAIP project of Component-4 from 31st July to 4th August, 2011 in USA.
- **Dr. A. K. Srivastava**, Director was deputed to USA for implementing the existing MoU and finalizing implementation of ICAR's international Ph.D. scholarship programme from 6th – 9th September, 2011.



My Earth My Duty Campaign: Director NDRI giving a boost to the Tree Plantation Drive by planting saplings.



Laying of the Foundation Stone of the extension wing of the Kaveri hostel



HONOURS/AWARDS

Dr. Rekha Ravindra Menon received the **Jawaharlal Nehru Award (2010)** for Outstanding Doctoral Thesis Research in Agricultural and Allied Sciences at ICAR.



Dr. Rekha Ravindra Menon receiving Jawaharlal Nehru Award 2010 from Hon'ble Union Minister for Agriculture, Sh. Sharad Pawarji

- **Young Scientist Award** was given to **Prerna Saini** for her oral presentation on **"Production and characterization of caseino phosphopeptides from buffalo casein"** at National Seminar on Fermented Foods, Banaras Hindu University, Varanasi, held at 8th -9th April 2011.
- **Richa Singh, Rajesh Kumar, Ramesh V, Seema Rana, Bimlesh Mann and Anuradha Kumari.** received **2nd Best Poster Award for Poster Paper Presented** entitled **"Antioxidant Potential of Strawberry Polyphenol Extract in Presence of Milk Proteins"** at National seminar on **"Recent advances in the development of fermented foods"**

Organized by Centre of Food Science and Technology, Institute of Agricultural Sciences, BHU, Varansi. (8th – 9th April, 2011).

PERSONALIA

Promotions

- **Sh. Jagdish Kumar**, Assistant promoted as Asstt. Admn. Officer w.e.f.18.07.2011.
- **Sh. Rajbir**, Assistant promoted as Asstt. Admn. Officer w.e.f.18.07.2011.
- **Ms Usha**, M.A. Technical Officer T-6(L/T) promoted as T-7/8 (L/T) w.e.f. 01.07.2010.

Retirement/Transfer/Joining

- **Dr. S. Subash** Scientist (Vety. Extension Education)) relieved from NDRI, Karnal on 06.09.2011 to join at SRS of NDRI, Bangalore.
- **Dr. V. K. Kansal**, Principal Scientist (Biochemistry Animal Scientist) retired from Council's service on superannuation on 30.09.2011.
- **Sh. D. K. Arya** Finance & Accounts Officer retired from Council's service on superannuation on 30.09.2011.
- **Dr. Pawan Singh**, Principal Scientist (LPM) joined at NDRI, Karnal on 18.07.2011 from CIRB Hisar on transfer.
- **Ms. Sunita Meena** joined as Scientist (Biochemistry Animal Scientist) at Animal Biochemistry Division, NDRI, Karnal on 30.08.2011.

REGIONAL STATIONS

SOUTHERN REGIONAL STATION, BANGALORE

RESEARCH NEWS

Regular Monitoring of the Status of udder Health in High Yielding Cows: Key to Control of Subclinical Mastitis

Under the project sponsored by NABARD, Bangalore, the work on subclinical mastitis at

farmers door step through *snap shot* diagnosis followed by laboratory based tests was carried out. Survey work was carried out and milk samples were collected from Bangalore rural & urban and Kolar districts.

Samples were screened through Electrical Conductivity Meter (EC) followed by California Mastitis Test (CMT) and Digital Somatic Cell



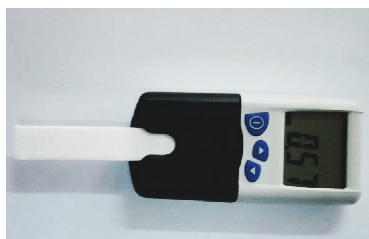
Counter. The results revealed that 61.15 % animals were normal and 29.62 % were affected with subclinical mastitis. Whereas, clinical mastitis was manifested in 9.23 % of animals.



Screening of milk samples at farmer's herd through electrical conductivity meter.



Gel formation in CMT; an indication of severity of mastitis



Detection of somatic cell count through Digital reader

Modeling of The Time-Independent Rheological Behaviour of Lassi

(Heartwin A. Pushpadass, Rajnarayan Saraswat and F. Magdaline Eljeeva Emerald)

The rheological characteristics of lassi were studied by using a computer-controlled rotational viscometer over a range of total solids (TS) sugar contents and with stabilizers such as carrageenan, pectin and locust bean gum (LBG). The viscometric data were converted into the basic shear stress vs. shear rate form using Mitschka

method. From the shear rate-shear stress data, the flow nature of lassi was evaluated. The apparent viscosities of the systems decreased with increasing shear rate, indicating pseudoplastic behaviour with yield stress. The rheological behaviour of lassi was adequately described by the Herschel-Bulkley and Casson models with a high coefficient of determination (R^2) and low root mean square error (RMSE). The Ostwald De Waele model did not fit very well because of the yield stress in lassi. The Herschel-Bulkley yield stress (σ_0), consistency coefficient (K) and the flow behaviour index (n) were determined as 0.638-7.725 Pa, 0.330-0.834 Pa.sⁿ and 0.514-0.701, respectively. The main and interaction effects of these selected factors on the apparent viscosity, yield stress, consistency coefficient and flow behaviour index were found to be highly significant. Of all factors, TS seemed to have the highest influence on the rheological behaviour of lassi. An increase in the concentration of TS was accompanied by an increase in the pseudoplasticity, consistency coefficient and yield stress. However, the effect of sugar on flow behaviour of lassi was quite opposite to that of TS. The flow parameters of lassi were positively influenced by both pectin and carrageenan. Carrageenan at 0.15% concentration was found to be the most suitable stabilizer for lassi. LBG-added samples showed visible whey separation owing to precipitation of milk proteins, and hence, it was recommended to stabilize lassi.

Development of Mathematical Models for Prediction of Shelf-life of Cheese – Puri Mix (Thanuja D. and Menon Rekha Ravindra)

Mathematical models were developed to predict the shelf-life of cheese – *puri* mix using two approaches, namely, deterioration due to moisture absorption and of lipid oxidation. The sorption behaviour was experimentally determined and described using the GAB model. Deterioration of the product due to absorption of moisture was anticipated to be manifested as non-enzymatic browning (NEB) and cakiness, while the index for oxidative rancidity was described in terms of peroxide value, which was expressed as a function of headspace oxygen concentration. NEB in the product was quantified in terms of its browning index and total colour difference. Development of cakiness in the sample was related to its sticky point temperature. The critical limit for moisture content based on



development of NEB was determined as 21.75 %, while for cakiness, it was 25.3 %; the critical headspace oxygen concentration for the product was determined as 14.3 %. The packaging material, low density polyethylene (350 gauge), was characterized for its water vapour transmission rate and oxygen permeability and found to be $5 \text{ gm}^2 \text{ day}^{-1}$ and $1600 \text{ cm}^3 \text{ m}^{-2} \text{ day}^{-1}$, respectively. The shelf life, at 38 °C and 95 % RH, was predicted to be 270 days based on moisture absorption, while it was predicted to be 180 days due to development of oxidative rancidity. The actual shelf life was determined to be 165 days; thereafter the sample was rejected due to rancidity development. Thus, the developed models showed a 90 % agreement with actual shelf life of cheese – *puri* mix, indicating the adequacy of the prediction.

Training Programmes Conducted

- Ten day training was conducted for four candidates on 'Preparation of Cheese and Related Products' from 12.07.2011 to 22.07.2011.
- Two ten day programmes training were conducted on 'Dairy Cattle Feed Analysis and Feed Formulation' from 18.07.2011 to 28.07.2011 and 4.08.2011 to 12.08.2011.
- Ten day training was conducted for six candidates on 'Preparation of Ice-cream and Indigenous Dairy products' from 01.08.2011 to 11.08.2011
- Three day training was conducted for twenty three candidates on 'Commercial Dairy Production' from 25.07.2011 to 30.07.2011.

Extension Activities

- During the period under report, 89 visitors in four batches comprising students from various educational institutes of southern region, farmers and entrepreneurs visited the Institute. The visitors were taken round the institute to various sections as per their needs and were explained the ongoing activities.
- Advisory services / technical advice was rendered to the needy clientele during personal visits and mail enquiries to the institute. Extension literature on dairy production and processing was

distributed to the needy clientele groups, visitors and trainees during their visits to the Institute.

- An Orientation Programme was organised for fifty progressive farmers / milk producers from Salem, Coimbatore, Nilgiris and Dindugal milk unions of Tamil Nadu on study tour in National Agricultural Development Programme. The farmers / trainees were provided with needed information on scientific dairy farming by brief-ups / discussions on ongoing research and extension activities and visit to dairy production & processing units as per their needs.
- Regular weekly visits were made by the extension team to the adopted villages under Rural Extension Programme for the benefit of the clientele group in the adopted villages to provide necessary dairy extension services in the villages.

RECENT HAPPENINGS

Visit of Dignitaries

Dr. B. N. Mathur, Former Director NDRI visited SRS of NDRI on 29th July, 2011 and addressed the Scientists of the Station. **Dr. A.K. Srivatsava**, Director, NDRI was also present and addressed the scientists.

IRC Meeting

The IRC meeting of On-going Research Projects was convened on 25th August, 2011. **Dr. A.K. Srivatsava**, Director, NDRI chaired the meeting. **Dr. S. L. Goswami**, Joint Director (Research) was also present at the meeting.



Dr. B. N. Mathur, Former Director, NDRI & Dr. A. K. Srivatsava, Director, NDRI with the Scientists of NDRI, Bangalore



EASTERN REGIONAL STATION, KALYANI

RESEARCH NEWS

Purification of Heparin Binding Oviduct Specific Proteins and their Effect on *In Vitro* Embryo Development in Cattle

(S. K. Das, A. K. Sharma, A. Chatterjee and A. K. Mohanty)

Cattle native oviduct specific proteins (cOSPs) were isolated from cattle oviducts obtained from slaughterhouse and precipitated by ammonium sulphate (60%), followed by overnight dialysis using buffer and purified by high performance liquid chromatography (HPLC) system with a hightrap heparin prepacked column (GE Healthcare). On the basis of HPLC purification, these cOSPs have been divided into three fractions i.e. (A) Total proteins (TP), (B) Heparin unbound proteins (HUBP) and (C) Heparin bound proteins (HBP), and checked in SDS-PAGE analysis (Fig.1).

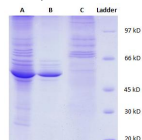


Fig.1 SDS-PAGE analysis of purified heparin binding cOSPs from cattle oviduct

Three fractions of oviduct specific proteins (TP, HUBP & HBP) were used in three different concentrations (1, 10 & 30 µg/ml) for *in vitro* maturation, sperm preparation, *in vitro* fertilization and *in vitro* culture of cleaved embryos (Fig.2). The control group was not supplemented with OSP. The highest cleavage rate (73.78%) and blastocyst formation rate (27.71%) was obtained by adding 10 µg/ml concentration of total OSP (TP) as a culture media supplement for IVF, IVF and IVC.]

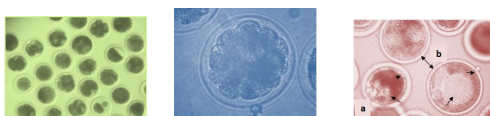


Fig. 2 *In vitro* developed Cattle embryos (A. Early stages, B. Morula & C. Blastocysts: a) early blastocyst, b) expanded blastocyst- arrow indicating blastocoel cavity and trophoblast cell layer) using OSP as a culture media supplement

Extension Activities

The station participated in the Utkal-Banga Utsav-2011 from 14th to 20th Aug' 2011 at Chandaneswar Mahavidyalaya Campus, Sahabajipur, Dist. Balasore, Orissa organized by the All India Agrabami Handicapped Samiti, Baruipur, Purba Medinipur. The institute activities and technologies related to good dairy practices were presented to the farmers through the ERS- NDRI Exhibition stall.



Midterm IRC Meeting held at ERS, Kalyani

The midterm IRC meeting was held at ERS-NDRI, Kalyani on 30th August, 2011 under the chairmanship of Dr. A. K. Srivastava, Director, NDRI. Dr. S.L. Goswami, Joint Director (Research), NDRI co-chaired the meeting. The progress of the ongoing projects was presented by the respective principal investigators.

Rajbhasha Samaroh Celebration

Rajbhasha Samaroh was organized on 14th September, 2011 at ERS, Kalyani. The programme was inaugurated by Dr. P. Roy, Officer-in-Charge, ERS-NDRI. Various events in Hindi like Bhasan Prtiyogita, Hindi Quiz, Hindi Karyashala etc. were organized. Dr. B. K. Singh, Hindi Professor (Retd.), Kanchrapra College was the chief guest for the occasion.

Forthcoming Events

- International Conference on Functional Dairy Foods (November 16-19, 2011)
- Annual Conference of Indian Society of Society of Agricultural Statistics (Dec.3-5, 2011)
- Winter School on Recent Advances in Functional Fermented Dairy Foods and their Quality Assurance (December 9-29, 2011)
- National Symposium on Recent Advances in Reproductive Biotechnology: Retrospective and prospective vision (January 30-31, 2012).

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